Verb Mapping for Sanskrit-Hindi Translator

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This thesis titled "**Verb Mapping for Sanskrit-Hindi Translator**" submitted by me for the award of the degree of **Doctor of Philosophy**, is an original work and has not been submitted so far in part or in full, for any other degree or diploma of any University or Institute.

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UNICODE DIACRITICS

अ - a

आ - ā

इ - i

ई - ī

उ - u

ऊ - ū

ऋ - ṛ

ऌ - lṛ

ए - e

ऐ - ai

ओ - o

औ - au

अं - aṃ

अः - aḥ

क - ka

ख - kha

ग - ga

घ - gha

ङ - ṅa

च - ca

छ - cha

ज - ja

झ - jha

ञ - ña

ट - ṭa

ठ - ṭha

ड - ḍa

ढ - ḍha

ण - ṇa

त - ta

थ - tha

द - da

ध - dha

न - na

प - pa

फ - pha

ब - ba

भ - bha

म - ma

य - ya

र - ra

ल - la

व - va

श - śa

ष - ṣa

स sa

ह - ha

क्ष - kṣa

त्र - tra

ज्ञ - jña

ABBREVIATION

1- First person

2 - Second person

3 - Third person

ABL - Ablative Case

ACC - Accusative Case

ADJ - Adjective

ASS -Associative

AUX - Auxiliary

BEN - Benefactive

C-DAC- Centre for Development of Advance Computing

CLIR - Cross Lingual Information Retrieval

COND - Conditional

CONJ - Conjunction

CRF - Conditional Random Field

DAT - Dative Case

DES - Desiderative

EBMT- Example Based Machine Translation

EMPH - Emphatic

ERG - Ergative Case

FSG - Feminine Singular

FUT - Future Tense

GEN - Genitive Case

HMM- Hidden Markov Model

IIIT- International Institute of Information Technology

IL-ILMT – Indian Language to Indian Language Machine Translation

ILMT- Indian Language Machine Translation

IMP- Imperative

IMPF- Imperative

INF- Infinitive

INS- Instrumental Case

JNU- Jawaharlal Nehru University

KBCS - Knowledge Based Computer Systems

LDCIL- Linguistic data consortium for Indian Languages

LPMS - Localization Project Management System

LT – Language and Technology

MAT - Machine Aided Translation

MPOST- Maithili Parts of Speech Tagger

MSG Masculine Singular

MSGH- Masculine Singular Honorific

MT- Machine Translation

N- Noun

NCST - National Centre for Software Technology

NER - Named Entity Recognizer

NLP- Natural Language Processing

OBL - Oblique Case

OCR- Optical Character Recognition

OGC - Oriya Grammar Checker

OMA - Oriya Morphological Analyzer

OPT - Optative

OSA - Oriya Semantic Analysis

OSC - Oriya Spell Checker

OWP - Oriya Word Processor

P- Pāṇini

PCPL - Participle

PFT - Perfective

PL - Plural

PLIL - Pseudo Lingua for Indian Languages

POS – Parts of Speech

PRN - Pronoun

PRS - Present Tense

PRT - Particle

PST – Past Tense

R&D- Research and Development

RC-ILTS - Resource Centre for Indian Language Technology Solutions

REFL- Reflexive

SaHiT- Sanskrit-Hindi Translator

SARS - Sanskrit Anaphora Resolution System

SG - Singular

SGH - Singular Honorific

SHMT- Sanskrit- Hindi Machine Translation

SL- Source Language

SMT - Statistical based Machine Translation

SUGG Suggestive

SVM- Support Vector Model

TAG -Tree-Adjoining-Grammar

TDIL- Technology Development for Indian Languages

TG- Transfer Grammar

TL- Target Language

TLX10 - Teleprinter and Telex Products

TTS- Text to Speech

UCSG - Universal Clause Structure Grammar

UNL - Universal Networking Language

WSD- Word Sense Disambiguation

Acknowledgement

I am very lucky to have Prof. Girish Nath Jha as my PhD supervisor and Prof. Rajeshwari V Pandharipande as my Co-Supervisor. Both of them are student-friendly and soft-hearted teachers. This research topic was a challenge for me because developing a Sanskrit-Hindi Machine Translation (SHMT) tool was my dream. These five years of long PhD journey became very easy with them. I had full freedom to think and argue with them for long hours. I am thankful to both of my mentors for their consistent support.

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INTRODUCTION

1. About Verb Mapping:

Verb Mapping is a process for identifying the root and suffix of source language and replacing them with the parallel root and suffix forms of the target language so that the semantic relation and specific predicate-argument structures can be produced by the coherent mapping of verb forms in both the languages. The sentence is present in its verb just as a whole Bunyan tree is present in its seed (Kapoor, 1985:25). The verb is the primary element in the sentence for the following reasons:

- It is always present in a sentence.
- It uniquely determines the number of co-occurring nominals.
- It indirectly determines the number and nature of subsidiary concepts (such as those denoted by adjectives) which may be present in a sentence.
- It directly determines the nature of adverbial modifications, temporal and spatial (Kapoor, 1985:26).

Therefore Verb Mapping is a crucial task in Machine Translation (MT).

These are some Issues and Challenges in Sanskrit-Hindi Verb Mapping. Both languages are from Indo-Aryan language family but there are morpho-syntactic differences between both the languages. Sanskrit verbs have been carefully studied by the Sanskrit Grammarians and Sanskrit has a well classified database of the verbal roots and it can generate n-number of Sanskrit verbs with the help of 22 *upasarga*. Further it is noticed that the *upasarga* has no fixed meaning and therefore the verbal meaning (of the verbs which have same *upasarga*) gets changed. Hindi doesn't have such a well classified database of verbal roots compare to Sanskrit. Sanskrit verbs are inflectional and Hindi verbs are periphrastic. Sanskrit *tiṅanta* verbs don't have agreement with the gender of the agent but Hindi agrees with the gender. Sanskrit is not aspectual but Hindi is aspectual. These linguistic differences make it a challenging task for MT to map Sanskrit-Hindi verbs.

2. Scope And Objectives Of The Present Research

This work will help in the appropriate translation of the given verb in the input text for Sanskrit Hindi Machine translation. Different suffixes are added to the root to make different forms of the verb which conveys different meanings. All the verbal

forms are not listed in any electronic database for the purpose of machine translation and this is not easy to create a huge list of parallel bilingual database of the verbal form manually for making a tool for verb handling. This work is going to provide a rule based approach to map the verbs for Sanskrit Hindi Machine translation by doing a contrastive study of Verbs between both the languages. In machine translation, there is a requirement of handling verb forms in the target language Hindi. So the present work aims at studying the issues in verb mapping in Sanskrit-Hindi MT system and to present the possible rule based approach to handle the verbs.

The scope and **objectives** of the present research can be outlined as following:

- Comparative study of Sanskrit and Hindi at the syntax level.
- Collection and creation of parallel corpus of root forms
- Making general rules for mapping the verb forms according to the transformational approach.
- Identifying the conditions where the Sanskrit verbs drop the general meaning or expresses other tense because of upasarga or nipāta used with the Sanskrit verbs.
- Present work can be useful to deal with divergences in Sanskrit-Hindi MT system at the level of verbs
- Writing transfer grammar rules for verb mapping.
- Partial contribute towards creating a simple machine translation system called SaHiT.

3. Works Related To Sanskrit And Hindi Verbs In Computational Linguistics:

Verbs in Sanskrit WordNet: WordNet is a large lexical data or an electronic thesaurus which has sets of cognitive synonyms called Synset. It interlinks the words with their specific meaning. It is a database of meaningfully related words and concept where each synonym expresses a distinct concept. It groups the words together based on their meaning and represents the concept of semantic and lexical relation. WordNet consists of four subnets- Noun, Verbs, Adjective and adverbs. In WordNet, about 1246 Sanskrit verbs are listed. When an input word is entered in the input box, the result gives the synset ID, POS, synonyms, Gloss in Sanskrit, Hindi and English along with Example. It shows number of available synset of the input word

and shows them one by one. Each synset shows the POS category of the word. For example- the word bhū is showing 6 synsets. The First four synsets are showing verb as the POS category of bhū and the 5th- 6th synsets are showing Noun as POS category of bhū. The first five Synsets show the synonym of the root bhū under the POS category 'verb'. The last Synset shows the synonyms under the POS category 'Noun'. For example- some verbs are searched and the following screen shots are given to understand the function of WordNet. The word bhū has 6 Synsets. The first four synsets have POS categoty "verb" and the last two have 'Noun'. 1st synset gives the synonyms: bhū, as, vṛt, 2nd Synset adds the synonym vid, 3rd Synset gives 13 synonyms (vyāpṛ etc.), 4th Synset gives 7 synonyms, 5th Synset gives 22 synonyms and 6th Synset gives 4 synonyms under Noun-POS category.

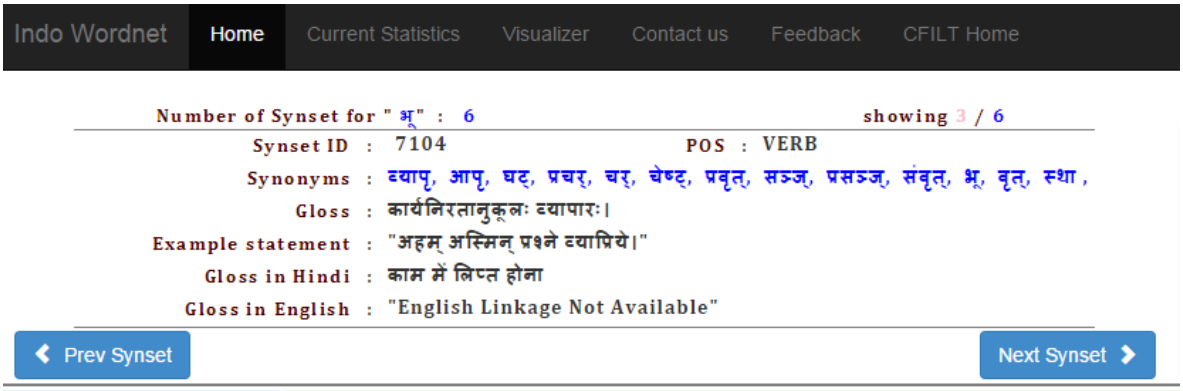

Fig1. Shows the verbal synonyms of the root bhū under the POS category 'Verb'

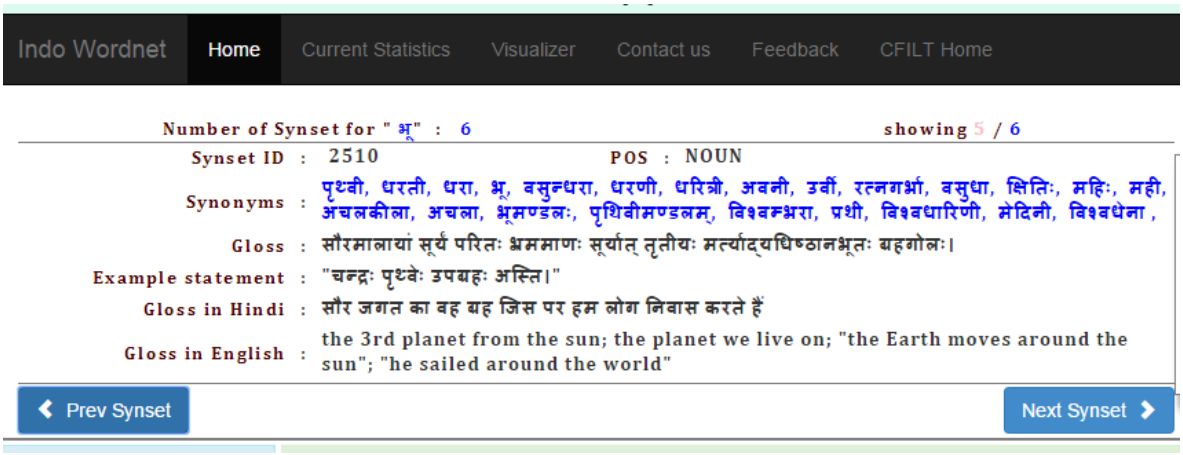

Fig.2 shows the nominal synonyms of the word bhū under the POS category 'Noun'

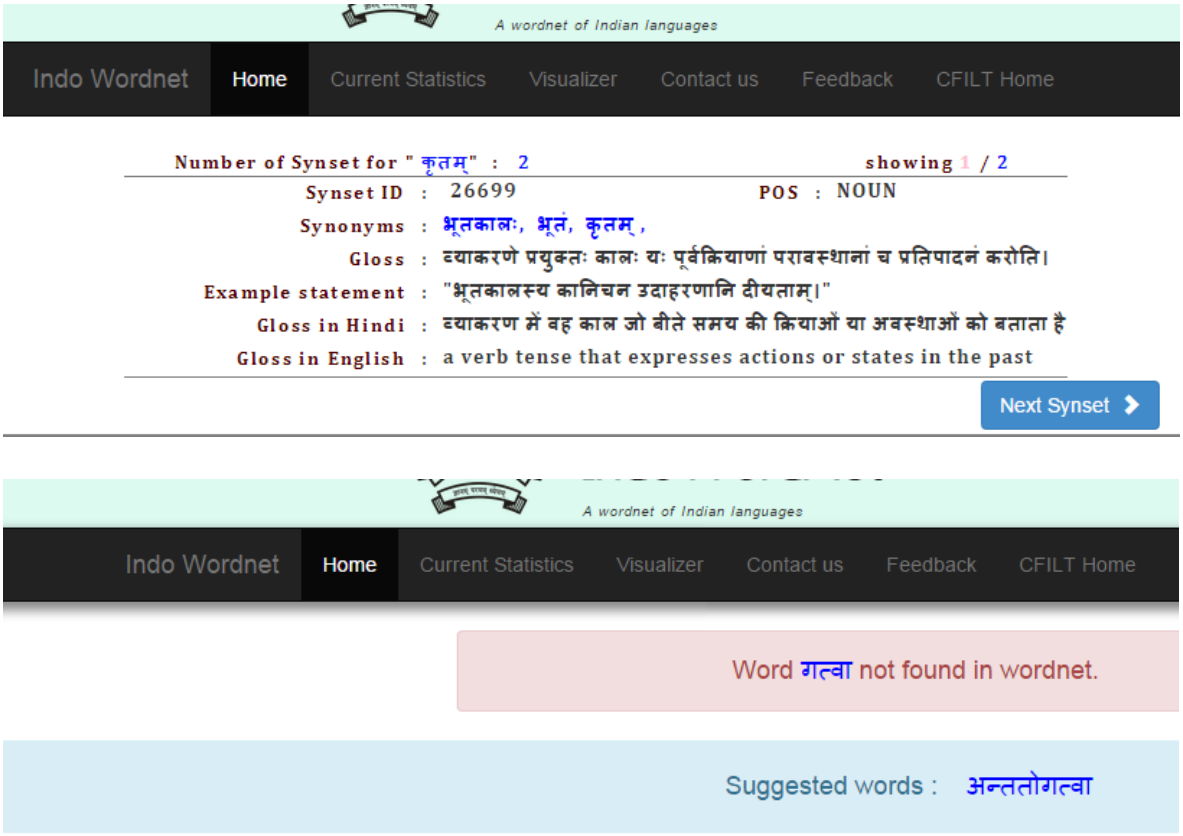

Fig.3 shows that the verb with the suffix ktvā is not found in the WordNet, it is suggesting other word.

Fig.4 shows the synonym of root has

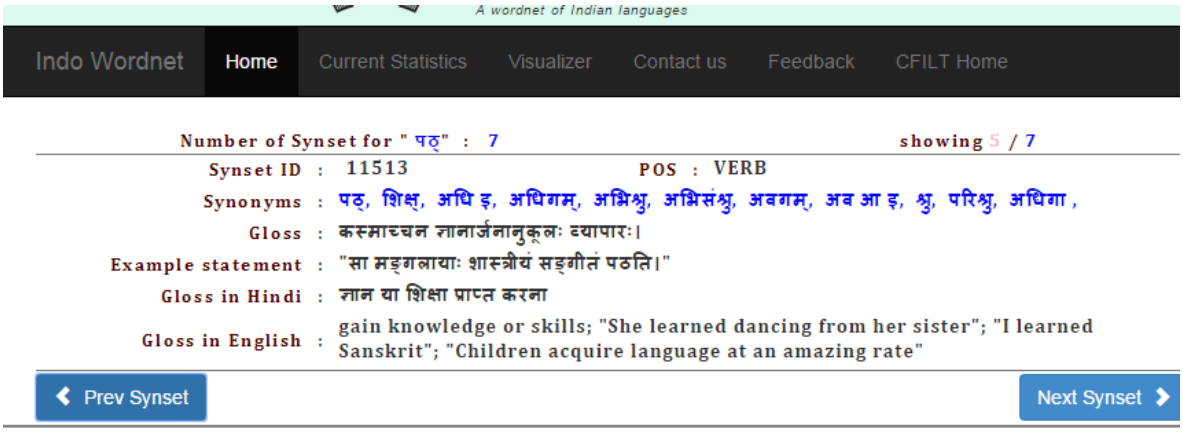

Fig.5 shows the synonym of root paṭh

This research is under progress. Therefore we cannot get all the Sanskrit verbs in WordNet. Further, it doesn't gives the meaning of verb forms (such as - paṭhati, paṭhataḥ etc).

Computational identification and analysis of Sanskrit verb-forms of bhvaadigana:

Muktanad Agrawal has submitted him M. Phil in JNU on the topic "Computational identification and analysis of Sanskrit verb-forms of bhvaadigana" under the supervision of Dr. Girish Nath Jha. His work is an attempt to make an analyzer for inflectional verb morphology of Sanskrit and recognizes verb forms in a given Sanskrit text. The analyzer follows the reverse Paninian approach to identify and analyze these constituent parts in Sanskrit verb forms. In the conclusion, Muktanand says- " the primary and most important function is the recognition of ti ending. Locating the ti ending in a word confirms it to be a tianta form on one hand; on other hand, separating the ti affix produces the verbal base. So, ti endings are the key in this analysis module. The verb forms which do not contain any ti termination in the end are problematic to be recognized and analyzed. For example bhava and babhūva are such forms. As for now, they are being stored in example base".

The Knowledgebase for Karma Kāraka (with Special Reference to the Verb of karma): This work is done by Manji Bhadra. In her thesis, she has focused on the semantic implementation of the kāraka with the special reference to the verb 'eating'

by using the concept of semantic primitives. Her approach is based on the methods discussed by Jeckendoff and Dorr to explain the most desired thing to the machine as it is fixed in mental representation. This work adopts the approach of Lexical Conceptual Structure.

Ontological knowledge base for selected verbs of Sanskrit and Bangla: This work has been done by Dr. Subhash Chandra for his PhD submitted to JNU. It claims to provide an ontological base for selected Sanskrit-Bangla verbs which helps in understanding the relation between verbs and different possible valid arguments. It tries to provide the real world knowledge to the computer to make it understand the verb argument relationship. It discusses about the nominal expectance of the verb and the compatibility of verb arguments. It has knowledge database of Sanskrit and Bangla and the database for argument valence Mapping. The system gives the ontological information of each input word with the help of relational database. It checks all the ontological information in the database and when the combination of arguments is match then the system returns it as valid combination of argument, otherwise it labeled invalid.

Automatic Identification and Analysis of Verb Grouping in Hindi: This work has been submitted by Dr. Narayan Kumar Choudhary as his PhD in JNU. In this work he has focused on the automatic identification of the verb groups in Hindi text which is basically local word grouping task in the NLP. It analyzes the inflectional verb morphology which represents the time and tense in Hindi. He observes that the verb groups are employed to show the various TAM combinations expressed in Hindi. In the next chapter, he explains the process of identifying and marking the verb groups.

The Sanskrit Heritage Site: The Sanskrit Heritage site[1] of Gerard Huet has Sanskrit verb-form generation tool[2] . This generates primary and secondary verbs in Sanskrit.

Sanskrit World[3]: This website is developed by Dr. Dhaval Patel. It has a Sanskrit tool section where verb generator tool is also available. It gives Sanskrit verb forms with their derivation process.

[1] http://sanskrit.inria.fr/ accessed on 30th June 2016 at 5:30 PM
[2] http://sanskrit.inria.fr/DICO/grammar.html#roots accessed on 30th June 2016 at 5:31 PM

Difference of present work from the earlier works:

All the above research works are very significant in the area of Computational linguistics research. The Machine Translation (MT) works are going on in many Indian languages funded by the DIT, GOI. Parallel mapping of verb forms are required for any MT tool. As not a single work is directly related to the parallel mapping of Sanskrit Verbs into Hindi, this work is certainly different from the earlier works. This work will help us in producing good output in SaHiT.

4. Research Methodology:

For this kind of applied research work in Computational Linguistics, a theoretical base is required. On the basis of contrastive properties found in the comparative study of Sanskrit-Hindi Syntax, the transfer grammar rules will be written (theoretically) to map the verbs in SaHiT. With the help of Java Programming, the tool will be developed for mapping Sanskrit-Hindi Verbs for SaHiT.

Step-wise Research Process:

- Comparative study of Sanskrit and Hindi at the syntax level.
- Collection and creation of parallel corpus of root forms.
- Studying the role of *upasarga* in Sanskrit verbs and creating a parallel database of *sopasarga-dhātu* and its Hindi meaning which can be used as verbal base for Sanskrit verbs.
- Creating a database of Sanskrit roots along with the imperative Hindi forms of those roots.
- Transfer Rule writing
- Programming

This system will contribute towards creating a rule based Sanskrit-Hindi machine translation system called SaHiT.

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[3] http://www.sanskritworld.in/sanskrittool/SanskritVerb/tiGanta.html accessed on 30th June 2016 at 5:39 PM.

CHAPTER DIVISION

Introduction

Chapter 1: Language Technology in India

Chapter 2: Sanskrit Verbs

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CHAPTER 1
LANGUAGE TECHNOLOGY IN INDIA

1.1 INTRODUCTION:

When the global world is staying connected through internet and the technology is reaching to the masses in different language spoken areas of the world, the digital device is changing the world rapidly. Digital communication in user's own language is making all kind of business easier. In the competitive world, the knowledge which is accessible to all in a faster manner is desired. After almost six decades of Computation Linguistics Research and Development (R&D), the digital world is confidently moving toward intelligent machines which can understand and process natural (human) language. Natural Language Processing (NLP) is opening a new window in the area of interdisciplinary R&D. Human knowledge and communications are expressed through language, both in written and spoken forms. Language technology (LT) permits computers to process human language, providing more natural human-machine interfaces, and more sophisticated access to stored information. LT is playing a central role in the multilingual information society of the future. The goal of LT system is software productions that have some knowledge of human language. In the field of LT, the linguistic knowledge and the computational technology, together, are providing a solution to overcome the challenge of linguistic diversity worldwide. LT related research in Indian Languages started in late '80s-early 90s, with the financial support of Govt. of India. Primarily the work was focused on computational engineering and programming. As soon as the scope of this subject increased and the requirement of linguists and the language experts became unavoidable, the linguistics departments and the language departments got involved. Because of this, the NLP research centers increased in India. Government also initiated the work in a consortia mode so that the experts of the different institutions can work together and the outcome of the research can help the multilingual country like India in overcoming the language barrier in near future. The details of the ongoing research are available on the website of some leading institutes and on the

TDIL websites[4] as well. The ongoing works are classified into the following categories on the TDIL website:

A. Fonts, Handwriting reader and keypads
B. Different Processing Tools Indian Languages
C. OCR
D. TTS and Speech to Text
E. POS Taggers, Parsers
F. Online Lexical resources and corpus
G. Localization
H. WorldNet
I. Machine Translation
J. Word Sense Disambiguation
K. E-learning Tools

1.2. Information about TDIL website:

The TDIL website has the following sections:

A. Indian Language Technology Products (ILTP):
B. Application Showcase:
C. Research Efforts: Machine Added Translation, OCR, TTS, ASR, OHWR, CLIA, SHMT

1.2.1 Indian Language Technology Products (ILTP): In the section of Indian Language Technology Products (ILTP), works done by different companies along with their description[5] has been listed. Following are the main companies which are providing different application software and tools:

1. A2all Company is providing the facility to search educational materials in the Indian languages[6].
2. Wish Tel Pvt. Ltd. is providing IRA[7] things tabled which is designed as a part of low cost device project under the National Mission on Education through ICT. It is funded by MHRD, Govt. of India[8].

[4] http://tdil.mit.gov.in/ accessed on June 6, 2016, 3:27 PM.
[5] http://tdil.mit.gov.in/Services/Lang_Tech_Product.aspx web accessed on 19th April 2015 at 7:58 PM
[6] http://www.atoall.com/Language/all/India.asp#gsc.tab=0 web accessed on 19th April 2015 at 8:53 PM
[7] IRA, named after 'Goddess Saraswati' is entirely prototyped, designed, developed and engineered in India (http://www.wishtel.com/about-us.html accessed on 21th June 2016 at 4;30 PM).

3. FTK technology Ltd. is providing a software application named LooKey for chat, email and Online Word Processing in Indian Languages Hindi, Bangali, Telugu, Marathi, Tamil, Gujarati, Kannada, Malayalam, Panjabi and Urdu[9].

4. Luna Ergonomics Pvt. Ltd. is providing Panini Keypad on mobile which can be installed on java enabled android mobiles and iPhones. It supports typing in 11 Indian Languages[10].

5. Central Hindi institute and CDAC Noida is providing Online Hindi Viswakosh- Hindi Encyclopedia, which has a collection of more than 12000 topics[11].

6. It is listed on TDIL web that Lipi Data Systems Pvt. Ltd. is providing Line Matrix Printer for Indian Languages using GIST card[12]. But the website is not opening.

7. Databyte Equipment Pvt. Ltd. is providing TLX10 (Teleprinter and Telex Products). The description of TDIL says that it's a bilingual electronic[13].

8. According to TDIL website, VSOFT Services Pvt. Ltd. is providing APS Corporate 2000++, APS Designer 4.0, and APS Desk, which are windows based multilingual interface for Indian languages on MS-Office, Pagemaker, CoralDraw etc. The APS Desk is a windows based ActiveX controls for language Programming which is helpful for programmers[14]. When the web is accessed, the page is not found.

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[8] http://www.wishtel.com/products.html web accessed on 19th April 2015 at 9:00 PM
[9] http://www.lookeys.com/ web accessed on 19th April 2015 at 9:05 PM
[10] http://paninikeypad.com/index1.php web accessed on 19th April 2015 at 9:08 PM.
[11] http://www.cdacnoida.in/SNLP/digital_library/vishwakosh.asp web accessed on 19th April 2015 at 9:12 PM
[12] http://www.lipidata.com/line_matrix.htm web accessed on 19th April 2015 at 9:15 PM
[13] http://www.databyteindia.com/telecom_products.html web accessed on 19th April 2015 at 9:30 PM
[14] http://www.vsoftsolutions.in/corp.htm web accessed on 19th April 2015 at 9:50 PM

9. Modular Infotech Pvt. Ltd. is providing "Shri Lipi" font, "Shri Lipi samhita" (keyboard layout and font) and "Shri Lipi Ankur" (script processor). These products support Indian Languages[15].

10. Deshweb.com P Ltd. provides "Aksharmala", an Indian Language input tool which transliterates the English characters into the target language[16].

11. Summit Information Technologies Pvt. Ltd. provides "e-Indica" which is an Indian language writing system through English Keyboard[17]. It also provides Hindi Spell checker, Fonts, Tools, Keyboard Layout and Translation. Indica and Unicode are also maintained separately.
12. Artech Infosystem Pvt. Ltd. provides Akshar – which is also providing Fonts, Tools, Keyboard Layout and Translation[18].
13. CDAC-Noida's product is also listed here. The products are- address management system, Bilingual Electronic Dictionaries, Lekhika, and On-line Bilingual IT Terminology.
14. TDIL website says that the Machine Added Translation System of IIT-Kanpur and CDAC-Noida is providing 60% correct translation. The original link[19] was not opening.
15. CDAC Bombay's MaTra and Mulyaankan are linsted on the TDIL website. MaTra is a translation demonstration prototype for translating English text into Hindi. Mulyaankana is a mining software aimed at detecting anomalies in valuation of imports.
16. About 20 products of CDAC-Pune are listed on TDIL website under the title "ILTP". "ALP" is a multilingual word processor. "Anveshak" is a Natural Language based Information Retrieval system which provides explicit information in natural language text to the question intended to be queried on a certain document. "Chitrankan" is an OCR for Indian Languages. "GIST CARD" provides robust solution for Indian Languages

[15] http://www.modular-infotech.com/html/downloads.html web accessed on 19th April 2015 at 9:55 PM
[16] http://aksharamala.com/ web accessed on 19th April 2015 at 10:00 PM
[17] http://www.summitindia.com/ web accessed on 19th April 2015 at 10:05 PM
[18] http://www.artechinfo.in/ProdOurProducts.html web accessed on 19th April 2015 at 10:12 PM
[19] http://cdacnoida.in/SNLP/machine_translation.asp web accessed on 19th April 2015 at 10:23 PM

on DOS. GIST Shell is a DOS based software which works on 'Lotus 123' and 'FoxPro' in Indian Languages. "iLeap" is a product related with tools and Keyboard layout. "iPlugin" is a web application development tool for Internet in Indian Language. "ISM" is a Windows based software for Indian Languages. It supports 19 languages. "ISM 2000 OFFICE" is a Word and Data processor. "ISM 2000 Publisher" is a tool for advance Multilingual Publishing Solutions. "ISM 2000 SOFT" is used for Web Publishing, database applications and Windows applications. "LEAP OFFICE 2000" is Indian language software for office application which provides multilingual spell checker, keyboard shortcuts, online keyboard and office language dictionaries tools. "LILA", "LILA Hindi Praveen" and "LILA Hindi Pragya" are Hindi learning Softwares. "Lips" is a pioneering technology for enabling Indian Language subtitling for the entertainment world. "LISM" is a Linux based application for Indian languages. "ManTra" is a English-Hindi MT Tool. "Saili" is a computer generated design of Indian Traditional Art. "Talaash" is a web based solution search for Indian Languages content.

17. Few other tools are also mentioned in the list which supports Indian Languages.

1.2.2 A**pplication Showcase and Research Efforts:** These two sections are providing the following information about the ongoing research and tools:

1. sandhan
2. Online Sanskrit tools,
3. Web OCR,
4. Anuvadaksh,
5. AnglaMT System,
6. Sampark: Indian Language MT System,
7. Text-To- Speech,
8. LPMS,
9. Online Hindi Wordnet,
10. Third Party applications etc.

1.2.2.1 Sandhan: It is a monolingual search system for tourism domain in five Indian languages viz., Bengali, Hindi, Marathi, Tamil and Telugu. For example, we searched Delhi and it provided the information about Delhi tourism places. Sandhan system has processed the query based on the input language and retrieved result from the respective language. It provides the summery of the content of the link appeared in front of the user.

Online Sanskrit tools are showing the tools developed by the consortium of 7 institutes. These are the tools: Transliteraton tools, Morphological generator, Morphological analyzer, Sandhi and Sandhi spliter. These tools are also available on the website of the Sanskrit Department[20] of Hyderabad Central University because that university was the consortium leader. So the details about these tools will be discussed along with the works of Hyderabad University.

[20] http://sanskrit.uohyd.ernet.in/ website accessed on 20th April 2015 at 6:14 PM

1. 2.2.2 The web OCR: It is a robust OCR for printed Indian scripts. It converts the printed documents into electronically accessible format from Bangla, Devanagari, Gurumukhi, Kannada, Malayalam, Tamil, Telugu and it will soon be available for Gujrati, Oriya, Tibetan, Assamese, Manipuri, Urdu script in future. Indian Language OCR being a consortium based project is having a hybrid approach, designed to work with the platform and technology independent modules. IIT Delhi is the Consortium Leader funded by Ministry of Communication and Information Technology.

1.2.2.3 Anuvadaksh (English to Indian Language Machine Translation System): It is a consortium project which has hybrid approach. It is a state-of-the-art solution that allows translating the text from English to the following eight other Indian languages Hindi, Urdu, Oriya, Bangla, Marathi, Tamil, Gujarati, Bodo. The consortium institutes have worked on the integration of four Machine Translation Technologies:

1. Tree-Adjoining-Grammar (TAG) based MT
2. Statistical based MT (SMT)
3. Analyze & Generate rules (AnalGen) based MT
4. Example Based MT (EBMT)

As per the TDIL website, the Named Entity Recognizer [NER], Word Sense Disambiguation [WSD], Morph synthesizer, Collation & Ranking and Evaluation modules have been developed by different consortium institutes and the Language Vertical tasks have been carried out by various consortia members.

1.2.2.4 Angla MT and **Sampark IL-ILMT** will be discussed in the section of Indian Languages Machine Translation.

1.2.2.5 Text-to-Speech (TTS): It converts the machine readable text into Human Voice. The TDIL website says that the consortium of 5 research institute is working on Indian Languages TTS system development. The languages covered by this consortium are: Hindi, Indian English, Bengali, Marathi, Tamil, Telugu Kannada, Gujarati, Assamees, Rajasthani, Manipuri and Malayalam. Diwakar Mishra has

worked on Sanskrit TTS which is available online on JNU website[21]. His system can be used for Hindi with reasonable output as well. In his paper "grapheme to phoneme converter for Sanskrit speech synthesis"[22] He says that there has been little effort to develop a TTS for Sanskrit except for a prototype Text-to-Speech system at International Institute of Information Technology (IIIT), Hyderabad (Mahananda et al, 2010). Acharya, multilingual computing website of IIT Madras, has link of online demo of Sanskrit speech synthesis. The synthesizer is developed on MBROLA speech synthesis engine and does syllable level synthesis (lacking intonation). In the website, it is embedded as a Java applet which could not be tested online.

1.2.2.6 Parts-of-speech Tagger for Indian languages: POS Tagger marks the grammatical category of a word in a given sentence. Different institutes have developed different tag-sets for Indian languages. Sanskrit Consortium[23] of 7 institutions and MSRI developed a Sanskrit Tagset. Similarly IIIT-Hyderabad developed ILMT POS and CIIL Mysore also developed POS for LDCIL Project. Various part of speech tagging approaches like Hidden Markov Model (HMM), Support Vector Model (SVM), Rule based approaches, Maximum Entropy (ME) and Conditional Random Field (CRF) have been used for POS tagging. Based on these Tagsets, different Institutes developed POS tagsets for different Indian Languages. The first POS tagger of Sanskrit was developed by C. Ramaswamy in JNU. JNU has also helped in developing the Maithili POS Tagger (MPOST) which is done by Saroj Kumar Jha, a research intern at JNU Sanskrit Center during 2013-14 from the School of Language (Computational Linguistics), MGAHV, Wardha. Hindi POS Tagger, Marathi POS Tagger, Bengali POS Tagger, Malayalam POS Tagger, Marathi POS Tagger, Panjabi POS Tagger and Kannada POS Tagger have also been developed so far[24].

1.2.2.7 Localization Project Management System (LPMS): It is a web based platform made available especially to the small time localization companies. One of

[21] http://sanskrit.jnu.ac.in/samvacaka/index.jsp web accessed on 20th April 2015 at 8:50 PM
[22] First Workshop on Indian Languages Data: Resources and Evaluation (WILDRE 2012) under LREC, Istanbul, Turkey, May 21, 2012
[23] Formed for Sanskrit-Hindi Machine Translation and Toolkit Development project.
[24] http://citeseerx.ist.psu.edu/viewdoc/download?rep=rep1&type=pdf&doi=10.1.1.206.5376 web accessed on 20th April 2015 at 11:35 PM.

the main objectives of this system is to provide high-end systems for daily localization requirements. This system, will help in support to communicate well with the surrounding. The LPMS consists of workflow which includes publishing documents for localization, managing the localization project(s), translators and reviewer's dashboard, offline translators workbench and others. Following are the modules in LPMS: -

Publisher/Client – One who is responsible for publishing the localization jobs to the online community of volunteers (project managers, translators & reviewers) for full-filling his/her localization needs.

Project Manager – One who is responsible for managing the localization job on behalf of client/publisher and keeps the track of its progress for both translation & review cycles.

Translator – One who participate into job translation cycle and is responsible for providing the translations for community jobs.

Reviewer – One who participate into job review cycle and is responsible for validating & reviewing the translations done by translator.

1.2.2.8 Online Hindi WordNet[25]: IIT Bombay[26] provides the detail of Hindi WordNet which has been developed on the basis of English WordNet[27] of Princeton University. It has cognitive synonym (synsets) which expresses the interlinked conceptual semantic meaning and lexical relations. English WordNet says: "WordNet superficially resembles a thesaurus, in that, it groups words together based on their meanings. However, there are some important distinctions. First, WordNet interlinks not just word forms—strings of letters—but specific senses of words. As a result, words that are found in close proximity to one another in the network are semantically disambiguated. Second, WordNet labels the semantic relations among words, whereas the groupings of words in a thesaurus do not follow any explicit pattern other than meaning similarity"[28]. Hindi WordNet says that semantically similar two words that can be interchanged in a context are kept in a synset. So, basically WordNet is representing lexical concept which can be used to remove ambiguity in cases where a single word has

[25] http://www.cfilt.iitb.ac.in/wordnet/webhwn/ accessed on 28th April, 2016 at 7:45 PM
[26] http://www.cfilt.iitb.ac.in/wordnet/webhwn/other/hwn_docs_2.pdf
[27] https://wordnet.princeton.edu/
[28] wordnet.princeton.edu/wordnet/download

multiple meanings. Synsets are the basic building blocks of WordNet. The Hindi WordNet deals with the content words or open class category of words and contains the category of Noun, Verb, Adjective and Adverb"[29]. For example, when the word 'ghara' (house) is searched, it gave 11 senses which have been given bellow as snapshot:

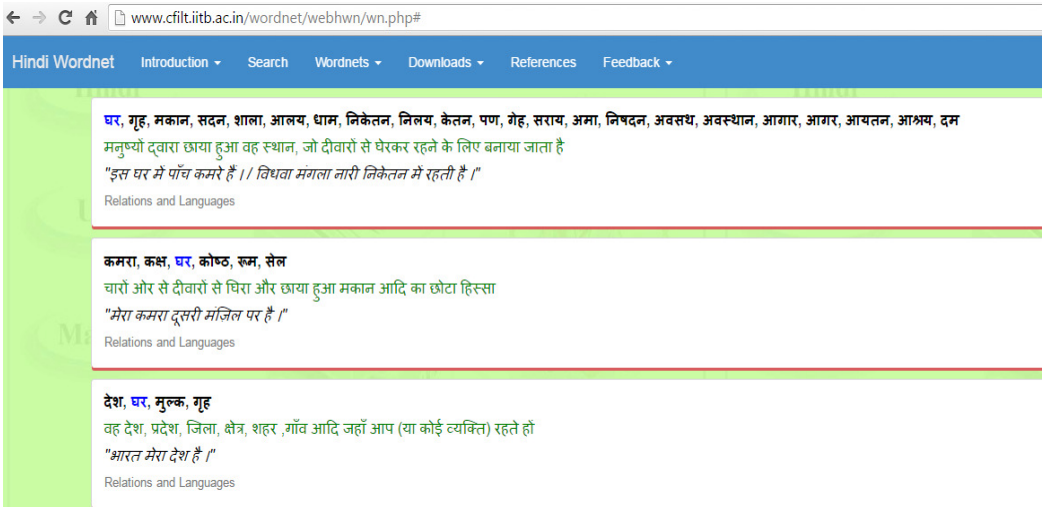

Fig1 of Hindi synset[30]

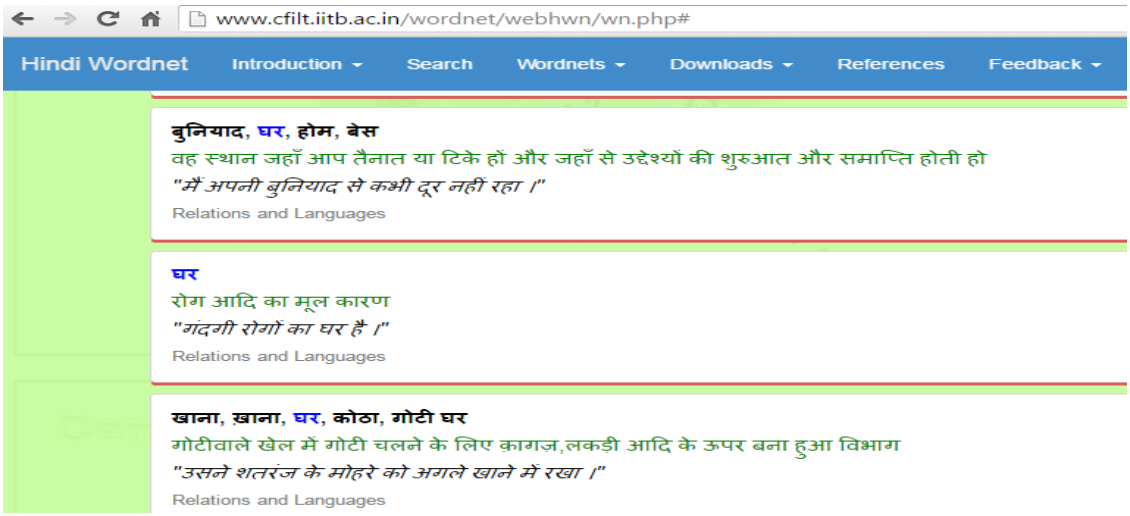

Fig.2 of Hindi Synset

[29] http://www.cfilt.iitb.ac.in/wordnet/webhwn/other/hwn_docs_2.pdf
[30] http://www.cfilt.iitb.ac.in/wordnet/webhwn/wn.php#

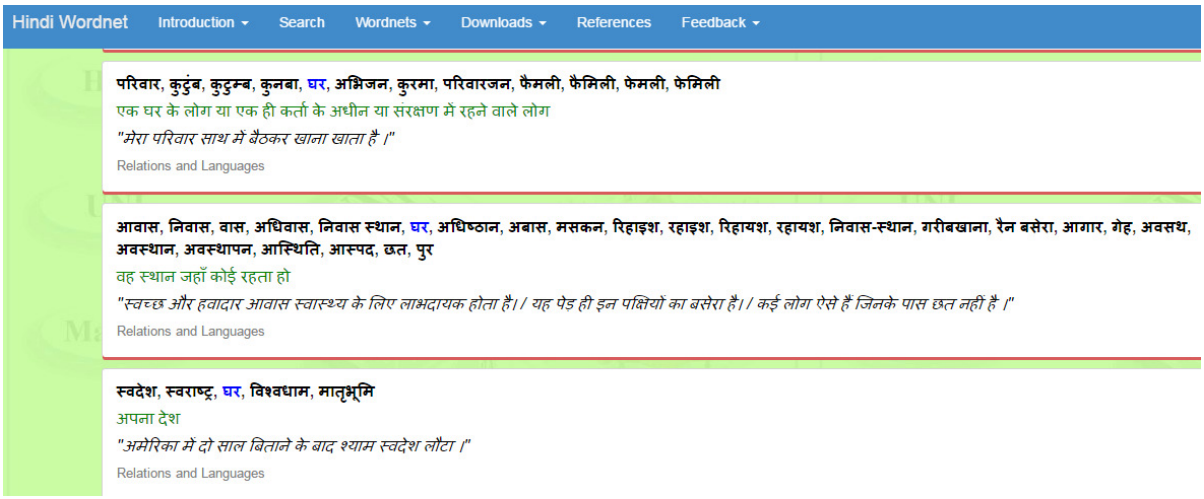

Fig.3 of Hindi Synset

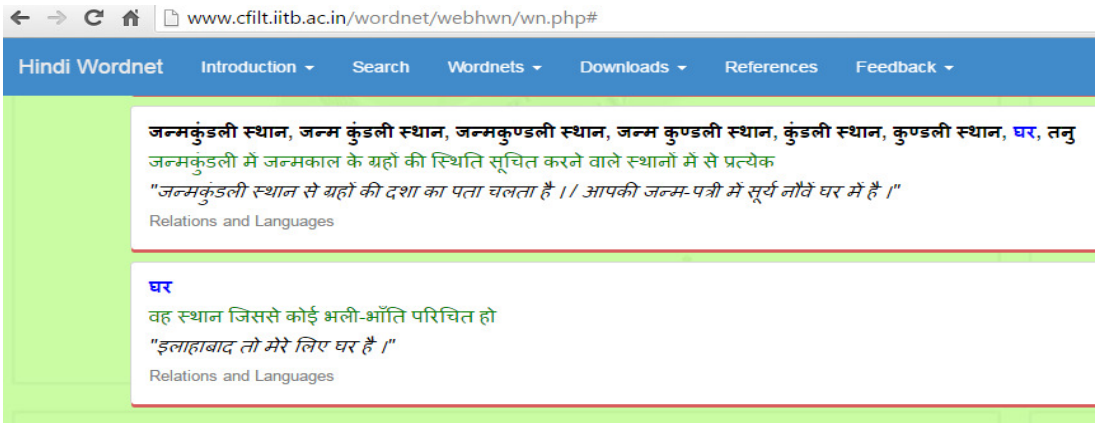

Fig.4 of Hindi Synset

1.2.2.9 Third Party application software: The TDIL website says that the third party applications are made available with purpose to promote the R&D in Indian Language Computing, Information Processing Tools and Techniques to facilitate human-machine interaction without language barrier. Under this title, the Hindi to Panjabi MT system development is proposed. The idea of this platform is to being the best researchers, collaborators and academia at a platform for better output.

1.2.3 Research Efforts: In this category, Machine Added Translation, OCR, TTS, ASR, OHWR, CLIA, SHMT etc have been highlighted. OCR and TTS have already been discussed under 2.2 and 2.5. The TDIL Website explains the CLIA as follows: "Cross-Language Information Access is an extension of the Cross-Language Information Retrieval paradigm. It enables a user to enter queries in languages they are familiar with, and uses language translation methods to retrieve documents originally created in other languages. The objective of Cross-Language Information Access is to introduce additional post retrieval processing to enable users make sense of these retrieved documents. This additional processing may take the form of

machine translation of snippets, summarization and subsequent translation of summaries and/or information extraction. The project is being implemented in consortium mode and eleven institutions are participating to build the system. At present, six languages are being targeted under Tourism and Health domain:-

i) Assamese

ii) Bengali.

iii) Gujarati

iv) Hindi.

v) Marathi.

vi) Oriya

vii) Punjabi.

viii) Tamil.

ix) Telugu."[31]

Regarding OHWR, the TDIL website says: "On-line handwriting recognition system (OHWR) is a useful tool that converts the written strokes of an individual into editable text thus bypassing the need for a keyboard for text entry. There are seven institutions participating to build the On-Line Handwriting Recognition System. The six scripts being targeted are:-

i) Assamese

ii) Bengali

iii) Devanagari

iv) Gurumukhi

v) Kannada

vi) Malayalam

vii) Tamil

viii) Telugu"

Regarding ASR, the TDIL website says: "Consortium Mode project has been initiated for development of Automatic Speech Recognition system for accessing prices of agricultural commodities through telephone channel as an interface on NIC website, which is multilingual and provides information on agricultural commodities".

[31] http://tdil.mit.gov.in/research_effort.aspx

Machine Added Translation and SHMT will be discussed in a separate section.

1.3. Approaches to Machine Translation

There are multiple approaches to MT. However, for However, for a classification purpose, the different approaches can be grouped into four approaches (Siddiqui and Tiwary, 2008; Hutchins, 1993) as described below.

1.3.1 Direct Approach

The direct approach relied on finding direct correspondences between source and target lexical units and has been criticized for their ad hoc quality, therefore, lost its scientific standing. The input for this type of MT is only bilingual dictionaries which could not capture the grammatical nuances of language. This approach to MT is probably least sophisticated and ideally suitable for the translation of long list of phrases on sub-sentential e.g. medical terminologies, simple catalogs of products and services, etc.

1.3.2 Rule Based Approach

Under this approach, an intermediate layer based on the input language text is created before translating into the target language. This intermediate layer is the desired abstraction of the input text and draws heavily on the grammatical rules of both the source and target language, along with parallel lexicons.

Rule based approach in itself also has several other approaches, the two main being: Transfer-based machine translation and Interlingua machine translation. The transfer based approach involves a measure of target language-independent analysis of the source language. This analysis is usually syntactic, and its result allows substituting source language lexical units with target language lexical units in context. Most of the transfer based systems includes the following stages:

- **Morphological analysis**: Surface forms of the input text are classified as to part-of-speech (e.g. noun, verb, etc.) with sub-category information (number, gender, tense, etc.).

- **Lexical categorization**: This stage involves part-of-speech tagging and word sense disambiguation to determine the correct meaning in the context of the input.

- **Lexical transfer**: This is basically dictionary look up; the source language lemma is looked up in a bilingual dictionary to get the correspondent word of target language.

- **Structural transfer**: This stage deals with larger constituents like phrases and clauses and does the concordances of gender and number, and re-ordering of words or phrases.

- **Morphological generation**: In this stage, the target language surface forms are generated.

Transfer types could be of two levels:

- **Surface transfer (or syntactic)**: This level does the transferring of "syntactic structures" between the source and target languages. It is suitable for languages in the same family or of the same type, for example in the Indo-Aryan languages between Hindi, Bangla, Marathi, Punjabi, etc.
- **Deep transfer (or semantic)**. This level constructs a semantic representation that is dependent on the source language. This representation can consist of a series of structures which represent the meaning. The translation also requires structural transfer. This level is used to translate between more distantly related languages (e.g. English-Sindhi or SIndhi-Manipuri, etc.)

Examples of projects based on the transfer approach include ARIANE and EUROTRA, both of the 1980's.

In the Interlingua approach, the source language and the target language are never in direct contact. The processing in such systems involve two major stages: (i) representing the meaning of a source language text in an artificial unambiguous formal language, Interlingua and then (ii) expressing this meaning using the lexical units and syntactic constructions of the target language. The advantages of this approach are that it requires fewer components in order to relate each source language

to each target language and it also takes fewer components to add a new language. In addition it supports paraphrases of the input in the original language, allows both the analyzers and generators to be written by monolingual system developers, and handles languages that are very different from each other. The most advantage of this approach is that it provides an economical way to make multilingual translation systems. On the contrary, the main disadvantage of this approach is the complexity of creating an adequate interlingua. This interlingua should be both abstract and independent of the source and target languages. Examples of projects based on interlingua approach include DLT (Sadler, 1989) which adopted a modified form of Esperanto as its interlingua. The KBMT89 (Goodman and Nirenburg, 1991) was also based on models of interlingua and used a knowledge base to achieve greater success in the domain of computers. Some of the other projects based interlingua are: NEC's PIVOT system (Okumura et al. 1991) and ULTRA (Farwell and Wilks, 1991). However, the only interlingual machine translation system that has been made operational at the commercial level is the KANT system (Nyberg and Mitamura, 1992), which is designed to translate Caterpillar Technical English (CTE) into other languages.

UNITRAN is an interlingual MT that deploys the Principles-based approach MT which itself based on the Principles and Parameters framework (Chomsky and Lasnik, 1993) as manifested in the Government-Binding Theory (Chomsky, 1981/1993). According to Chomsky (1993), the grammar is viewed as a modular system of principles rather than a large set of ad hoc language-specific rules. This Principles-based approach is based on universal principle that all languages are same at the underlying level and the distinctions among languages are handled by settings of parameters associated with the universal principles. The common system handles the Interaction effects of linguistic principles so that the programmer does not need to specifically spell out the minutiae of rule applications. A small set of principles will be able to cover all languages and, thus, the unmanageable grammar size of alternative approaches would be no longer a problem.

1.3.3 Corpus Based Approach

The availability of large parallel corpora for any language pair and specifically for any foreign to Indian language pair is still an issue. Since 1989 corpus based approach

has emerged one of the widely explored areas in MT. Nowadays this approach has dominated over other approaches because of high level accuracy achieved during the translations. Analysis of corpus for different purposes gave new linguistic insights and facilitated new methods to emerge such as statistical MT and example-based MT.

1.3.3.1 Statistical word-based translation Model

- The fundamental unit of translation: word
- The number of words in translated sentences is different, because of compound words, morphology and idioms.
- Fertility: the ratio of the lengths of sequences of translated words which tells how many target words each source word produces. Simple word-based translation can't translate between languages with different fertility
- Example: GIZA++ package (GPLed): freely

1.3.3.2 Statistical phrase-based translation Model

- The fundamental unit of translation: a phrase or sequence of words: these phrases are not linguistic phrases but phrasemes (any combination of two words)
- The translation is done based on the vector of features with matching values for the language sequence pair.

1.3.3.3 Statistical syntax-based translation Model

- The fundamental unit of translation: syntactic unit
- Translation is done through the rules consists of sequence of words and variables in the source language and a syntactic tree in the target language (having words or variable at branches), and a vector of feature values which describe the language pair's probability.

1.3.3.4 Statistical Hierarchical phrase-based translation Model

- The fundamental unit of translation: phrases as well as syntactic units
- It uses synchronous context-free grammars as rules (syntax-based translation) for translation purposes.

The concept of Example-based translations (EBMT) was first proposed by Makoto Nagao (1981). Here translations are done through analogies. An EBMT system takes the input of a source sentence and looks for a similar sentence in the source language from the corpus and generates the translation with adaptations. First, the input sentence is decomposed into certain fragmental phrases. Then, these fragmental phrases are translated into the target language phrases by the analogy translation principle with proper examples as its reference (knowledge database). Finally the target language phrases are composed into one long sentence. The instances of example-based systems are ATR project known as Transfer-Driven MT ((Sumita et al. 1990; Furuse & Iida 1992, 1992a) for spoken language translation, research at Hitachi (Kaji et al. 1992) and at Kyoto (Utsuro et al. 1992).

1.3.4. Hybrid Approach

Hybrid Approach is a modern approach to MT where translation is characterized by the use of features from rule-based and statistical techniques. It is adopted because of the failure of any single technique to achieve a satisfactory accuracy. SYSTRAN and Asia Online are the examples of hybrid approach.

1.3.5. Multi-engine Approach

This approach is similar to the hybrid approach. Here the translation involves running multiple MT systems in parallel. The final output is produced after combining the outputs of all the sub-systems. The Multi-engine system uses rule-based, statistical-based, example-based, transfer-based and knowledge-based as its sub-systems. This approach has an intermediate decision tree algorithm having above discussed sub-systems and also directs the master system from where to draw the output for the particular construction. For example, for small sentences, it is always preferred to get the translations from example-based MT.

1.3.6. Development of cross-Language Information Access: It is an extension of the Cross-Language Information Retrieval paradigm. The objective of Cross-Language Information Access is to introduce additional post retrieval processing to enable users make sense of the retrieved documents in their desired languages. This can be helpful in machine translation of snippets, summarization and subsequent translation of summaries and/or information extraction. At present, the following languages are being targeted under Tourism and Health domain:-Assamese Bengali, Gujarati, Hindi, Marathi, Oriya, Punjabi, Tamil and Telugu.

1.4. Machine Translation Systems for Indian Language: There are various efforts visible in this direction. Important MT systems are being discussed below:

1.4.1 Govt. funded MT systems:

Domain specific machine added translation systems are being developed under the name Anuvadaksh where English is the Source language and Hindi, Marathi, Bangla, Oriya, Tamil and Urdu are the target languages. Interlingua base approach is also being used to develop ILMT systems along with Angla-Bharti Technology and Experimental Machine Translation System has been made available for following languages pair as technology demonstrator:

i) English to Bangla

ii) English to Punjabi

iii) English to Malayalam

iv) English to Urdu

The Sampark system (IL-ILMT), the experimental Machine Translation System has been made available for following languages pair as technology demonstrator:

i) Punjabi to Hindi

ii) Hindi to Punjabi

iii) Urdu to Hindi

iv) Telugu to Tamil

These MT systems will be discussed in detail in the section of Machine Translation in Indian Languages below.

1.4.2 Details of MT systems developed for Indian Languages: Following are the MT systems developed in Indian Languages:

1.4.2.1 Anglabharati[32]: The AnglaBharti project was launched at the Indian Institute of Technology; Kanpur in 1991 for Machine aided Translation from English to Indian languages. Sinha *et al*. (2001) has pioneered Machine Translation research in India. The approach and lexicon of the system is general-purpose with provision for domain customization. A machine-aided translation system specifically designed for translating English to Indian languages. English is a SVO language while Indian

[32] http://www.iitk.ac.in/
http://www.cse.iitk.ac.in/users/langtech/hist.htm
http://www.cse.iitk.ac.in/users/langtech/anglabharti.htm

languages are SOV and are relatively of free word order. Instead of designing translators for English to each Indian language, AnglaBharti uses a (Dave *et al*.,2001) pseudo-interlingua approach. It analyses English only once and creates an intermediate structure called Pseudo Lingua for Indian Languages (PLIL). In AnglaBharti they use rule based system with context free grammar like structure for English, A set of rules obtained through corpus analysis which is used to distinguish conceivable constituents. Overall, the AnglaHindi (Sinha & Jain, 2003) system attempts to integrate example-based approach with rule-based and human engineered post-editing. AnglaBharti is a pattern directed rule based system with context free grammar (Sinha and Jain, 2003) like structure for English (source language) which generates a 'pseudo-target' (PLIL) applicable to a group of Indian languages (target languages). A set of rules obtained through corpus analysis is used to identify plausible constituents with respect to which movement rules for the PLIL is constructed. The idea of using PLIL is primarily to exploit structural similarity to obtain advantages similar to that of using Interlingua approach. The intermediate language structure has the word and word-group order as per the structure of the group of target languages. It also uses some example-base to identify noun and verb phrases and resolve their ambiguities. The system is a machine aided translation system for translation between English to Hindi, for the specific domain of Public Health Campaigns.

1.4.2.2 Anusaaraka[33]: Anusaaraka (1995) project started at IIT Kanpur by Prof. Rajeev Sangal and his team including Prof Chaitanya and Amba Kulkarni. It is now being continued at IIIT Hyderabad. It was started with the explicit aim of translation from one Indian language to another. The project was funded by Technology Development in Indian Languages (TDIL), Govt of India and Satyam Computers Private Limited. Anusaarakas have been built from Telugu, Kannada, Bengali, Punjabi and Marathi to Hindi. It is domain free but the system has been applied mainly for translating children's stories. Anusaaraka aims for perfect "information preservation". In fact, Asnusaaraka output follows the grammar of the source

[33] http://www.iiit.net/ltrc/
http://www.iiit.net/ltrc/Anusaaraka/anu_home.html
http://www.iiit.net/ltrc/Publications/anu_brief.html

language (where the grammar rules differ and cannot be applied with 100% confidence). For Example, a Bengali to Hindi Anusaaraka can take a Bengali text and produce output in Hindi which can be understood by the user but will not be grammatically perfect. An e-mail server been established for the Anusaaraka. To run the Anusaaraka on a given text, e-mail has to be sent with the name of the language in the subject line. For example, if 'Telugu' is put in the subject line, it involuntarily runs the Telugu to Hindi Anusaaraka. The focus in Anusaaraka is not mainly on machine translation, but on language access between Indian languages. Anusaaraka systems can be obtained from their website[34]. They are currently attempting an English-Hindi Anusaaraka machine translation system. Anusaaraka mainly focuses on language access between Indian languages, using principles of Paninian Grammar (PG) (Bharati *et al*., 1995) and exploiting the close similarity of Indian languages. Badodkar[35] states in brief that the task of building an MT System is subdivided into two parts. The first module (called core anusaaraka) does language-based analysis: It takes all the information in the source text and resents it in its output, in an intermediate language that is quite close to the target language. The second module may do domain specific knowledge based processing, statistical processing, etc. in which it may utilize world knowledge, frequency information, concordances, etc. to produce output in the target language.

1.4.2.3 MANTRA[36]: MAchiNe assisted TRAnslation tool (MANTRA) (1999) of Centre for Development of Advanced Computing, Bangalore translates English text into Hindi in a precise domain of personal administration, specifically gazette notifications, office orders, office memorandums and circulars. Initially, the Mantra system was started with the translation of administrative document such as appointment letters, notification and circular issued in central government from English to Hindi. It is based on the Tree Adjoining Grammar (TAG) formalism from University of Pennsylvania. It uses Lexicalized Tree Adjoining Grammar (LTAG) (Bandyopadhyay, 2004) to represent the English as well as the Hindi grammar. Tree Adjoining Grammar (TAG) is used for parsing and generation. It is based on

[34] http://www.iiit.net/ltrc/Anusaaraka/anu_home.html
[35] http://www.cfilt.iitb.ac.in/Translation-survey/survey.pdf
[36] http://www.cdacindia.com/html/about/success/mantra.asp

synchronous Tree Adjoining Grammar and uses tree transfer for translating from English to Hindi. The system is tailored to deal with its narrow subject domain. The Mantra has become part of "The 1999 Innovation Collection" on information technology at Smithsonian institution's National museum of American history, Washington DC, USA. This system can be obtained from the C-DAC website[37] or by contacting Dr. Hemant Darbari. This project was funded by the Rajya Sabha Secretariat. The grammar is specially designed to accept, analyze and generate sentential constructions in "Officialese" domain. Similarly, the lexicon is suitably restricted to deal with meanings of English words as used in its subject domain. The system is ready for use in its domain. The system is developed for the Rajya Sabha Secretariat, the Upper House of Parliament of India. It translates the proceedings of parliament such as study to be laid on the table, Bulletin Part-I and Part-II. This system also works on other language pairs such as English- Bengali, English-Telgu, English-Gujarati and Hindi-English and also among Indian languages such as Hindi-Bengali and Hindi-Marathi. The Mantra approach is general, but the lexicon/grammar has been limited to the sub-language of the domain.

1.4.2.4 AnglaBharti-II: AnglaBharti-II (2004) (Sinha, 2004) addressed many of the shortcomings of the earlier architecture. It uses a Generalized Example-Base (GEB) for hybridization besides a Raw Example-Base (REB). During the development phase, when it was found that the modification in the rule-base was difficult and might result in unpredictable results, the example-base has been grown interactively by augmenting it. At the time of actual usage, the system first attempts a match in REB and GEB before invoking the rule-base. In AnglaBharti-II, provision were made for automated pre-editing and paraphrasing, The purpose of automatic pre-editing module is to transform/paraphrase the input sentence to a form which is more easily translatable. Automated pre-editing may even fragment an input sentence if the fragments are easily translatable and positioned in the final translation. Such fragmentation may be triggered in case of a failure of translation, by the 'failure analysis' module. The failure analysis consists of heuristics on speculating what might

[37] http://cdac.in/html/aai/mantra.asp

have gone wrong. The entire system is pipelined with various sub modules. All these have contributed significantly to greater accuracy and robustness to the system.

1.4.2.5 AnglaHindi[38]: AnglaHindi is English to Hindi version of the AnglaBharti which uses example-base and statistics to obtain more acceptable and accurate translation for frequently encountered noun and verb phrases. Besides using all the modules of Anglabharti, AnglaHindi also makes use of an abstracted example-base. The example base is statistically derived from the corpus. Ambiguities in the meanings of the verb phrases are also resolved using an appropriate distance function in the example base. The system is claimed to generate approximately 90% acceptable translation in case of simple, compound and complex sentences up to a length of 20 words. It has provisions for augmenting its abstracted example-base specific to an application domain. This not only eliminates the alternative translations but also generates more accurate and acceptable translation. The AnglaHindi system attempts to integrate example-based approach with rule-base and human engineered post-editing[39].

1.4.2.6 Anubharti[40]: Anubharti (2004) (Sinha, 2004) approach for machine-aided-translation is a hybridized example-based machine translation approach that is a combination of example-based, corpus-based approaches and some elementary grammatical analysis. The example-based approaches follow human-learning process for storing knowledge from past experiences to use it in future. In Anubharti, the traditional EBMT (Gupta and Chatterjee, 2003) approach has been modified to reduce the requirement of a large example-base. This is done primarily by is achieved by identifying the syntactic groups. Matching of the input sentence with abstracted examples is done based on the syntactic category and semantic tags of the source language structure. Both of these system architectures, AnglaBharti and AnuBharti, have undergone a considerable change from their initial conceptualization. In 2004 these systems named as AnglaBharti-II and AnuBharti-II. AnglaBharti-II uses a generalized example-base for hybridization besides a raw example-base.and the AnuBharti-II to cater to Hindi as source language for translation to any other

[38] http://www.cse.iitk.ac.in/users/rmk/proj/proj.html
[39] Thanks to Pinki Nainwani for her brief presentation on this topic during group discussion.
[40] http://www.iitk.ac.in/infocell/Archive/dirnov2/techno_machine.html

language, though the generalization of the example-base is dependent upon the target language.

1.4.2.7 Matra[41]: The MaTra system (2004), developed by the Natural Language group of the Knowledge Based Computer Systems (KBCS) division at the National Centre for Software Technology (NCST),Mumbai (currently CDAC, Mumbai) and supported under the TDIL Project is a tool for human aided machine translation from English to Hindi for news stories. It has a text categorization component at the front, which determines the type of news story (political, terrorism, economic and so on.) before operating on the given story. Depending on the type of news, it uses an appropriate dictionary. It requires considerable human assistance in analyzing the input. Another novel component of the system is that given a complex English sentence, it breaks it up into simpler sentences, which are then analyzed and used to generate in Hindi. They are using the translation system in a project on Cross Lingual Information Retrieval (CLIR) (Rao, 2001) that enables a person to query the web for documents related to health issues in Hindi.

1.4.2.8 UCSG MAT[42]: MAT (developed by University of Hyderabad) is a machine aided translation system for translating English texts into Kannada. It requires post editing. It works at sentence level. It parses an input sentence using the UCSG (Universal Clause Structure Grammar) parsing technology (developed by Dr. K. Narayana Murthy) and then translates it into Kannada using the English-Kannada bilingual dictionary, Kannada Morphological Generator and the translation rules.

1.4.2.9 UNL MT[43]: It is developed by Indian Institute of Technology, Mumbai. IIT, Mumbai is the Indian participant in Universal Networking Language (UNL) project. UNL is an international project of United Nations University. UNL is an interlingua for semantic representation. Input in the source language is converted into UNL and

[41] http://www.ncst.ernet.in/matra/
http://www.ncst.ernet.in/matra/about.shtml

[42] http://www.uohyd.ernet.in/

[43] http://www.cfilt.iitb.ac.in/

then de-converted from UNL to the target language. Currently, work on conversion and deconversion in English, Hindi and Marathi is going on.

1.4.2.10. Tamil Anusaaraka[44]: It is developed by Anna University's K. B. Chandrasekhar Research Centre, Chennai. The aim is to build a Human Aided Machine Translation System for English-Tamil. The MT system has three major components, viz. morphological analyzer of source language, mapping unit and the target language generator. The Tamil-Hindi Machine Aided Translation (MAT) system has a performance in the range of 75%. The state-of-the-art Tamil Morphological analyzer can handle nearly 3.5 million word forms including compound words with more than 95% accuracy.

1.4.2.11 English-Hindi MAT[45]: Jadavpur University at Kolkata has a rule-based English-Hindi MAT. It uses transfer approach. It works for news sentences.

1.4.2.12 Anuvaadak[46]: Anuvaadak 5.0 system has been developed by super Info soft private limited, Delhi under the supervision of Mrs. Anjali Rao Choudhury for a general purpose English-Hindi Machine Translation. For specific domains it has inbuilt dictionaries. It has specific domains like Official, formal, agriculture, linguistics, technical and administrative. The meaning of any English word is not available in Hindi in dictionary then there is facility of translation is provided. In the windows family this software runs on any Operating system. The Spell-checker is in both English and Hindi. It has an inbuilt thesaurus and grammar checker. Inbuilt grammar checker works in pre-translation and post-translation stages. It has inbuilt *dictionaries for specific domains* e.g. official, formal, agriculture, linguistics, technical, and administrative. An English word processor is inbuilt. When Hindi meaning of the English word is not available in dictionary, facility of transliteration is provided. The software runs on any operating system in the Windows family.

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[44] http://www.au-kbc.org/frameresearch.html

[45] http://www.jadavpur.edu/

[46] http://www.mysmartschool.com/pls/portal/portal.MSSStatic.ProductAnuvaadak

1.4.2.13 Anubaad Hybrid Machine Translation System: Anubaad a hybrid MT system is developed in the year 2004 for translating English news headlines to Bengali, developed by Bandyopadhyay (2000) at Jadavpur University Kolkata and. The current version of the system works at the sentence level.

1.4.2.14 Statistical MT by IBM[47]: IBM India Research Lab at New Delhi has started work on statistical machine translation between English and Indian Languages. Their work is based on similar work at IBM for other languages.

1.4.2.15 Oriya Machine Translation System (OMTrans):[48]: It is developed by Utkal University, Vanivihar. In OMTrans, the source language is English and target language is Oriya. It does sense disambiguation using the N-gram model. It has a parser and Oriya Morphological Analyser (OMA), OGC (Oriya Grammar Checker), OSC (Oriya Spell Checker) and OSA (Oriya Semantic Analysis). These modules contribute to OWP (Oriya Word Processor) which facilitates multilingual editing.

1.4.2.16 Shiva and Shakti Machine Translation: The system Shiva is an Example-based and the system Shakti is working for three target languages like Hindi, Marathi and Telgu. Shiva and Shakti are the two Machine Translation systems from English to Hindi and are developed jointly by Carneige Mellon University USA, international institute of information technology, Hyderabad and Indian institute of science, Bangalore, India. The system is used for translating English sentences into the appropriate language. Shakti machine translation system (Bharati *et al*., 2003) has been designed to produce machine translation systems for new languages rapidly. Shakti system combines rule based approach with statistical approach whereas Shiva is Example-Based machine translation system. The rules are mostly linguistic in nature and the statistical approach tries to infer or use linguistic information. Some modules also use semantic formation. Currently system is working for three languages (Hindi, Marathi and Telugu).

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[47] http://www.research.ibm.com/irl/projects/translation.html

[48] http://www.ilts-utkal.org/omt.htm

1.4.2.17 Tamil-Hindi Machine Aided Translation System[49]: The system Tamil-Hindi Machine-Aided Translation system has been developed by Prof. C.N. Krishnan at Anna University at KB Chandrashekhar (AU-KBC) research centre, Chennai. The translation system is based on Anusaaraka Machine Translation System, the input text is in Tamil and the output can be seen in a Hindi text. It uses a lexical level translation and has 80-85% coverage. Stand-alone, API and Web-based on-line versions are developed. Tamil morphological analyser and Tamil-Hindi bilingual dictionary are the byproducts of this system. They also developed a prototype of English-Tamil Machine-Aided Translation system. It includes exhaustive syntactical analysis. It has limited vocabulary (100-150) and small set of transfer rules.

1.4.2.18 English-Kannada Machine-aided Translation System: English-Kannada MAT system is developed at Resource Centre for Indian Language Technology Solutions (RC-ILTS), University of Hyderabad by Dr. K. Narayana Murthy. The system is essentially a transfer-based approach and it has been applied to the domain of government circulars. English-Kannada machine translation system using Universal Clause Structure Grammar (UCSG) formalism. The system is funded by the Karnataka government.

1.4.2.19 Hinglish Machine Translation System: Hinglish a machine translation system for pure (standard) Hindi to pure English forms developed by Sinha and Thakur (2005) in the year 2004. It had been implemented by incorporating additional level to the existing English to Hindi translation (AnglaBharti-II) and Hindi to English translation (AnuBharti-II) systems developed by Sinha. The system claimed to be produced satisfactory acceptable results in more than 90% of the cases. Only in case of polysemous verbs, due to a very shallow grammatical analysis used in the process, the system is not capable to resolve their meaning.

1.4.2.20 English to (Hindi, Kannada, Tamil) and Kannada to Tamil Language-Pair Example-based Machine Translation System: English to {Hindi, Kannada and Tamil} and Kannada to Tamil language-pair example based machine translation

[49] http://www.au-kbc.org/research-areas/nlp/demo/mat/

system developed by Balajapally *et al*. (2006) in the year 2006. It is based on a bilingual dictionary comprising of sentence dictionary, phrases-dictionary, words-dictionary and phonetic-dictionary is used for the machine translation. Each of the above dictionaries contains parallel corpora of sentence, phrases and words and phonetic mappings of words in their respective files. Example Based Machine Translation (EBMT) has a set of 75,000 sentences most commonly spoken that are originally available in English. These sentences have been manually translated into three of the target Indian languages, namely Hindi, Kannada and Tamil.

1.4.2.21 Punjabi To Hindi Machine Translation System: Punjabi to Hindi machine translation system developed by Josan and Lehal at Punjabi University Patiala in the year 2007. This system is based on direct word-to- word translation approach. This system consists of modules like pre-processing, word-to-word translation using Punjabi-Hindi lexicon, morphological analysis, word sense disambiguation, transliteration and post processing. The system has reported 92.8% accuracy.

1.4.2.22 Sampark[50] (Machine translation System among Indian language): It is developed by the Consortium of institutions. Consortiums of institutions include IIIT Hyderabad, University of Hyderabad, CDAC (Noida, Pune), Anna University, KBC, Chennai, IIT Kharagpur, IIT Kanpur, IISc Bangalore, IIIT Alahabad, Tamil University, Jadavpur University in the year 2009. It translates the domain specific sentences. Currently the TDIL webpage[51] is showing only one domain- Tourism domain. Currently these MT systems have English, Hindi, Malayalam, Marathi, Panjabi, Tamil, Telugu and Urdu as source languages. The target languages are Oriya, Gujarati, Bengali, Bodo Hindi, Malayalam, Marathi, Panjabi, Tamil, Telugu and Urdu.

[50] http://sampark.iiit.ac.in/sampark/web/index.php/content
[51] http://tdil-dc.in/components/com_mtsystem/CommonUI/homeMT.php

1.4.2.23 Hindi to Punjabi Machine Translation System: Hindi to Punjabi Machine translation System developed by Goyal and Lehal (2010) at Punjabi University Patiala in the year 2009. This system is based on direct word-to-word translation approach. This system consists of modules like pre-processing, word-to-word translation using Hindi-Punjabi lexicon, morphological analysis, word sense disambiguation, transliteration and post processing. The system has reported 95% accuracy. The overall conclusion of machine translation systems in Indian perspectives that from the year 1995 to 2009 the MT systems developed have achieved lots of success in translating languages. Still work has been carried out to achieve better than previous study.

1.5 Work done in Sanskrit processing

Some important analyzer tools for Sanskrit processing are as follows:

1.5.1 Sanskrit POS Tagger: It has been developed as a Ph.D. result by R. Chandrasekar under the guidance of Dr. Girish Nath Jha, Special Centre for Sanskrit Studies (SCSS), JNU. It performs as a primary tool in SHMT by tagging each string with its grammatical category.

1.5.2 Sanskrit *kāraka* analyzer[52] : It is developed as a Ph.D. result by Sudhir Kumar Mishra (2007) under the guidance of Dr. Girish Nath Jha, SCSS, JNU . This system analyses the *kārakas* in a given input (i.e. Sanskrit prose text) on the basis of Paṇini and kātyāyaṇa *kāraka* formulation. *kāraka* identification in a NP is important for the handling of *vibhakti chinha* (case marker) in Hindi.

1.5.3 Subanta analyzer[53]**:** It is developed as a part of M.Phil. Dissertation by Subash (2006) under the guidance of Dr. Girish Nath Jha, SCSS, JNU which uses a hybrid approach of Paṇinian formalism and example-based technique and gives a comprehensive computational analysis of subanta pada. It also provides a brief information on Nominal Inflectional Morphology (subanta) of Paṇini.[54]

1.5.4 KṛDanta Analyzer[55] : It is developed as a part of M.Phil. Dissertation by Surjit Kumar Singh (2008) under the guidance of Dr. Girish Nath Jha, SCSS, JNU. As kṛdanta also forms NPs in Sanskrit and a lot of children domain texts and dramas have kṛdanta form, it plays an important role in its analysis.

1.5.5 Gender Recognition and Analyzer Of *Sanjñā Pada*[56] : It is developed as a part of M.Phil. research work by Manji Bhadra (2007) under the guidance of Dr. Girish Nath Jha, SCSS, JNU. It analyses the gender of a noun in SL input. In second chapter of the dissertation, It provides a description on the effect of gender in Hindi agreement and in third chapter, it provides information on simple Sanskrit NPs in brief as well.

1.5.6 Śābdabodha System: It is developed by Academy of Sanskrit Research, Malkote, claims to process all types of sentences of Sanskrit and handling of generation and analysis of subantas. The website 'vedavid'[57] has only one page which shows that Śābdabodha System was developed in 1995-96 and it contains Śemuṣī as an important component of the system. The website of Sanskrit Academy[58] has a brief

[52] http://sanskrit.jnu.ac.in/karaka/analyzer.jsp ; (21.5.2011; 3:45 PM).
[53] http://sanskrit.jnu.ac.in/subanta/rsubanta.jsp (21.5.2011; 3:45 PM).
[54]Machine Recognition and Morphological Analysis of Subanta-Padas, pp-35-37.
[55] http://sanskrit.jnu.ac.in/kridanta/ktag.jsp (21.5.2011; 3:47 PM).
[56] http://sanskrit.jnu.ac.in/grass/analyze.jsp (21.5.2011; 3:47 PM).
[57] http://www.vedavid.org/ASR/project.html (21.5.2011; 3:47 PM).
[58] http://www.sanskritacademy.org/Achievements1.htm# (21.5.2011; 3:47 PM).

description of Śemuṣī from which it is clear that the system basically functions as Subanta analyzer.

1.5.7 The **Desika**[59] **: This** system developed by Indian Heritage Group, C-DAC, Bangalore led by P. Ramanujan, claims to be a NLU system for generation and analysis for plain and accented written Sanskrit texts based on grammar rules of Pāṇini Aṣṭāḍhyāyī. In this system, *subanta* generation module is given which is downloadable from the website of TDIL. According to TDIL website, The *DESIKA* software helps in understanding a natural language input (typically an isolated sentence) through paraphrasing, voice change, query answering or summarizing, to develop a language-independent knowledge representation scheme based on ancient Indian Sciences, to develop tools for linguistic analysis and to assist in analysis and presentation of scriptural (accented text) knowledge, phonetic and language research, teaching etc., It was developed on DOS platform and has now been ported on Windows platform[60]. According to C-DAC, Bangalore website[61] DESIKA is a comprehensive package for generating and analysing Sanskrit words which serves the need for an authentic Computer-based package for its study. It caters to different user communities like Academicians, Students, Researchers, Linguists, Computer Scientists etc.

1.5.8 Morphology of Sanskrit Case Affixes: A Computational Analysis: This research has been done by Dr. Girish Nath Jha (1993), JNU. This work takes into the account the Pāṇinian formalisms for inflectional morphology of case affixes and its explanation as provided by Bhaṭṭojidīkṣita's *Siddhāntakaumudī* and gives the paradigm of word forms for most of the words correctly. A small program for plural morphology of Hindi has also been given which generates plural forms of Hindi words (with or without postpositions).

1.5.9 Sanskrit Morphological Analyzer of JNU: The "Sanskrit Morphological Analyzer" is a collection of modules developed as a result of Computational Sanskrit R&D at Special Center of Sanskrit Studies, JNU under the supervision of Dr. Girish Nath Jha. It gives the morph analysis of Sanskrit input word.

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[59] http://tdil.mit.gov.in/download/Desika.htm (21.5.2011; 3:47 PM).
[60] http://tdil.mit.gov.in/nlptools/ach-nlptools.htm (22.5.2011, 10:45 PM)
[61] http://www.cdacb.in/html/ihg/pdf/desika.pdf (22.5.2011, 10:55 PM)

1.5.10 Sanskrit Morphological Analyzer: It is developed by Vinish Jain, an M.Tech student of IIIT-Hyderabad, under the guidance of Amba P. Kularni, which was a further development of an earlier working Sanskrit Morphological Analyzers developed at ASR Melkote. Later with the collaboration of RSVP, Tirupati Sanskrit Hindi Machine Translation System **(Sampark)** is developed in HCU[62].

1.5.11 Vibhakti Divergence between Sanskrit and Hindi[63]: Vibhakti divergence between the both languages is studied by Patel Preeti Khimji which presents the difference in case marking. She has classified the divergence into 7 categories[64] saying that the divergence discussed by Dorr [1994] is either of rare occurrences or does not pose much problem in MT. Her study is presenting the *kāraka prakaraṇa* of Aṣṭādhyāyī in a classified manner but the dependencies of Hindi case marker i.e. the cause of getting particular case marker in Hindi is not discussed during contrastive representation of both languages.

1.5.12 Anaphora in Sanskrit: Jha, Girish Nath (et al.)[65] has presented a comprehensive documentation and classification of Sanskrit anaphora and the resolution system is a part of Sanskrit Analysis System developed by the principal author at Computational Linguistics R&D, Special Centre for Sanskrit Studies, Jawaharlal Nehru University, New Delhi.

1.5.13 Discourse Anaphora and Resolution Techniques in Sanskrit: Jha, Girish Nath (et al.)[66] has collected and classified cases of discourse anaphors in Sanskritfrom a wide renging sample from earliest times to the 18th century text of *Ambikā Dutta Vyāsa* (*Śivarājavijayaṃ*) and then presented a computational model to handle such cases in Sanskrit.

1.5.14 Sanskrit Anaphora Resolution System: Madhav Gopal is currently working on Anaphora resolution system for Sanskrit called *Sanskrit Anaphora Resolution System* (SARS) in JNU. His work is primarily concerned with resolving pronominal

[62] http://www.sanskrit.uohyd.ernet.in 23.5.2011, 4:00PM
[63] M.Phil. Dissertation Submitted by Patel Preeti Khimji in Dept. of Sanskrit Studies, School of humanities, Uinversity of Hyderabad in June 2010.
[64] Optional, Exceptional, Differential, Alternative, Non-kāraka, Verbal and Complex-perdicate.
[65] Johansson, C. (Ed.) *Proceedings of the Second Workshop on Anaphora Resolution (2008)*
[66] Devi, Sobha Lalitha (ed al.) *Proceedings of 7th Discource Anaphora and Anaphora Resolution Colloquium (2009)*

anaphors in Sanskrit text *Pañcataṅtra*. He uses PNG constraints mainly for pairing anaphor and antecedent. He intends to provide a robust algorithm and a tool which is implemented in Java.

1.5.15 Sanskrit Compound Processor: This research work is being done by Mr. Anil Kumar in HCU under the supervision of Amba Kulkarni. Their paper *Sanskrit Compound Processor*[67] presents the importance of compound processing to understand their meaning and decode the relations between its components and to produce their *vigrahavākya*. This work may also be seen as an important one for handling compound nominals in NP mapping in SHMT.

1.5.16 Knowledgebase for *karma-kāraka*: This research has been done by Ms. Manji Bharda[68] in JNU. In this research the most desired i.e. the karma of the given sentence is being taken care. So this research will help us in handling karma during SHMT.

1.5.17 Lexical Ambiguities and their resolution in Sanskrit with Special Reference to *Pañchataṅtra*: This research is being done by Mr. Muktanand Agrawal[69] in JNU. In this research, lexical ambiguities are being resolved. So this research will help us in handling ambiguities during SHMT.

1.5.18 Named Entity Recognition for Sanskrit: a hybrid approach: This research has been done by Mr. Sachin Kumar[70] in JNU. In this research Named Entity Recognition System is being developed. This research may help us in disambiguating Sanskrit names from adjectives.

1.5.19 Computational Identification and Analysis of Sanskrit Verb-forms of bhvādigaṇa : This work of Muktananda Agrawal at SCSS, JNU, is an attempt to make an analyzer for inflectional verb morphology of Sanskrit. the verb analyzer developed here recognizes verb forms in a given Sanskrit text. It further analyses these words to retrieve the related information. The verbal suffixes which are called tiṅ terminations signify tense, aspect, mood, person, and number. The analyzer

[67] G.N.Jha (Ed.):Sanskrit Computational Linguistics, LNCS 6465, pp.57-69, 2010. © Springer-Vergal Bernil Heidelberg 2010.
[68] http://sanskrit.jnu.ac.in/rstudents/phd.jsp
[69] http://sanskrit.jnu.ac.in/rstudents/phd.jsp
[70] http://sanskrit.jnu.ac.in/rstudents/phd.jsp

follows the reverse Pāṇinian approach to identify and analyze these constituent parts in Sanskrit verb forms. This work provides the strategy to identify the tiñ suffix in the verb root.

1.5.20 Kṛdanta Recognition and Processing for Sanskrit: This work of Surjit Kumar Singh (2008), SCSS JNU is an attempt to develop a tool for Kṛdanta Recognition and Processing for Sanskrit. use of Kṛdanta is more frequent in spoken Sanskrit then written Sanskrit. this tendency has also been seen in the other languages and in Standard Hindi as well, almost verb forms are constituated by kridanta and the gender of verb is according to subject, or object in case of passive voice. Thus the structure of Hindi is nearer to Sanskrit Kṛdanta than tiñanta.[71]

1.5.21 Ontological Knowledge base for Selected Verbs for Sanskrit and Bangla: To understand verb argument relationship by machine, there is a need to represent real world knowledge in the machine. This work of Subhash (2011), has been done to develop an ontological knowledge base for selected verb of Sanskrit and Bangla, to study the relationship between verbs and their acceptable arguments, to explore the theories that how verb semantics can determine the morpho-syntactic valence of its arguments. The work constructs a bridge between first argument (subject) and second or other argument (object) for semantic and syntactic research.

1.5.22 Development of Sanskrit Computational Toolkit and Sanskrit-Hindi Machine Translation System: This project in the consortium mode under the leaderaship of Amba Kulkarni (University of Hyderabad) has been funded by DIT since April 2008 for building computational tools and Sanskrit-Hindi MT in the domain of children stories, and for building mutimedia and e-learning content for kids.

1.5.23. SaHiT: Sanskrit-Hindi Translator is being developed by JNU under the supervision of Dr. Girish Nath Jha. Various tools for Sanskrit (SL) processing has been developed which is accessible at http://sanskrit.jnu.ac.in .

1.5.24. Anusaarak Sanskrit Hindi MT System: It has been developed by Dept of Sanskrit, University of Hyderabad, under the supervision of Amba Kulkarni.

[71] Surjit Kumar Singh (2008), thesis, p-27.

According to the information given on the website, it produces Hindi translation of a Sanskrit text and also provides intermediate outputs at various levels viz. *pada-viśleṣaṇa*, *kāraka- viśleṣaṇa*, *śabdārtha-nirdhāraṇa* etc.

The above discussion shows that India has initiated so many projects with the financial support from govt. of India in the field of Language technology. In the ongoing research works, Sanskrit related researches are milestone as many of the projects of Indian Language Processing have adopted the Paṇinian model of Natural Language Processing.

Chapter 2

Sanskrit Verbs

2.1 Introduction:

There are two types of verbs, primitive and derived. Primitive verbs are discussed in Pāṇini's *dhātupāṭha* by the sutra *bhūvādayo dhātavaḥ* (P-1.3.1) and this is ordered subsets listed in ten *gaṇa*s. The derived verbs (which take *san* affixes) are explained by the *sūtra* '*sanādyantāḥ dhātavaḥ*' (P-3.1.32).

In this chapter, first the arrangement of the roots in *dhātupāṭha* is being discussed. Then the suffix forms are being discussed.

2.1.1 Roots:

The root words which have been classified in ten '*gaṇa*' in the Pāṇini's *dhatupāṭha* are the basic components of the Sanskrit grammatical tradition to deal with the linguistic study of Sanskrit. For the verb formation, one has to look for the root word. The characteristics of the roots in Sanskrit grammatical tradition are well researched by Gajanan Balkrishna Palsule[72]. Language changes and the use of verbs in the language also changes. This is evident in Pāṇini's description as well. Pāṇini has used the expression of *chandasi* and *bhāshāyaṃ* to refer the *Vedic* and *laukika* language respectively. Where he does not mention *chandhasi* or *bhāshāyaṃ,* those *sūtra*s apply to the whole language which he described. Palsule (pg-191) observed that *naigama* and *bhāṣika* roots were distinguished by Yaska. *Vārtika* and *Bhāṣya* also differentiated the *Vedic* use. For example, *chandoviṣayatva* of the roots *dīdhī* and *vevī* (Vā. 1 on P. 1.1.6).

Various grammatical achievements like abstracting the augments, union vowels and stem-building elements, accreting the various vowel gradations and other strengthening and weakening process of language, and also deducting the rules of *sandhi* had already taken place in the continuing process of descriptive analysis of living language of the society. Thus the language provided the data for analysis and on the basis of that analysis grammarians derived the roots and identified the verb

[72] The Sanskrit Dhātupaṭhs: A critical Study, Daccan College , Pune, 1961.

formation process. Palsule (pg-163) says that the aim of the ancient Hindu grammarians, particularly the *Sūtrakāra*, was a practical one. Their task was only to analyse the language as they had known to it; to reduce the words to that basic element which seemed to express the general meaning, and which recurred in every concrete form. As long as this basic element possessed an individuality, all its own – characterized, on the one hand by a particular phonetic form and by a semantic peculiarity on the other, as long as this basic element displayed a certain productivity in the inflectional and derivative forms, that was sufficient for being styled as *dhatu* (root), no matter what its ultimate origin was.

2.1.2 Classification of Roots: Palsule (pg-59) says that a considerable part of the *sūtra-pāṭha* consists of rules teaching the various operations which the roots undergo in the different verbal formation or primary derivations. While some roots display specific peculiarities, many others behave in a common way under a particular set of conditions. The roots, with some common properties, have been kept in specific groups so that it can be indicated that such and such roots undergo such and such operation under such and such condition. Thus the roots have been grouped, wherever possible, based on similarities in the verb formation process and the group of roots, not a particular root, is used as the representative root of that group to avoid the repetition of the roots in the Pāṇini's *sūtrapāṭha*. The arrangement of roots have been done in two ways: first, grouping roots together according to their general characteristics or specific '*vikaraṇa*' into ten *gaṇa*, second, the roots which are showing the particular phenomenon in the application process is being marked with specific '*anubandha*' ('*anubandha*' are used as artificial makers to identify the root or root gropus) in the *dhatupāṭha*. In this way, arrangement of roots into ten '*gaṇa*' and the addition of '*anubandha*' is going side-by-side to ensure '*lāghava'* (precision) in Pāṇini's *Asṭādhyāyi* (or *sutrapāṭha*).

Pāṇini used particular *'anubandha'* for particular purpose. Palsule (Pg-76) says, 'while thinking of the connection between the *anubandha* and their significances, the things which suggests itself first is that the universal features of the root must have claimed Pāṇini's attention while particular feature must have received attention only afterwards". He further says, (on pg-81), that the presence or absence of the union vowel (*idāgama*) and the voice (*pada*) claimed Pāṇini's attention first. Every root

must have a vowel somewhere, either in the beginning or at the end or in the middle; or as in some rare cases like that of √i , the root must consist solely of a vowel. Panini decided to make use of this root vowel by modifying it into a technical device. Of the three types of accents, the *udātta* naturally suggested itself first. There are 1545 roots (1258 *seṭ* and 287 *aniṭ*) in Pāṇini's *dhātupāṭha* in which accents are used in connection with the union vowel. The large group of *seṭ* roots therefore came first and to these roots, the *udātta* accents have been assigned. The *aniṭ* roots have been given the *anudātta* accents. The *anubandha 'ṅ'* (ङ्) is used to indicate ā*tmanepada,* 'ñ' (ञ्) is used to indicate *ubhayapada* and rest is automatically *parasmaipada*. The whole class of consonant roots (a little above 1600) already required addition of some vowel in order to prevent their final consonant from being technically called 'it' and from consequently dropped out. So Pāṇini allowed *udātta* accent to *parasmaipada*, *anudātta* accent to *atmanepada* and *svarita* accent to *ubhayapada* respectively. Palsule observed that in the case of the roots where no further feature was to be indicated by the additional vowel, the vowel used is '*a*'. Where some additional featrure had to be indicated by the added vowel, the remaining vowels are used. Out of the 13 vowels, '*a*' was already used and Panini didn't used *ai* and *au* as *anubandha*. Palsule (p- 83) listed the rest vowels as anubandhas in the descending order of their frequency:

Feature	Anubandha
The stable penultimate nasal	*ī*
No shortening of the radical vowel in the reduplicated Aorist	*ṛ*
Optional insertion of the union vowel –*i*- in the gerundives in -*tvā*	*u*
Absence of the union- vowel –*i*- in the ppl.	*ī*
Optional absence in the union-vowel –*i*- in general	*ū*
Optional formulation of a Aorist-stem with a weak *a*	*ir*
Formation (necessarily) of the Aorist-stem with the weak *a* in a	*ḷ*

parasmaipada	
Preservation of the short quantity of the radical a in the *iṣ*-Aorist	*e*
Formation of pp. with *–na*	*o*
Absence in the union-vowel –i- in the ppl. But optional insertion of the same in connection with an impersonal act, or the beginning of an action	*ā*

Palsule further listed out the Anubandhas prefixed to the roots:

The use of the ppl. to denote an action not restricted to the past time	*ñi*
Formation of an action noun in *–athu*	*ṭu*
Formation of adjectives with *–trima* in the sense *tena trimitam*	*ḍu*
Formation of a feminine action-noun in *ā*	*ṣ*
Distinction of √ī 'remember' and √hā 'abandon' from other roots with the same spelling but differing in the order	*k*
The exclusion of the two *dā* roots, viz., dai 'purify' and dā 'cut' from the rules governing dā roots in general	*p*
Distinction of the roots ī 'go' and dā 'give' from other roots with the same spelling but different in some other respect	*ṇ*
Indicating the feminine form in –ī in stanaṃdhayi from dhā; or according to another view, distinction of √dhe 'suck' from √dhā 'place', 'nourish'	ṭ

Pāṇini has used *anubandha* technique for precision in rule formation. These *anubandhas* are affixed with roots to supply certain information about the roots and word formation process. The *ṅ* and *ñ* (ङ् & ञ्) *anubandha*s at the end of the roots

indicates its *atmanepada* and *ubhayapada* categories respectively. The rest roots, which are not marked with *ṅ* & *ñ*, are *parasmaipada*. For the roots, which have *ñi, ṭu* & *ḍu anubandha*s at the beginning, Pāṇini has indicated some specific task. The roots starting with ñi *anubandha*s are *ñīt* and takes *kta* suffix (ñītaḥ ktaḥ - P- 3.2.187) in present tense *(ñimidā + ktaḥ = minnaḥ*). In Pāṇini's dhātupāṭha. *ñi anubandha* is added to 10 roots *(ñiindhī, ñikṣvidā, ñitṛṣa, ñitvarā, ñidhṛṣā, ñiphalā, ñibhī, ñimidā, ñiṣvap* and *ñiṣvidā*). Instead of naming 10 roots in the sutra, Panini simply said '*ñītaḥ ktaḥ'*. The roots starting with anubandha *ṭu (ṭukṣu, ṭudu, ṭunadi, ṭubhrājṛ, ṭubhrāś, ṭubhlāś, ṭumasjo, ṭuyācṛ, ṭuvamu, ṭuvepṛ, ṭuośvi, ṭuosphūrjā)* take the suffix '*athuc*' (*ṭvito'thuc* P-3.3.89) and the roots starting with *anubandha ḍu (ḍukṛñ, ḍukrīñ, ḍul, ḍudāñ, ḍudhāñ, ḍupacaṣ, ḍubhṛñ, ḍumiñ, ḍulabhaṣ, ḍuvap)* take *ktri* suffix. This precision was due to the *anubandha* technique which is applied in Pāṇini's dhātupātha (or the well arranged database of the root words). The same precision has been maintained in the entire process of *Astādhyāyi*.

The roots are divided into 10 *gaṇa*s. Each gaṇa has specific *vikaraṇa* which comes between the root and the suffix. The following table shows the 10 *gaṇa*s and vikaraṇas with Panini's sutra:

Gaṇa	*vikaraṇa*	*Panini's sutra*
bhvādi	*śap (a)*	*kartari śap*
adādi	*śap (śap lopaḥ)*	*adiprabṛtibhyaḥ śap*
juhotyādi	*ślu (śap lopaḥ)*	*juhotyādibhyaḥ śluḥ*
divādi	*śyan (ya)*	*divadibhyaḥ śyan*
svādi	*śnu (no)*	*svādibhyaḥ snuḥ*
tudādi	*śa (a)*	*tudādibhyaḥ śaḥ*
rudhādi	*śnam (na)*	*rudhādibhyaḥ śnam*
tanādi	*u (o)*	*tanādikṛbhyaḥ uḥ*

kryādi	*śnā (nā)*	*kryādibhyaḥ śnā*
curādi	*ṇic +śap (aya)*	*ṇicaśca*

Cardona (pg-23) says that there is a group of verbs that make up a set with respect to certain operations but cannot be included in an ordered subset of the *dhātupāṭha*, so that a special name is needed for them. According to P-1.1.20 (*dādhāghvadhāp*), a verb with the form *dā* or *dhā* (except *dā* with the marker *p* i.e. *dāp*) is called *ghu*. This is because of the difference in the verb formation process which shows some insertion or deletion of vowel sounds. Ex- *dā - dīyate, dhā- dhīyate* etc.

sanādyanta roots: the base-words which have *san, kyac, kāmyac, kyaṣ, kyaṅ, kvip, ṇiṅ, iyaṅ, ṇic, yak, āya* and *yaṅ* suffixes are called *sanādyanta* roots.

2.1.3 Gaṇa identification of verbs: *Gaṇa* identification of verbs depends on the *vikaraṇa* which is visible in the verbs. Some *vikaraṇa* suffixes are similar and because of that there may be confusion in identifying the verb gaṇas through verb forms. First and sixth *gaṇa*s have 'a' *vikaraṇa* left after '*it-sañjyā*' and it is added to the roots of *bhvādi* and *tudādi gaṇa*. During verb formation, the roots and vikaraṇa of bhvādigaṇa becomes *guṇa* i.e. *i/ī, u/ū, ṛ/Ṝ* (which are the ending letters of the roots, and *upadhā* letters) becomes *e, o, ar* respectively. The *guṇa* **doesn't** take place with the roots of *tudādigaṇa*. For example- √budh from *bhvādigaṇa* becomes '*bodh*' because of *guṇa* (u=o) and the form in *laṭ lakāra* becomes *bodhati*. √*likh* from *tudādigaṇa* has 'i' and it does become *guṇa* 'e'. So the form of √*likh* from *tudādigaṇa* is *likhati* (in absence of *guṇa*, it does not become *lekhati*). This is the beauty of verb classification done by Panini in his *dhātupāṭha.*

√kṛṣ is kept in both *gaṇa* (*bhvādi* and *tudādi gaṇa*). √kṛṣ becomes *karṣati* in *bhavādigaṇa,* and in *tudādigaṇa*, √kṛṣ becomes *kṛṣati*.

The *vikaraṇa* is dropped in *adādigaṇa* and *juhotyādigaṇa*. Therefore in *adādi*, root and suffix is added simply. But in *juhotyādigaṇa, dvitva* takes place to the roots. For example, √dā becomes *dadāti* (not *dāti*).

In the verb forms *-naśyati* and *kathayati,* the *vikaraṇa ya* is visible in the *divādi* and in *curādi gaṇa, ya* is visible as a part of *aya vikaraṇa*. The roots which have consonants before *ya*, is from *divādigaṇa* and the roots to which '*a*' vowel is added before *ya*, are from the *curādigaṇa*.

svādi and *tanādi* verb forms shows *'no'* and the verb identification is confusing. For example- *śaknoti* and *tanoti*, both verbs have *'no'*. The *svādi gaṇa* has *vikaraṇa snu* which shows *'no'* and *tanādi* has *vikaraṇa uḥ* which shows '*o*'. Therefore '*n*' letter is part of *vikaraṇa* in *svādigaṇa* and '*n*' letter shown is *tanādigaṇa* is part of the roots.

2.1.4 The seṭ and aniṭ roots:

For the purpose of *iḍāgama* to the roots, the roots are classified into two parts: *seṭ* and *aniṭ*. The *anekāc* roots are *seṭ*. The *ekāc anudātta* roots are *aniṭ.* All *ekāc ā-* ending root are *aniṭ*. All *i-kārānta ekāc* roots except *śvi* and *śri* are *aniṭ*. The roots *śvi* and *śri* are seṭ. the *ī-kārānta* roots except *śīṅ* and *ḍīṅ* are *aniṭ*. The *ekāc ukārānta* roots except *snu, nu, kṣu, yu, ru* and *kṣṇu* are *aniṭ*. All *ūkārānta* roots except *sū* and *dhū* are *seṭ*. The roots *sū* and *dhū* are *veṭ*. The *ekāc hrasva ṛkārānta* roots, except *vṛñ, vṛṅ, jāgṛ* and *svṛ*, are *aniṭ*. All the *dīrgha ṛkārānta* roots are *seṭ.* All *ejanta* roots are *aniṭ.*

In the *ekāc* roots, all *kakārānt* roots, except *śak*, are aniṭ; all *cakārānta* roots except *pac, muc, ric, vac, vic* and *sic,* are *aniṭ*; all *cha*-ending roots, except *praccha*, are seṭ. In the *ekāc ja*-ending roots only 15 roots- *tyaj, nijir, bhaj, bhañj bhuj, bhrasj, masj, yaj, yuj, ruj, rañj, vijir (rudhādi), svañj, sṛj* are *aniṭ*, rest are *seṭ*. In the *ekāc da*-ending roots, *ad, kṣud, khid, chid, tud, nud, pad (divādi), bhid, vid (divādi), vid (rudhādi), śad, sad, svid, skand* and *had*, these 15 roots are *aniṭ* and rest are *seṭ*. Root *vid* from *adādi* and *tudādi gaṇa* are *seṭ*. The *ekāc dhakārānt*a roots (except *krudh, kṣudh, budh, bandh, yudh, rudh, rādh, vyadh, sādh, śudh, sidh*) are *seṭ*. All *na*-ending *ekāc* roots, except *man* and *han*, are *seṭ*. All *pa*-ending *ekāc* roots, except 13 roots- *āp, chup, kṣip, tap, tip, tṛp (divādi), dṛp (divādi), lip, lup, vap, śap, svap, sṛp,* are seṭ. All *bha*-ending *ekāc* roots except *yabh, rabh, labh,* are seṭ. All *makārāmta* roots, except- *gam, nam, yam,* and *ram*, are *seṭ*. All *ekāc śakārānta* roots, except *kruś, danś, diś, dṛś, mṛś, riś, ruś, liś, viś, spṛś,* are *seṭ*. All *ekāc ṣakārānta* roots except *kṛṣ, tviṣ, tuṣ, dviṣ, duṣ, puṣ(divādi), piṣ, viṣ, śiṣ, śuṣ* and *śliṣ(divādi),* are *seṭ*. All *ekāc sakārānta* roots, except

vas and *ghas*, are *seṭ*. All *ekāch hakārānta* roots, except *dah, dih duh, nah, mih, ruh, lih* and *vah*, are *seṭ.*

2.1.5 The *sakarmaka* and *akarmaka* (Transitive and Intransitive):

The verbs of the roots which don't take object, is called *akarmaka*. In those verbs the agent is the experiencer of the result of the action. Those intransitive verbs in Sanskrit are formed with the roots which have the meaning of - *lajjā, sattā, sthiti, jāgaraṇa, vṛddhi, kṣaya, bhaya, jīvita, maraṇa, śayaṇa, krīḍā, ruchi* and *dīpti*[73].

The difference between *sakarmaka* (transitive) and *akarmaka* (intransitive) roots can be understood by the discussion of *phala* (result) and *vyāpāra* (process) of the action/*kriyā*. When *phala* and *vyāpāra* is located in the agent of the action only, then the verb is *akarmaka*. But when the *phala* (result) is not located in the agent, (or there is an object where the result is located), the verb is transitive. So, the *āśraya* of *phala* and *vyāpāra* is different in the transitive verb.

The transitive and intransitive verbs are important in the discussion of *vācya* (voice). The transitive roots make *kartṛ-vācya*, *karma-vācya* and *karmakartṛ-vācya*. The intransitive roots make *kartṛ-vācya* and *bhāva-vācya*.

Transitive root's voice example-

1. *saḥ odanaṃ pacati* (*kartṛ-vācya*)
2. *tena odanaṃ pacyate* (*karma-vācya*)
3. *odanaḥ pacyate* (*kartṛ-karma-vācya*)

Intransitive root's voice example-

1. *saḥ tiṣṭhati* (*kartṛ-vācya*)
2. *tena sthīyate* (*bhāva-vācya*)

2.2 Suffix:

[73] lajjā-sattā-sthiti-jāgaraṇaṃ vṛddhi-kṣaya-bhaya-jīvita-maraṇaṃ, śayaṇaṃ-krīḍā-ruchi-dīptyarthaṃ dhātugaṇaṃ te akarmakamāhuḥ.

There are 18 suffixes in *tiṅanta* which are added to the roots to form Sanskrit verbs. These 18 suffixes are divided into *parasmaipada* and *ātmanepada* respectively. First nine suffixes are *parasmaipada* and rest is *atmanepada*. Both are divided into three persons and three numbers. The following table shows the *tiṅanta* suffixes:

parasmaipada

	singular	Dual	Plural
Third Person	*Tip*	*Tas*	*Jhi*
Second Person	*Sip*	*Thas*	*Tha*
First Person	*Mip*	*Vas*	*Mas*

ātmanepada

	singular	Dual	Plural
Third Person	*ta*	*ātāṃ*	*Jha*
Second Person	*thās*	*āthāṃ*	*dhvaṃ*
First Person	*iḍ*	*vahi*	*mahiṅ*

These suffixes are added to the roots of all ten *gaṇa*s and form the verbs in ten *lakāra*s. The ten *lakāra*s are: *laṭ, liṭ, luṭ, lṛṭ, leṭ, loṭ, laṅ, liṅ, luṅ* and *lṛṅ*. The *ac* (*a, i, u, ṛ, e, o*) and *hal* (*ṭ* and *ṅ*) *varṇa* are dropped due to *it sañjya* from the *sutra*s '*upadeśe'janunāśike it*' (P-1.3.2) and '*halantyaṃ*' (1.3.3) respectively. '*uccāraṇasāmarthyāt lasya nettvaṃ*' *vṛtti* clears that "*l*" sound is there for pronunciation, and because l sound is there, it is called *lakāra*. In each *lakāra*, *tip* etc first 9 *parasmaipada* suffixes and *ta, ātāṃ* etc 9 *ātmanepada* suffixes are added to the root for verb formation. These 18 suffixes are called *ādesha* in the place of *l* or all the ten *lakāra*s. The ten *lakara*s are used to indicate tense and mood. *lakāra* represents number/*vacana* and person/*kartā* as well. The following Panini sutras are indicating particular *lakāra* for particular tense and mood:

1. *vartamāne laṭ* (3.2.123)
2. *parokṣe liṭ* (3.2.115)
3. *anadyatane luṭ* (3.3.15)
4. *lṛṭaḥ śeṣe ca* (3.3.13)
5. *loṭ ca* (3.3.162)
6. *anadyatane laṅ* (3.2.111)
7. *vidhi-nimantraṇādhīṣṭa-sampraśna-prārthaneṣu liṅ* (3.3.161)
8. *liṅāśiṣi* (3.4.116)
9. *luṅ* (3.2.110)
10. *liṅnimitte lṛṅ kriyātipattau* (3.3.139)

The roots take the suffixes to form verbs in the above discussed *lakāra*s. These *lakāra*s are used in *karmaṇi* and *kartari* sentences with transitive roots and in *bhāva* and *kartari* sentences with intransitive roots. These ten *lakāra*s are also divided into two groups, *sārvadhātuka* and *ārdhadhātuka*. The roots to which *sārvadhātuka lakāra*s (*laṭ, loṭ, laṅ* and *vidhiliṅ*) are added as suffixes, they take *vikaraṇa* of their respective *gaṇa*. The *vikaraṇa* comes in between the root and the suffix and plays an important role in verb formation in these four *lakāra*s. The rest *lakāra*s (*liṭ, luṭ, lṛṭ, luṅ, lṛṅ* and *āśīrliṅ*) are called *ārdhadhātuka* where *vikaraṇa* does not come in between the root and the suffix.

The suffixes in each *lakāra* take different forms because of *ādesha* during verb formation. So, the change in suffix forms of *sārvadhātuka lakāra*s (*laṭ, loṭ, laṅ* and *vidhiliṅ*) and *ārdhadhātuka lakāra*s (*liṭ, luṭ, lṛṭ, luṅ, lṛṅ* and *āśīrliṅ*) are discussed bellow.

2.2.1 Suffix changing in laṭ lakāra (parasmaipada):

In the *parasmaipadi tiñ* suffixes (*tip tas jhi sip thas tha mip vas mas*), *tip* drops *p* which is *it-sanjñaka* and the suffix tip becomes *ti*. The suffix *tas* becomes *taḥ* by the *sūtra sasajuso ruḥ (P-8.2.66)* and *rutva-visarga* by *kharavasānayorvisarjanīyaḥ (P-8.3.15).* The suffix *jhi* becomes *anti* by the *sūtra jho'ntaḥ*. The suffix *sip* becomes *si* by dropping *it-sanjñaka p*, *thas* becomes *thaḥ* by *rutva-visarga* of *s*, *tha* suffix is unchanged. The suffix *mip* drops *itsanjñaka p*, *vas* and *mas* become *vaḥ* and *maḥ* by *rutva-visarga* of *s*. **Therefore, final form of laṭ suffixes are:**

Person	Singular Number	Dual Number	Plural Number
Third	**Ti**	**taḥ**	**anti**
Second	**Si**	**thaḥ**	**tha**
First	**Mi**	**vaḥ**	**maḥ**

2.2.2 Suffix changing in loṭ lakāra (parasmaipada):

The *parasmaipadi tiṅ* suffixes (*tip tas jhi sip thas tha mip vas mas*) are getting changed in *loṭ lakāra*. The suffix *ti* is changing into *tu* when the *i* vowel is becoming *u* by the *sūtra eruḥ (P-3.4.86)*. In the suffix *jhi, jh* becomes *ant* by the sutra *jho'ntaḥ* and i vowel becomes *u* by *eruḥ*; thus the suffix jhi becomes *antu*. The suffixes *tas, thas, tha* and *mip* become *tām, tam, ta* and *am* respectively by the *sūtra tasthasthamipāmtāntantāmaḥ(P-3.4.101).* Suffix *sip* drops *p* and becomes *hi* by the *sūtra*s *serhyapicca (P-3.4.87)* and *ato heḥ(P-6.4.105)*. By the *sūtra merniḥ (P-3.4.89), mi* of *mip* becomes *ni* and the *itsanjñaka p* is dropped. The end letter *s* in *vas* and *mas* is dropped by the *sūtra nityaṃ ṅitaḥ* (P-3.4.99) and *alo'ntasya (P-1.1.52)*. These three suffixes finally become *āni, āva* and *āma* after *savarṇa-dīrgha* by the sūtra *ato dīrgho yañi (P-7.3.101)*. **Therefore final forms of *loṭ lakāra* suffixes are:**

Person	Singular Number	Dual Number	Plural Number
Third	**Tu**	**tām**	**antu**
Second	**Hi**	**tam**	**ta**
First	**āni**	**āva**	**āma**

2.2.3 The suffixes in laṅ lakāra (parasmaipada):

The *parasmaipadi tiṅ* suffixes (*tip tas jhi sip thas tha mip vas mas*) are getting changed in *laṅ lakāra* because of *aṭ-āgama* by the sūtra *luṅ-laṅ-lṛṅkṣvaḍ-udāttaṭ (P-6.4.71). aṭ* is *ṭit* and therefore, it comes at the beginning of the root. The *i* vowel at the end of the suffix is dropped by the sūtra *itaśca (P-3.4.100)*. The suffixes *tas, thas, tha* and *mip* become *tām, tam, ta* and *am* respectively by the sūtra *tasthasthamipāmtāntantāmaḥ (3.4.101). jh* becomes *ant* by the *sūtra jho'ntaḥ (P-7.1.3)*. The *i* vowel at the end of the suffix is dropped by the *sūtra itaśca (P-3.4.100)*, the *t*

letter of *ant* remains *halantya* which is dropped by the *sūtra saṃyogāntasya lopaḥ(P-8.2.23).* **Therefore the final form of laṅ lakāra suffix is:**

Person	Singular Number	Dual Number	Plural Number
Third	**ta**	**tāṃ**	**an**
Second	**s (ḥ/visarga)**	**Tam**	**ta**
First	**Am**	**Va**	**ma**

2.2.4 The suffixes in vidhiliṅ lakāra (parasmaipada):

The *parasmaipadi tiṅ* suffixes (*tip tas jhi sip thas tha mip vas mas*) are getting changed in *vidhiliṅ lakāra* because of *yāsuṭ āgama* instead of *sīyuṭ* (*liṅaḥ sīyuṭ*) by the *sūtra yāsuṭ parasmaipadeshūdātto ṅicca (P-3.4.103)* and *yās* becomes *iy*. The *y* letter of *iy* is dropped by the sūtra *lopovyorvali (P-6.1.65)*. The suffixes *tas, thas, tha* and *mip* become *tām, tam, ta* and *am* respectively by the *sūtra tasthasthamipāmtāntantāmaḥ(P-3.4.101)*. **Therefore the final form of suffixes in vidhiliṅ lakāra is:**

Person	Singular Number	Dual Number	Plural Number
Third	**It**	**itāṃ**	**iyuḥ**
Second	**iḥ**	**itaṃ**	**Ita**
First	**iyaṃ**	**Iva**	**ima**

Form of the *ārdhadhaatuka lakāra*s (*liṭ, luṭ, lṛṭ, luṅ, lṛṅ* and *āśīrliṅ*) are discussed bellow;

2.2.5 The suffixes in *liṭ lakāra* (parasmaipada):

The *parasmaipadi tiṅ* suffixes (*tip tas jhi sip thas tha mip vas mas*) are getting changed into *ṇal-atus-us-thal-athus-a-ṇal-va-ma* respectively in *liṭ lakāra* because of the *sūtra ṇalatusus-thalathusa-ṇalavamāḥ(P-3.4.82).* The *tiṅ* forms which come in the place of *liṭ lakāra* are *ārdhadhātuka* by the *sūtra liṭ ca (P-3.4.115)*. The *vikaraṇa* is not added in *ārdhadhātuka lakāra*s. There is *iḍāgama* by the *sūtra ārdhadhaatukasyeḍ valādeḥ(P-7.2.35)* which says that there will be *iḍāgama* if the suffixes starts with all

the consonants except *ya* and *ha*. **Therefore the final form of suffixes in *liṭ lakāra* is:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**a**	**atuḥ**	**uḥ**
Second	**(i)tha**	**athuḥ**	**a**
First	**a**	**(i)va**	**(i)ma**

2.2.6 The suffixes in *luṭ lakāra* (parasmaipada):

The *parasmaipadi tiṅ* suffixes *tip tas jhi* are getting changed because of the *sūtra luṭaḥ prathamasya ḍāraurasaḥ(P-2.4.85). tip tas jhi* becomes *ḍā-rau-rasa* respectively. *sya* and *tāsi* are added to '*lṛṭ-lṛṅ*' (indicated by *lṛ*) and *luṭ lakāra* respectively by the *sūtra syatāsi-lṛluṭoḥ(P-3.1.33). ḍ* is dropped because of *itsanjñā* by the *sūtra cuṭū* (P-1.3.7) and because of *ḍitva*, the *ṭi-sanjñaka ās* (from *tāsi*) is also dropped. **Therefore the final form of *luṭ lakāra* suffixes are:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**tā**	**tārau**	**tāraḥ**
Second	**tāsi**	**tāsthaḥ**	**tāstha**
First	**tāsmi**	**tāsvaḥ**	**tāsmaḥ**

2.2.7 The suffixes in *lṛṭ lakāra* (parasmaipada):

The *parasmaipadi tiṅ* suffixes (*tip tas jhi sip thas tha mip vas mas*) are not changing in this *lakāra*. *sya* is added by the *sūtra syatāsi-lṛluṭoḥ(P-3.1.33)* and there is *iḍāgama* by the *sūtra ārdhadhaatukasyeḍ valādeḥ (P-7.2.35)*. **Therefore the final forms of *lṛṭ lakāra* suffixes are:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**ṣyati**	**ṣyataḥ**	**ṣyanti**
Second	**ṣyasi**	**ṣyathaḥ**	**ṣyatha**
First	**ṣyāmi**	**ṣyāvaḥ**	**ṣyāmaḥ**

2.2.8 The suffixes in āśirliṅ lakāra (parasmaipada):

This *lakāra* becomes *ārdhadhaatuka* by the *sūtra liṅgāśiṣi (P-3.4.116)* and therefore it doesn't take any *vikaraṇa* between root and suffix. *yāsuṭ* is inserted between root and suffix which becomes *kit* by the *sūtra kidāśiṣi (P-3.4.104)*. *suṭ* is inserted before siffix *ti* by the *sūtra suṭ tithau (P-3.4.107)*. The *sa* letter of *suṭ* and *yāsuṭ* is dropped by the *sūtra skoḥ saṃyogādyorante ca (P-8.2.29)*. The suffixes *tas, thas, tha* and *mip* become *tām, tam, ta* and *am* respectively by the s*ūtra tasthasthamipāmtāntantāmaḥ (P-3.4.101).* **Therefore the suffixes in *āśirliṅ lakāra* are:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**yāt**	**yāstām**	**yāsuḥ**
Second	**yāḥ**	**yāstaṃ**	**yāsta**
First	**yāsaṃ**	**yāsva**	**yāsma**

2.2.9 The suffixes in *luṅ lakāra* (parasmaipada):

In *luṅ lakāra*, *cli* comes between the root and the suffix. *cli* becomes *sic* by the sūtra *cleḥ sic*. *sic* is dropped (becomes *luk*) by the *sūtra gātisthā-ghupā-bhūbhyaḥ sicaḥ parasmaipadeṣu (P-2.4.77).* when *sārvadhātuka tiṅ* is added, the *ik* of the roots *bhū* and *sū* doesn't become *guṇa* because it is restricted by the *sūtra bhūsuvostiṅi (P-7.3.88)*. *iṭ-āgama* happens with the roots *sic* and as along with the suffixes *tip* and *sip* (which are called *apṛkta hal* because of *i* lopa) by the *sūtra astisico-apṛkte (P-7.3.96)*. The suffix *jh* (third person plural number) becomes *jus* by the *sūtra sijabhyastavidibhyaśca (P-3.4.109)* when it is added to the roots which have *ā*-ending. Except the root *māṅ* (*na māṅyoge*), *aḍāgama* happens before the roots by the sūtra *luṅ-laṅ-lṛṅ-kṣvaḍudāttaḥ (P-6.4.71)* to insert *a* at the beginning of the roots in *luṅ lakāra*. The suffixes *tas, thas, tha* and *mip* become *tām, tam, ta* and *am* respectively by the *sūtra tasthasthamipām tāntantāmaḥ (P-3.4.101)*. **So the final forms of luṅ suffixes are:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**ta**	**tāṃ**	**an**
Second	**aḥ**	**taṃ**	**ta**

First	**am**	**va**	**ma**

Here the *aḍāgama* and *āḍāgama* happenes to the halādi and ajādi roots respectively.

2.2.10 **The suffixes in lṛṅ lakāra (parasmaipada)**:

The root takes *lṛṅ lakāra* by the *sūtra liṅ-nimitte-lṛṅ-kriyātipattau (P-3.3139).* The *parasmaipadi tiṅ* suffixes (*tip tas jhi sip thas tha mip vas mas*) are added according to number and person. *aḍāgama* happens before the roots by the *sūtra luṅ-laṅ-lṛṅ-kṣvaḍudāttaḥ (P-6.4.71)* to insert *a* at the beginning of the roots in *lṛṅ lakāra*. *sya* is added by the *sūtra syatāsi-lṛluṭoḥ (P-3.1.33)* and there is *iḍāgama* after the root by the *sūtra ārdhadhaatukasyeḍ valādeḥ (P-7.2.35). sakāra* of *sya* becomes *ṣakāra* by the *sūtra ādeśapratyayoḥ*(P-8.3.59). The *ikāra* of *ti, si* and *jhi* suffix is dropped by the *sūtra itaśca (3.4.100)* . The suffixes *tas, thas, tha* and *mip* become *tām, tam, ta* and *am* respectively by the *sūtra tasthasthamipāmtāntantāmaḥ (P-3.4.101). s* letter is dropped in *vas* and *mas* suffixes by the *sūtra nityaṃ ṅitaḥ (P-3.4.99).* **Finally the form of *lṛṅ lakāra* suffixes are:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**ṣyat**	**ṣyatāṃ**	**ṣyan**
Second	**ṣyaḥ**	**ṣyataṃ**	**ṣyata**
First	**ṣyaṃ**	**ṣyāva**	**ṣyāma**

2.3 Formation of ātmanepada suffix forms:

The *ātmanepada* suffix are *ta, ātām, jha, thāsa, āthām, dhvam, iḍ, vahi, mahiṅ.* In the ten *lakāra*s these suffixes are getting changed. *laṭ, loṭ, laṅ* and *vidhiliṅ lakāra* are *sārvadhātuka* and rest are *ārdhadhātuka*. *sārvadhātuka* takes *vikaraṇa*. Here, the *ātmanepada* suffixs in all the ten *lakāra*s are discussed.

2.3.1 The suffixes in *laṭ lakāra* (*ātmanepada*):-

The *ātmanepada* suffixes are *ta ātām jha, thās āthām dhvam, iṭ, vahi mahiṅ. ātmanepada* root takes *ātmanepada* suffixes. In the suffix *ta*, *a* is *ṭit* and it becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79).* Therefore sūffix *ta* becomes *te*. *ā* of

ātāṃ and *āthāṃ* becomes *iy* by the *sūtra āto ṅitaḥ (P-7.2.81)* and the *y* of *iy* is dropped by the *sūtra lopo vyorvali (P-6.1.65).* The rest part of *ātāṃ* suffix is *tāṃ* where *āṃ* is *ṭit* and therefore *āṃ* becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79).* So the suffix *ātāṃ* becomes ete. In the *jha* suffix, *jh* becomes *ant* by the *sūtra jho'ntaḥ* and a becomes *ṭi sanjñā.* Therefore *a* becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79).* So the suffix *jha* becomes *ante*. *thās* becomes *se* by the s*ūtra thāsaḥ se (P-3.4.80). āthām* becomes *iy* by the *sūtra āto ṅitaḥ* (P-7.2.81) and the *y* of *ey* is dropped by the *sūtra lopo vyorvali (P-6.1.65).* The rest part of *āthām* suffix is *thām* where *ām* is *ṭit* and therefore *ām* becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere* (P-3.4.79) and finally *āthām* becomes *ethe*. The suffix *dhvam* has *am* as *ṭi sanjñaka* and therefore it (*am*) becomes *e* as well. So the suffix *dhvam* becomes *dhve*. The suffix *iṭ* is *ṭit* and therefore it also becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79). vahi* and *mahi* has *ṭit i*-sound which becomes *e* as well by the earlier *sūtra* and therefore the forms of *vahi* and *mahi* becomes *vahe* and *mahe*.

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	te	ete	Ante
Second	se	ethe	Dhve
First	e	vahe	Mahe

2.3.2 The suffixes in *loṭ lakāra* (*ātmanepada*):

Suffix *ta, ātām, jha, thās, āthām, dhvam, iṭ, vahi, mahiṅ* are getting changed in *loṭ* also. The suffix *ta* has *a* as *ṭi-sanjñā* and this is also becoming *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere(P-3.4.79).* Further *e* becomes *ām* by the *sūtra āmetaḥ (P-3.4.90).* Therefore final form of *ta* suffix is *tām* in *laṅ lakāra*. *ā* of *ātāṃ* and *āthāṃ* becomes *iy* by the *sūtra āto ṅitaḥ (P-7.2.81)* and the *y* of *iy* is dropped by the *sūtra lopo vyorvali (P-6.1.65).* So the suffixes *ātām* and *āthām* becomes *itām* and *ītḥām* respectively. In the *jha* suffix, *jh* becomes *ant* by the *sūtra jho'ntaḥ (P-7.1.3)* and a becomes *ṭi sanjñā.* Therefore *a* becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4,79).* The suffix *jha* is now *ante* and the *e* becomes *ām* by the *sūtra āmetaḥ(P-3.4.90).* So the final form of the suffix *jha* is *antāṃ.* The suffix *thās* becomes *se* by the *sūtra thāsaḥ se (P-3.4.80).* The *sūtra savābhyāṃ vāmau (P-3.4.91)* says that the sound *e*, which is after

the sound *s* and *v*, becomes *va* and *am*. Therefore *s+e* becomes *s+va* and finally the suffix *thās* becomes *sva*. The suffix *dhvam* has *am* as *ṭi sanjñaka* and therefore it (*am*) becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere(P-3.4.79)*. The suffix *dhvam* becomes *dhve* and *e* of *dhve* becomes *am* by the *sūtra savābhyāṃ vāmau(P-3.4.91)*. So the final form of suffix *dhvam* remains *dhvam*. *āṭ āgama* is done before the suffix *iṭ* by the *sūtra āḍuttamasya picca (P-3.4.92)*. The *antyavarṇa ṭ* is dropped from *āṭ* and *iṭ*. *ā* and *i* becomes *ai* by the *sūtra āṭaśca(P-6.1.89)*. So the final form of the suffix *iṭ* is *ai*. The suffixes *vahi* and *mahiṅ* have *ṭi-sanjñaka i* which becomes *e* by the *ṭita-ātmanepadānāṃ ṭere(P-3.4.79)*. Further *e* becomes *ai* by the *sūtra eta ai(P-3.4.93)*. So the final forms of *vahi* and *mahiṅ* are *vahai* and *mahai* respectively. **The Final siffix forms are:**

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**tām**	**itām**	**antām**
Second	**Sva**	**ithām**	**Dhvam**
First	**Ai**	**āvahai**	**āmahai**

2.3.3 **The suffixes in laṅ lakāra (*ātmanepada*):**

This lakāra takes *āṭ āgaṃ* before the roots starting with the *ac varṇa* by the *sūtra āḍajādīnām(P-6.4.72)*. This *lakāra* is not *ṭit*, therefore there is no *etva* by the *sūtra ṭita-ātmanepadānāṃ ṭere(P-3.4.79)*. The *sūtra thāsaḥ se (P-3.4.80)* is also not applied here. *ā* of *ātām* and *āthām* becomes *iy* by the *sūtra āto ṅitaḥ (P-7.2.81)* and the *y* of *iy* is dropped by the *sūtra lopo vyorvali*. In the *jha* suffix, *jh* becomes *ant* by the *sūtra jho'ntaḥ* and *a* (rest part of *jha*) is simply added to *ant* to become *anta*. In the suffix *iṭ*, *ṭ* is dropped by *halantyam*. *Sandhi* takes place between the *vikaraṇa* and *i*. With the suffix *vahi* and *mahiṅ*, there is no change but there is *dīrgha* by the *sūtra ato dīrgho yañi(P-7.3.101)*. So the final form of *laṅ lakāra* suffix is – *ta, ātāṃ, anta, thāḥ, āthāṃ, dhvaṃ, i, vahi mahi*. The final forms are:

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**ta**	**itām**	**anta**
Second	**thāḥ**	**ithām**	**dhvam**

First	**I**	**vahi**	**mahi**

2.3.4 **The suffixes in *vidhiliṅ lakāra* (*ātmanepada*) :**

In this *lakāra, sīyuṭ āgaṃ* takes place between the root and suffix by the *sūtra liṅaḥ sīyuṭ(P-3.4.102).* After *anubandha lopa*, *sīy* is there. The *s* of *sīy* is dropped by the *sūtra liṅaḥ sa lopo'ntyasya* (P-7.2.79) and *iy* is left. *y* from *īy* is dropped by *lopovyorvali(P-6.1.65).* As *vidhiliṅ* is *sārvadhātuka,* it takes *vikarana* (*śap* etc). The suffix *ta* is getting attached with *ī* to form the suffix *īt* in first person (*prathama puruṣa*) singular number. In the dual number *y* of *īy* is not dropped because of the absence of *valādi* suffix. So the suffix is *īyātāṃ*. In the plural *jha* becomes *ran* by the *sūtra jhasya ran (P-3.4.105)* and *y* of *īy* is dropped because of the presence of *valādi pratyaya*. So the suffix in the first person singular number becomes *īran*. The same process is repeated in second person (*madhyama-puruṣa*) and first person (*uttama-puruṣa*). The suffixes in second person become *īthās*, *īyāthāṃ* and *īdhvaṃ*. In *uttama puruṣa*, the suffix in singular number is becoming *īya* because of *a-ādeśa* to *iṭ* suffix by the *sūtra iṭo't*. The suffixes in dual and plural number are becoming *īvahi* and *īmahi* by dropping *y* of *īya* (*lopo vyorvali*).

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**īt**	**īyātām**	**īran**
Second	**īthāḥ**	**iyāthām**	**īdhvam**
First	**īya**	**īvahi**	**imahi**

2.3.5 **The suffixes in *liṭ lakāra* (*ātmanepada*):**

In this lakāra, some roots have *dvitva* and some have *āṃ āgama* instead of *dvitva* in *liṭ*. The roots from *bhvādi* to *kryādi gaṇa* (except *jāgṛ, ūrṇu, daridrā, cakāsṛ, dīdhī* and *vevī*) are *ekāc*. But when these *ekāc* roots take *sanādi* suffixes, they become *anekāc*. The roots of *curādigaṇa* take *ṇic*, therefore they become *anekāc*. In *liṭ*, *anekāc* roots take *āṃ* suffix[74] instead of *dvitva* of the roots. *ijādi gurumān*[75] roots, except *ṛcch* root,

[74] kāsyanekāca āṃ vaktavyaṃ.
[75] ijādi gurumato'nṛtaśc

take *āṃ*. The roots *day, ay* and *ās* takes *āṃ*[76]. The roots *jāgṛ, us, vid* take *āṃ* optionally[77]. The root *bhī, hrī, bhṛ*, and *hu* becomes *ślu* and they undergo *dvitva* process followed by *āṃ*[78]. The forms of *bhū, kṛ* or *as* roots are added to the roots which have taken *āṃ* suffix in *liṭ*, Now the condition is – {root + *āṃ* + *bhū*, *kṛ* or *as*}. In this condition they will be *aṃga* and further they will take *liṭ* suffix by *kṛñcānuprayujyate liṭI (P-3.1.40)*. *liṭ* becomes *ādeśa ta ātām jha*, *thās āthām dhvam, iṭ, vahi mahiṅ* by different sūtras. The suffix gets *ta* as *ādeśa* by the *sūtra ām-pratyayavat-kṛño'nu-prayogasya (P-1.3.63)*. sūffix *ta* gets *eś ādeśa* by the *sūtra liṭastajhayoreśirec*. (P-3.4.81) *ś* becomes it-sanjñā by the *sūtra halantyaṃ (P-1.3.3)* and dropped by the *sūtra tasya lopaḥ (P-1.3.9)*. Here *dvitva* (of *kṛ* root) and *yaṇ* was happening simultaneously. *yaṇ* is being restricted by the *sūtra dvirvacane'ci (P-1.1.59)* to allow *dvitva* (of *kṛ*) by the *sūtra liṭi dhātoranabhyāsasya (P-6.1.8)*. First *kṛ* becomes *abhyāsa* by the *sūtra purvo'bhyāsasya* (P- 6.1.4) where *ṛ* becomes *ar* and finally becomes *kar*. Here *r* is dropped by *halādi śeṣaḥ (P-7.4.60)* and *ka* becomes *ca* by the *sūtra kuhoścuḥ (P-7.4.62)*. Letter *ṃ* of *āṃ* becomes *anusvāra* by *mo'nusvāraḥ* (P-8.3.23) and *anusvāra* becomes *parasavarṇa* ñ by the *sutra vā padāntasya (P-8.4.59)*. Now the condition is root+ *āñcakṛ* + *e* (by *eś ādeśa*). The *guṇa* (by the *sūtra sārvadhātukārdhadhātukayoḥ (P-7.3.84)*)) is possible but *asaṃyogālliṭ kit (P-1.2.5)* is making the *liṭ lakāra 'kit'* and *kṅiti ca* is restricting the *guṇa*. the sound *ṛ* become *r* (i.e. *repha ādeśa*) by *iko yaṇaci* to form root+ *āñcakre*.

When root takes *ātāṃ*, the condition becomes root + *āñcakṛ* + *ātāṃ*. The *guṇa* (by the *sūtra sārvadhātukārdhadhātukayoḥ(P-7.3.84)*) is possible but *asaṃyogālliṭ kit (P-1.2.5)* is making the *liṭ lakāra 'kit'* and *kṅiti ca* is restricting the *guṇa*. the sound *ṛ* become *r* (i.e. *repha ādeśa*) by *iko yaṇaci (P-6.1.76)*. *ātāṃ* has *ṭit-sañjyaka āṃ* which becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere* (P-3.4.79) and thus *ātāṃ* becomes *āte*. Finally the form becomes root+ *āñcakrāte*.

When root takes *jha, jha* becomes *irec* by the *sūtra liṭastajhayoreśirec (P-3.4.81)*. In the condition root+*āñcakṛ* + *ire*, sound *ṛ* become *r* (i.e. *repha ādeśa*) by *iko yaṇaci* and the form becomes root+*āñcakrire*.

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[76] dayāyāsaśc
[77] uṣvidjāgṛbhyo'nyatarasyāṃ
[78] bhīhrībhṛvābhyāṃ śluvacca

In the condition root+*āñcakṛ*, *thās* is *ādeśa* in second person singular number. The suffix *thās* becomes *se* by the *sūtra thāsaḥ se* (P-3.4.80) which further gets changed into *ṣe* by *ādeśapratyayoḥ (P-8.3.59)*. Finally the form becomes root+*āñcakṛṣe*.

In the condition root+*āñcakṛ āthāṃ* is *ādeśa* in second person dual number. *āthāṃ* has *ṭit āṃ* which becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere* (P-3.4.79) and *āthāṃ* becomes *āthe*. By the *sūtra ikoyaṇa'ci (P-6.1.76)*, *ṛ* (of *kṛ*) becomes *r* and the final form becomes root+*āñcakrāthe*.

In the condition root+*āñcakṛ, dhvaṃ* is *ādeśa* in second person plural number. *dhakāra* becomes *ḍhakāra* by the *sūtra iṇaḥ ṣīdhvaṃ-luṅ-liṭāṃ dho'ṅgāt (P-8.3.78). ḍhvaṃ* has *ṭit āṃ* which becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79)* and *ḍhvaṃ* becomes *ḍhve*. Final form becomes root+*āñcakṛḍhve*.

In the condition root+*āñcakṛ, iṭ* is the *ādeśa uttama-puruṣa* singular number. After *anubandhalopa* of *ṭ, i* becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79).* Final form becomes root+*āñcakṛe*.

In the condition root+*āñcakṛ,* the *vahi* and *mahiñ* are the *ādesh* in *uttama-puruṣa* dual and plural number respectively. In *mahiṅ, ṅ anubandha* is dropped and *i* of these two suffixes also becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79).* And the final forms in uttama-puruṣa dual and plural number becomes root+*āñcakṛvahe* and root+*āñcakṛmahe* respectively.

Similarly the roots (which have *āṃ* instead of *dvitva*) take *bhū* and as roots and becomes root+*āṃ*+*bhū* and root+*āṃ*+*as* respectively. The roots *bhū* and *as* also undergo to the *liṭ* formation process and forms *edhāmbabhūva* and *edhāmāsa* etc 18 more forms in *liṭ lakāra*.

In *halādi* roots, the first *ekāc* undergoes *dvitva* and in *ajādi* roots, the second *ekāc* undergoes *dvitva*[79]. The roots, which have *dvitva,* undergo to *abhyāsa* process where first *hal* and first *ac* of the *abhyāsa* are kept and is rest dropped (by *halādi śeṣaḥ*). There are some exception of *halādi śeṣaḥ* as well. If the *halādi* roots starting with *śar pratyāhāra* (i.e. s, ś and ṣ) have *khay* (i.e. first and second letters of *kavargādi* five

[79] Pushpa Dixit- vol-2, p-287.

varga), second hal and first ac of the *abhyāsa* will be kept and rest will be dropped by the *sūtra śarpūrvāḥ khayaḥ (P-7.4.61)*. The roots having *ṛ* ending in the *abhyāsa* becomes a by the *sūtra urat (P-7.4.66)* and *uraṇa raparaḥ* (1.1.51) changes *a* into *ar*. Further *ar* (from *abhyāsa*) drops *r* by the *sūtra halādi śeṣaḥ (P-7.4.60).* If there is *dīrgha* in *abhyāsa*, it is becoming *hrasva* by the sūtra *hrasvaḥ(P-7.4.59). kuhoścuḥ* (P-7.4.62) does *cakāra ādeśa* to *kavarga* and *ha*. The *hakāra* in the root *han* becomes *dhakāra* by the *sūtra abhyāsācca (P-7.3.55). jhaś* and *khay* becomes *jaś* and *car* by the *sūtra abhyāse carca (P-8.4.54)*. The *abhyāsa u* of the root *bhū* becomes *a* by the *sūtra bhavateraḥ (P-7.4.73)* .

In *ajādi* roots, *ekāc* roots have *dvitva* by the *sūtra liṭi-dhātoranabhyāsasya (P-6.1.8)* and only first *ac* is kept. Rest part is dropped by the *sūtra halādi śeṣaḥ (7.4.60).* The initial *a* of *abhyāsa* becomes *ā* by the *sūtra ata ādeḥ(P-7.4.70).* The *ṛkārādi* roots have '*a*' at the beginning that too become *ā.* If there are two consonents (*hal varṇa*) in a root after *ā*, the root will take *nuḍāgaṃ* by the *sūtra tasmānnuḍ dvihalaḥ (p- 7.4.71)*. Ex- *arc→ arc arc (dvitva) →a arc* (deletion of consonents from the first *arc)→ā arc* (*a* becomes *ā* by *sūtra ata ādeḥ*)→ *ā na arc =ānarc*. The root *aś* is an exception. It does not have two consonents (*hal varṇa*) after changing the *a* into *ā* but the *nuḍāgaṃ* is being done to make the *aṃga ānaś. nuḍavidhau ṛkāraikādeso repho haltvena gṛhyate*[80] says that the roots starting with *ṛ* at the beginging will also be considered as having two *hal varṇa* and there also be the insertion of the *na* (*nuḍāgama*). Ex- *ṛj --> ṛj ṛj -->ṛ ṛj--> ar ṛj--> a ṛj--> ā ṛj --> ā na ṛj = ānṛj* .

The *vacyādi* and *grahyādi* roots undergo to *samprasāraṇa*. Here *y, v, r, l* gets changed *into i, u , ṛ, ḷ* respectively. ex- *yaj* becomes *ij*, *vac* becomes *uc*, *vraśc* becomes *vṛśca*. When the two letters out of the four (*y, r, l, v*), comes togather, the second one gets c hanged.

first letter doesnot get channged. But in the root *vay* the first letter *v* gets changed into u and not the second letter *y*[81]. After the *pūrvābhyāsa*, these roots in *liṭ lakāra* take th e following 18 suffix-es of *liṭ lakāra: ṇal-atus-us- thal-athus-a-ṇal-va-ma* in *parasma ipada* by the *sūtra ṇalatusus-thalathusa-ṇalavamāḥ* and take following suffixes in *ātm anepada*: *e, āte, ire, se, āthe, dhve,e, vahe, mahe*. These *ātmanepada* suffixes are obta

[80] Pushpa Dixit- vol-2, p-296.
[81] Pushpa Dixit, p-297.

ined after applying different sutras[82] on the suffixes- *ta, ātām, jha, thāsa, āthām, dh vam, iḍ, vahi, mahiṅ.*

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**Ta**	ātām	**Jha**
Second	**thāsa**	**āthām**	**Dhvam**
First	**iḍ**	**vahi**	**mahiṅ**

2.3.6 **The suffixes in *luṭ lakāra* (*ātmanepada*):**

In this *lakāra*, *luṭ* gets *ātmanepada ādeśa* *ta, ātām, jha, thās, āthām, dhvam, iṭ, vahi* and *mahiṅ* according to the person and number. *tās* is coming from the *sūtra syatāsī lṛluṭoḥ (P-3.1.33)*. The suffix *ta, ātām, jha* are changing into *ḍā-rau-ras* by the *sūtra lutaḥ prathamasya ḍāraurasaḥ(P-2.4.85).* In *ḍā* suffix, *ā* is rest after the *anubandhalopa*. Because of *ḍitva-sāmarthya*, *ās* of *tās* is dropped. Thus finally *tā* is the suffix form. *iḍāgama* takes place by the *sūtra ārdhadhātukasyeḍa valādeḥ (P-7.2.35)* in between the roots and the suffixes. When *ātām* becomes *rau* and *ras* in *luṭ*, third person (*prathama-pruṛṣa*) dual and plural number, the *s* of *tās* is dropped by the *sūtra ri ca*. Thus the suffix form in third person dual number becomes *tārau* and in the third person plural number the suffix becomes *tāraḥ* (*rutva visarga* of *s* in). By the *sūtra thāsaḥ se (P-3.4.80)*, *thās* becomes *se* in second person singular number and finlly *tāse* is formed. In second person dual number, the suffix is *āthām* which has *ṭit āṃ*. *ṭit āṃ* becomes *e* by the sūtra *ṭita-ātmanepadānāṃ ṭere* (P-3.4.79) and the suffix becomes *tāsāthe*. In *dhvaṃ ādeśa*, *ṭit āṃ* also becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere* (P- 3.4.79) and the suffix *tādhve* is formed. In the *uttamapuruṣa*, *iṭ* is *ādeśa* in singular number. *hala ṭ* is dropped and *ṭit i* becomes *e* by the *sūtra ṭita-ātmanepadānāṃ ṭere (P-3.4.79)*. The *s* of *tās* becomes *h* by the *sūtra ha eti*. So the suffix in *uttamapuruṣa* singular number is *tāhe*. The *s* of *tās* is unchanged in *uttamapuruṣa* dual and plural number. So the suffix forms are *tāsvahe* and *tāsmahe*.

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	**tā**	**tārau**	**tāraḥ**

[82] liṭaśtajhayoreśirec , ṭit-ātmanepadānāṃ ṭere, thāsaḥ se.

Second	**tāse**	**tāsāthe**	**tādhve**
First	**tāhe**	**tāsvahe**	**tāsmahe**

2.3.7 **The suffixes in *lṛṭ lakāra* (*ātmanepada*):**

The *lṛṭ* takes sya by the *sūtra syatāsi lṛlutoḥ* and the *s* of *sya* gets changed into *ṣ* by the *sūtra ādeśapratyayoḥ (P-8.3.59).* The rest process is same as *laṭ lakāra*. Only in the *uttamapuruṣa* dual and plural number, *a* of *sya* becomes *ā* by the *sūtra atodīrgho yañi (P-7.3.101)* to form the suffixes *ṣyāvahe* and *ṣyāmahe*. So the final forms of *lṛṭ* in *ātmanepada* are:

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	ṣyate	ṣyete	ṣyante
Second	ṣyase	ṣyethe	ṣyadhve
First	ṣye	ṣyāvahe	ṣyāmahe

2.3.8 **The suffixes in *āśīrliṅ lakāra* (*ātmanepada*):**

The *āśīrliñ* is *ārdhadhātuka*.So when the suffix is added to the root, it becomes *ārdhadhātuka* by the *sūtra liñgāśiṣi (P-3.4.116)*. Here *sīyuṭ āgama* is taking place by the *sūtra liṅaḥ sīyuṭ* (P-3.4.102)but the *s* of the *sīyuṭ* is not getting dropped because the *sūtra liñgaḥ sa lopo'nantasya (P-7.2.79)* is applied to the *sārvadhātuka* only. Here the *s* if *sīyuṭ* and the *suṭ* is *pratyayāvayaya*[83] and if the *ikāra* is present before the *s*, it becomes *ṣ* by the *sūtra ādeshpratyayoḥ*. Thus the letter *ta* is also becoming *ṭa* by the *sūtra ṣṭunā ṣṭuh (P-8.4.41)*. Because the *āśīrliñ* is *ārdhadhātuka*, *iḍāgama* is happening by the *sūtra ārdhadhātukasyeḍa valādeḥ (P-7.2.35).* The letter *y* of *sīyuṭ* will be dropped if the *val* suffixes are added to the root. Suffix *jha* of the *ātmanepada* becomes *ran* by the *sūtra jhasya ran (P-3.4.105)*. After these processes, we can get the final forms in the *āśīrliñ* in *ātmanepada* as:

Person	**Singular Number**	**Dual Number**	**Plural Number**
Third	ṣīṣṭa	ṣīyāstām	ṣīran

[83] Sri *Govindacharya* P-102

Second	ṣīṣṭhāḥ	ṣīyāstām	ṣīdhvam
First	ṣīya	ṣīvahi	ṣīmahi

2.3.9 The suffixes in *luṅ lakāra* (*ātmanepada*):

In this *lakāra*, the suffixes are made up of the following six suffixes: *sijluk, sak+sij, aṅ, caṅ, ksa* and *sic*. The suffix *sijluk* appears only in *parasmaipada*. This suffix is *sārvadhātuka* and it does not allow *śap* (along with *sic*). The *gā ādeśa* of the root iṇ *gatau*, the root *sthā*, 4 *dā* roots (*do= dā, dāṇa=dā, deṅ=dā, ḍudāñ=dā*), *ḍudhāñ=dhā, pā pāne* from *bhvādigaṇa*, root *bhū, ghrā, dheṭ* (*dhā*), *śā, chā* and *sā* these roots take the suffix made by *sijluk* suffix in *luṅ lakāra parasmaipada*. The *ā* ending roots except *gā*, *pā pāne, sthā, ghusañjaka dā, dhā, khyā,hvā* get *sak+sic* suffixes in *luṅ parasmaipada*.The *ā-ending* roots in *ātmanepada* take suffixes made by *sic* only. The *halanta* roots *yam, ram, nam* take the suffix made by *sak+sic*. In these roots *ram* is *ātmanepada* but when it comes with the *upasarga vi* and *ā*, it becomes *parasmaipada* and in that case it takes suffix made by *sak+sic*. The roots *vac, asu, khyā, lip, ṣic, hveñ,* roots from *puṣādigaṇa, dyutādigaṇa* and *lṛdit* roots, root *sṛ, śās* and *ṛ*, roots which are *irit jṚṣ vayohānau, mrucu, mlucu gatyarthau, grucu glucu steyakaraṇe, gluñcu gatau, tuośvi gativṛddhayoḥ* and the *śrauta* root *stanbhu* take the suffix made by *aṅ* suffix in *luṅ parasmaipada*. In *Vedic Sanskrit kṛ, mṛ, dṛ* and *ruh* take suffix made up of *aṅ* suffix but in *laukika* Sanskrit, *kṛ, mṛ, dṛ* roots take suffix made by *sic* and the root *ruh* takes *ksa*. The roots having *ṇyanta*, and the roots *śri, drū, sru, dheṭ, śvi, gup, kam* (which either have or don't have *ṇyanta*) take the suffix made by *caṅ*. The roots *dheṭ* and *śvi* optionally take suffix made by caṅ. The roots which are '*aniṭ śalanta igupadha*' take the suffix made by *ksa* suffix. These roots are- *kruś, diś, mṛś, riś, ruś, liś, viś, spṛṣ, kṛṣ, tviṣ, dviś, śliṣ, mih, ruh, lih, dih, duh*. When the *veṭ* roots- *gṛhu, bṛhu, tṛhu, stṛhu, guhū,* which are *śalanta igupadha*, becomes *aniṭ* they take suffixes made by *ksa*.

The forms of these suffixes are given below:-

The suffix made by *sijluk*: (*parasmaipada*)

Person	Singular	Dual	Plural

Third Person	t	tām	an (uḥ)
Second Person	s (:)	tam	ta
First Person	am	va	ma

The suffix made by *sak+sic*: (*parasmaipada*)

Person	Singular	Dual	Plural
Third Person	sīt	siṣṭām	siṣuḥ
Second Person	sīḥ	siṣṭam	siṣṭa
First Person	siṣam	siṣva	siṣma

Suffix made by *aṅ-* (*parasmaipada*)

Person	Singular	Dual	Plural
Third Person	at	atām	an
Second Person	aḥ	atam	ata
First Person	Am	āva	āma

Suffix made by *aṅ-* (*ātmanepada*)

Person	Singular	Dual	Plural
Third Person	ata	etām	Anta
Second Person	athāḥ	ethām	Adhvam
First Person	e	āvahi	āmahi

Suffix made by *caṅ-* (*parasmaipada*)

Person	Singular	Dual	Plural
Third Person	at	atām	an
Second Person	aḥ	atam	ata
First Person	am	āva	āma

Suffix made by *caṅ-* (*ātmanepada*)

Person	Singular	Dual	Plural
Third Person	ata	etām	anta
Second Person	athāḥ	ethām	adhvam
First Person	e	āvahi	āmahi

Suffix made by *ksa-* (*parasmaipada*)

Person	Singular	Dual	Plural
Third Person	sat	satām	san
Second Person	saḥ	satam	sata
First Person	sam	sāva	sāma

Suffix made by *kas- (ātmanepada*)

Person	Singular	Dual	Plural
Third Person	sat	sātām	santa
Second Person	sathāḥ	sāthām	sadhvam
First Person	si	sāvahi	sāmahi

Suffix made by *sic* – (*parasmaipada*)

Person	Singular	Dual	Plural
Third Person	sīt	satām	suḥ
Second Person	sīḥ	stam	sta
First Person	sam	sva	sma

Suffix made by *sic-* (*ātmanepada*)

Person	Singular	Dual	Plural
Third Person	sat	sātām	sata
Second Person	sthāḥ	sāthām	dhvam
First Person	si	svahi	smahi

Suffix made by *iṭ+sic*- (*parasmaipada*)

Person	Singular	Dual	Plural
Third Person	īt	iṣṭām	iṣuḥ
Second Person	īḥ	iṣṭam	iṣṭa
First Person	iṣam	iṣva	iṣma

Suffix made by *iṭ+sic* - (*ātmanepada*)

Person	Singular	Dual	Plural
Third Person	iṣṭa	iṣātām	iṣata
Second Person	iṣaṭhāḥ	iṣāthām	iḍhvam
First Person	iṣi	iṣvahi	iṣmahi

In this *lakāra*, *ajādi* roots take *āṭ āgama* (by the *sūtra āḍajādinām (P-6.4.72)*) and *cli* suffix (by *cli luñi (P-3.4.43)*). The *cli* suffix has *ādeśa sic* by the *sūtra cleḥ sic (P-3.4.44)*. After *anubandha lopa*, only *s* is rest in the *sic*. Due to *ārdhadhātuka*, *iḍāgama* takes place after the root.

The *halādi* roots take *aṭ āgama*. The *aṭ* and *āṭ* both are *ṭit*, and therefore they are added before the root.Therefore the *aṅga/* base form is: *āṭ/aṭ* + root +suffix forms.

2.3.10 **The suffixes in *lṛṅ lakāra* (*ātmanepada*):**

The process of *lṛṅ lakāra* formation is almost similar to *laṅ lakāra*. The *āṭ* and *aṭ āgama* is added at the beginning of *ajādi* and *halādi* roots respectively. And the *vikaraṇa sya* is added before the suffixes of *laṅ lakāra* to make the form of *lṛṅ*. The final form of *lṛṅ lakāra* suffixes are in *ātmanepada* are:

Person	Singular	Dual	Plural
Third Person	Syat	syeṭām	syanta
Second Person	syathāḥ	syethām	syadhvam

First Person	Sye	syāvahi	syāmahi

2.4 Verb Formation Process: The verb formation can be divided into two sections: Primay form formation and secondary form formation**.**

2.4.1 Primary form formation:

For the verb formation, the roots from the ten *gaṇa*s (*bhuvādigaṇa* etc ten *gaṇa*s) undergo to the following process:

a) The roots (in *sārvadhātuka*) take *laṭ lakāra* etc from the *sūtra vartamāne laṭ* (P-3.2.123) and so on.
b) For the verb form, it takes the suffix *tip* etc depending on number and person. The suffixes are getting modified (as discussed above) and getting the final forms of suffixes.
c) Because the suffix became *sārvadhātuka*, the *vikaraṇa śap* etc is being inserted in between the root and the suffix by the *sūtra kartari śap* and so on. Here *śap* etc *vikaraṇa*s also undergo through *itasañjñā* and *lopa* process. Finally *itasañjñaka* letters are dropped by the *sūtra tasya lopaḥ (P-1.3.9)* and '*a*' etc *vikaraṇa*s are added to the roots. These *vikaraṇa*s are *sārvadhātuka* by the *sūtra tiṅśit- sārvadhātukam(P-3.4.113)'*.
d) In this stage, *sandhi* takes place between the root and the *vikaraṇa*. For this purpose, we look for the verb endings. In the *ik* ending roots, *ik* becomes *guṇa*. For example, in the roots *ji, nī, dru, bhū, hṛ, tṛ- i/ī* becomes *e*, *u/ū* becomes *o*, *ṛ/Ṛ* becomes *ar* respectively. From *eco'yavāyāvaḥ (P-6.1.77), e* and *o* becomes *aya* and *ava* respectively. Therefore the form becomes *jay-*, *nay-*, *drav-*, *bhav-*, *har-*, *tar-* respectively. And when the *vikaraṇa* is added, these forms become *jaya-*, *naya-*, *drava-, bhava-, hara-, tara-* respectively. In the *ejanta* roots, *e, ai, o* and *au* are the endings. When *śap* is added to the roots which has *e, ai* and *au* endings, the endings change into *ay, āy* and *āv* respectively. For example, *dhe* (*dh*+*e*) becomes *dh*+ *aya*= *dhay-, mlai* becomes *ml*+*āy*= *mlāy-* and *dhau* becomes *dh*+*āv*= *dhāv-*. And when the vikaraṇa is added, these forms become *dhaya-, mlāya-, dhāva-* respectively. In the *laghu ik-upapada* roots (roots having *i, u* and *ṛ* in *upadhā*), the letters in the *upadhā* becomes

guṇa. For example, *cit-* becomes *chet-*, *mud-* becomes *mod-* and *vṛṣ* becomes *varṣ-*. When the *vikaraṇa* is added, these forms become *cheta-*, *moda-* and *varṣa-* respectively. The roots *pā, ghrā, dhmā, sthā, mnā, dāṇ, dṛś, ṛ, sṛ, śadḷ* and *sadḷ* becomes *pib-, jighr-, dham-, tiṣṭh-, man-, yacch-, paśy-, ṛcch-, dhau-, śīy-* and *sīd-* respectively when *śit* suffix is added[84]. When the *vikaraṇa* is added, these forms become *piba-, jighra-, dhama-, tiṣṭha-, mana-, yaccha-, paśya-, ṛccha-, dhāva-, śīya-* and *sīda-*. When *śit* suffix is added, the roots *iṣ, gaṃ* and *yaṃ* take *ch-* in the place of last letter[85]. From the *sūtra che ca (P-6.1.72)*, there will be *tukāgama* and the froms of these roots will be *icch-, gacch-* and *yacch-* respectively. After adding the *vikaraṇa*, these roots become *iccha-*, *gaccha-* and *yaccha-* respectively. The *vikaraṇa* is simply added to the rest roots in the *bhavādigaṇa*. In this way, depending on the ending words and *upadhā* words, the modifications in the roots take place.

e) After the *aṃgakārya* (or *sandhi*) between root and *vikaraṇa* (in *sārvadhātuka*), the suffixes are added and the final verb is formed in all *lakāra*s respectively.

f) For the *ārdhadhātuka lakāra*, roots are to be identified as *seṭ* and *aniṭ*.if the root is *seṭ*, there will be *iḍāgama*. The roots follow the rest process similar to the *sārvadhātuka*.

2.4.2 Secondary form formation:

2.4.2.1 The verb formation process in *curādigaṇa* and *ṇijanta* –

Ten *gaṇa*s have been discussed in the section of classification of Roots. In those ten gaṇas, the curādigaṇa and ṇijanta is taking two *vikaraṇa*s *-ṇic* and *śap*. The *vikaraṇa ṇic* is *svārthika* in *curādigaṇa*, so it doesnot add any specific meaning to the verb. And in the *ṇijanta*, it is used in sense of *hetu* and therefore the *ṇic* suffix is used to make causative forms in Sanskrit. The *ṇic* suffix, in *curādigaṇa*, is added to the root by the sutra *satyāpapāśa....curādibhyo ṇic* (P-3-1-25). In *nijanta* it is assigned by the *sūtra hetumatiśca*.

[84] pāghrādhmāsthāmnā(P-7.3.78)
[85] iṣugamiyamāṃ chaḥ P-7.3.78)

In *ṇic* suffix, *ṇa* becomes *itsanjñaka* by *cuṭu* and *ca* by *halantyaṃ*. Both the *itsanjñaka* is dropped by the *sūtra tasya lopaḥ.* The *ikāra* is rest in the *ṇic* suffix and that *ikāra* is *ārdhadhātuka* by the *sūtra ārdhadhātukaṃ śeṣaḥ.* By the *sūtra 'puganta-laghūpadhasya ca*', *ikāra* and *ik* (*i, u, ṛ* -which is present at the *upadhā*) becomes *guṇa*. In the absence of *ik* letters at the *upadhā*, *vṛddhi* takes place by the *sūtra ata upadhāyāḥ* and *aco ñṇiti*. After *guna/vṛddhi* between root and *ṇic* suffix, the root is called *sanādyanta* (it beomes *dhātu-sañjaka*) which takes the different *tiṅanta* suffixes to form verbs in *curādigaṇa.* In between *sanādyanta dhātu* and *tiṅanta* suffixes, *śap vikaraṇa* is added. After the *itsanjñā* of *ś* and *p*, only *a* is left in *śap* which is *sārvadhātuka*. Therefore *guṇa* takes place by the sūtra *sārvadhātukārdhadhātukayoḥ* and *i* becomes *e*. By the *sūtra 'eco'yavāyāvaḥ*, *e* becomes *ay* to which *a* (of *śap*) is added. Almost all *ṇic* roots are *ubhayapadi.* The process of verb formation is similar to the other *gaṇa*s except *liṭ* and *luṅ*.

In liṭ, the sūtra – *'kāsyanekāca ām-vaktavyo liṭi*' and *kṛñcānuprayujyate liṭi* are assigning *ām*-suffix and applying *kṛ-bhū-as* forms- *ckāra*, *babhūva* and *āsa* with the *curādi* roots. Because the *ām*-suffix is inserted in *liṭ*, the *luk* of *ṇi*, which was taking place by the *sūtra ṇeriniṭi* does not take place. The *sūtra ayāmantālvāyyetnviṣṇuṣu* assigns *ay* in the place of *ṇi*. Therefore the verb forms are root+ *ayāñcakār*a, root+ *ayāmbabhūva* and root+*ayāmāsa*.

In *luṅ*, when *ṇic* is added to the root, *cli* (by the sūtra cli luṅi , P-3-1-43) gets changed into *caṅ* because of *caṅ ādeśa* by the *sūtra ṇiśridrusrubhyaḥ kartari caṅ* (P-3-1-48). When *caṅ* is there with the root, it allows *sanvadbhāva* by the *sūtra sanvallaghuni caṅpare'naglope* (P-7-4-93). Because of *sanvadbhāva*, dvitva of root takes place and the *abhyāsa akāra* gets changed into *ikāra* due to *ādesh* by the *sūtra sanyataḥ.* If there is *ukāra* at the *abhyāsa*, it gets changed into *ikāra* by the *sūtra oḥ puyaṇjyapare*. After *aṭāgaṃ, cli-> caṅ*, and *tiṅ* process, the *lūṅ* forms are generated in *parasmaipada and ātmanepada.*

Forms of ṇyanta: -

In *parasmaipada* - *bhū* → *bhāva* + *yati/yataḥ/yanti/yasi/yathaḥ/yatha/yāmi/yāvaḥ/yāmaḥ* (in *laṭ*).

*bhū → bhāva + yāñcakāra/ yāñcakratuḥ/ yāñcakruḥ/ yāñcakratha/ yāñcakrathuḥ /yāñcakra / yāñcakāra/yāñcakṛva/ yāñcakṛma (*in *liṭ*)

*bhū → bhāva + yāmbabhūva/ yāmbabhūvatuḥ/ yāmbabhūvuḥ/ yāmbabhūvitha/ yāmbabhūvathuḥ/ yāmbabhūva / yāmbabhūva/ yāmbabhūviva/ yāmbabhūvima (*in *liṭ)*

bhū → bhāva + yāmāsa/ yāmāsatuḥ/ yāmāsuḥ/ yāmāsitha/ yāmāsathuḥ/ yāmāsa/ yāmāsa/ yāmāsiva/ yāmāsima (in *liṭ*)

bhū → bhāva + yitā/yitārau/yitāraḥ/ yitāsi/ yitāsthaḥ/ yitāstha/ yitāsmi/ yitāsvaḥ/ yitāsmaḥ (in *luṭ*)

bhū → bhāva + yiṣyati/ yiṣyataḥ/ yiṣyanti/ yiṣyasi// yiṣyathaḥ/ yiṣyatha/ yiṣyāmi/ yiṣyāvaḥ/ yiṣyāmaḥ (in *lṛṭ*)

bhū → bhāva + yatu/yatāṃ/yantu/ya/yataṃ/yata/yāni/yāva/yāma (in *loṭ*)

bhū → a+ bhāva + yat/yatām/yan/yaḥ/yatam/yata/yam/yāva/yāma (in *laṅ*)

bhū → bhāva +yet/yetām/yeyuḥ/yeḥ/yetam/yeta/yeyam/yeva/yema (in *vidhiliṅ*)

bhū → bhāv +yāt/yāstām/yāsuḥ/yāḥ/yāstam/yāsta/ yāsam/yāsva/yāsma (in *āśīrliṅ*)

bhū → abī+bhavat /bhavatām/ bhavan/ bhavaḥ /bhavatam/ bhavata/ bhavam/ bhavāva/ bhavāma (in *luṅ*)

bhū → a+bhāva+ yiṣyati/yiṣyataḥ/yiṣyanti/ yiṣyaḥ/ yiṣyatam/ yiṣyata /yiṣyam/ yiṣyāva/ yiṣyāma (in *lṛṅ*)

In these *lakāra* forms, the verb form of *luṅ lakāra* is looking different as the '*ya*' form is dispeared during verb formation process because the *ikāra* of *nic* has been dropped by the *sūtra ṇeraniṭ*. The root has *dvitva, abhyāsa* becomes *hrasva*, and root undergoes to the *jaśtva* process. Further *ukāra* of *abhyāsa bu* has *ādeśa it* by the *sūtra*

oḥ puyaṇjyapare. Further this *ikāra* becomes *dīrgha* by the *sūtra dīrgho laghoḥ*. Because of these processes, we see the difference in *luṅ- ṇijanta*.

For example- root *ad- atti* (*laṭ*) -- *ādayati (ṇijanta-laṭ*) --*ādidat-* (*ṇijanta-luṇ*)

Root *kup-*	*kupyati-*	*kopayati-*	*acukupat*
Root *kṛ-*	*karoti-*	*kārayati-*	*akārayat*
Root *khād -*	*khādati-*	*khādayati-*	*acīkhada*

Forms of ṇyanta: -

In *atmanepada - bhū → bhāva + yate/yete/ante/yasi/yathaḥ/yatha/yāmi/yāvaḥ/yāmaḥ* (in *laṭ*)

bhū → bhāva + yāñcakre/yāñcakrāte/yāñcakrire /yāñcakriṣe/ yāñcakrāthe/ yāñcakriḍhve/ yāñcakre/ yāñcakṛḍhve/ yāñcakṛmahe (in *liṭ*)

bhū → bhāva + yitā/yitārau/yitāraḥ/ yitāse/ yitāsāthe/ yitādhbe/ yitāhe/ yitāsvahe/ yitāsmahe (in *luṭ*)

bhū → bhāva + yiṣyate/ yiṣyete/ yiṣyantei/ yiṣyase/ yiṣyethe/ yiṣyadhve/ yiṣye/ yiṣyāvahe/ yiṣyāmahe (in *lṛṭ*)

bhū → bhāva +yatāṃ/yetāṃ/yantām/ yasva/ yethām/ yadhvam/ yai/ yāvahai/ yāmahai (in *loṭ*)

bhū → a + bhāva + yata/ yetām/ yanta/ yathāḥ/ yethām/ yadhvam/ ye/ yāvahi/ yāmahi (in *laṅ*)

bhū → bhāva + yeta/ yeyātām/yeran/yethāḥ/yeyāthāṃ/yedhvam/yeya/ yevahi/yemahi (in *vidhiliṅ*)

bhū → bhāva +yiṣīṣṭa/ yiṣīyāstām/ yiṣīran /yiṣīṣṭhāḥ/ yiṣīyāsthām/yiṣīdhvaṃ/ yiṣīya/ yiṣīvahi/ yiṣīmahi (in *āśīrliṅ*)

bhū → abī+bhavata /bhavetām/ bhavanta/ bhavathāḥ /bhavethām/ bhavadhvam/ bhave/ bhavāvahi/ bhavāmahi (in *luṅ*)

bhū → *a + bhāva+ yiṣyata/ yiṣyetām/yiṣyanta /yiṣyathāḥ / yiṣyethāṃ/ yiṣyadhvam/ yiṣye/ yiṣyāvahi/ yiṣyāmahi* (in *lṛṅ*)

2.4.2.2 **Verb formation process in *sananta* –** The *sananta* forms of verbs are used to express the sense of desire (*icchā*). Here the root takes *sanādi* suffixes. The *sanādi* suffixes are 12 – *san, kyac, kāmyac, kyaṅ, kyaṣ, kvip, yaṅ, īyaṅ, yak, āya, ṇic*, and *ṇiṅ*. (The *ṇic* and *san* suffixes are used with all the roots. The suffix *yaṅ* is not used with all roots and suffix *yak* is used with *kaṇdvādi* roots. The suffixes *īyaṅ*, *āya* and *ṇic* is used with the roots maintioned in the *sūtra*s. The suffixes *kyac, kāmyac, kyaṅ* and *kyaṣ* are used with *subanta*s only, and not with the roots. The suffix *kvip* is used with *prātipadika*s only, and not with the roots). The verb forms of the roots in *sanādyanta* are dependent on their catagories, i.e. *ātmanepada, parasmaipada* and *ubhayapada*. For example- √*paṭh* → √*paṭh* +*san* (*dhātoḥ karmaṇaḥ samānakartṛkād-icchāyāṃ vā*) → *anubandhalopa , ārdhadhātukasañjyā, iḍāgama,* → √*paṭh* +*isa* → √*paṭh*+ √*paṭh* + *isa* (*sanyaṅoḥ*) → *pa+paṭh+isa* → *pi+paṭh+isa* (*sanyataḥ*)→ *pipaṭhiṣa* (*ādeshapratyayoḥ*) → *pipaṭhiṣa+śap +tip/tas… etc. = pipaṭhiṣati/ pipaṭhiṣataḥ/ pipaṭhiṣanti* etc are the forms. In this way, all the forms can be derived in *sanādyanta* process.

2.4.2.3 **Verb forms of *yaṅanta and yaṅluganta* –** These verb forms are used to indicate the reduplication of the action[86]. The difference between *yaṅ* and *yaṅluk* is this much that the *yaṅ* suffix is present in the *yaṅanta* process and *yaṅ* becomes *luk* in the *yaṅluk* process. (i.e. *ya* is visible in *yaṅ*, and *ya* is not visible in *yaṅluk*). For example- *gacchati* → *jaṅgamyate, jayate* → *jejīyate, paṭhati* → *pāpaṭhyate, dadāti*→ *dedīyate, paśyati*→ *darīdṛśyate, rakṣyati* →*rārakṣyate* etc are the *yaṅanta* examples. In *yaṅanta*, all forms are *ātmanepada*[87]. In *yaṅluganta*, the verb forms are *parasmaipada* because of the principle "(*yaṅ-pratyayasya*) *ṅitvasya pratyayāpratyaya-sādhāraṇatvena pratyaya-lakṣaṇāpravṛtteḥ* (*anudāttedbhyo ṅitbhyo'pi ātmanepadaṃ bhavati*)[88]. It means that *pratyayalakṣaṇa* is unapplicable where the *pratyaya* (suffix) and *apratyaya* (other than suffix) both are indicated. Therefore *ṅit*-ending of

[86] dhātorekāco halādeḥ kriyāsamabhihāre yaṅ, (P-3-1-22), (paunaḥpunyaṃ bhṛśārthaśca kriyā-samabhihāraḥ, tasmin dyotye yaṅ syāt)
[87] Dixit, Pushpa, (2011), sanādyanta-dhātupāṭha, p-4.
[88] Dixit, Pushpa, (2011), sanādyanta-dhātupāṭha, p-4.

ātmanepada is also not possible. So *yaṅluganta* has only *parasmaipada* forms. For example - √*bhū* → *bobhavīti, bobhūtaḥ, bobhuvati* etc.

2.4.2.4 Verb forms of *nāmadhātu*:- The *nāmadhātu* formation is a process of changing *nāma* or *prātipadika* into the root to form the verbs. Here the nominal words the source of *nāmadhātu*. So the roots listed in the *dhātupātha* are not used to form the verbs of *nāmadhātu*. The suffixes *kyac, kyaṣ, kyaṅ , kvip* etc are used with the *subanta-pada* to form these *nāmadhātu*s. When *kyaṅ* suffixe is used, it denotes the *upamāna* or behavior (*ācaraṇa*)[89]. For example- *kṛṣṇāyate*=(*kṛṣṇa kī taraha ācaraṇa karatā hai*). When agent desires something for himself, then the object of the desire takes the *kyac* or *kāmyac* suffix. For example- *saḥ* (*ātmanaḥ*) *putraṃ iccati = putrīyati* (*kyac*), *saḥ* (*ātmanaḥ*) *putraṃ iccati = putrakāmyati* (*kāmyac*). The suffix *kyaṣ* is used with *lohitādi prātipadika* (*lohitādi-ḍābhyaḥ kyaṣ*) and *avyakta-anukaraṇa* i.e. reduplication of unuttered sound (*avyaktānukaraṇād…*). For example- *lohitāyati/lohitāyate, a-paṭapaṭāyati/paṭapaṭāyate*. The suffix *kvip* is used with all the *prātipadika*s to indicate the sense of *ācaraṇa* (behavior). For example- *aśvati, kākati, gardabhati* etc.

2.5 The kṛdanta forms of Verbs: The Sanskrit verbs have *tiṅanta* and *kṛdanta* forms. In the *tiṅanta* forms, roots take the *tiṅanta* suffixes and in the *kṛdanta* forms, roots take *kṛdanta* suffixes. These *kṛdanta* forms are primarily *subanta* padas but these are used to express participle forms (of verbs). Approx 136 suffixes are listed in Pāṇini's *Aṣṭādhyāyi* which are used in the sense of *kartari, karmaṇi, bhāve, kārake sañjyāyāṃ, kṛcchra-akṛcchra-artheṣu, akartari, tācchīlike-kartari, bahula-arthe, vidhau, arhe, chandasi-kṛtyarthe, chandasi-tumarthe, pūrvakāle, pratiṣedhe, icchārtheṣu, karaṇ-adhikaraṇayoḥ* etc. Following are the important *kṛdanta* suffixes which are used to express the participle forms in a Sanskrit sentence:

Whenever any suffix is added to the root, it affects the last svars of the *ajanta* root and *upadhā svara* (second last svara) of the *halanta svara*. There are four types of suffixes- *tiṅanta, vikaraṇa, sanādyanta and kṛdanta*. The *kṛdanta* suffix is divided into *kṛtya* and *kṛt*. *tavyat, tavya,anīyara, yat, ṇyat* and *kyap* are *kṛtya* suffixes which are used for passive voice. The *kṛt* suffixs are used for active voice. The *kṛt* suffixes-

[89] kartuḥ kyaṅ salopaśca (P-3/1/11). upamānātkartuḥ subantādācāre kyaṅ vā syāt.

tumun, ṇamul, ase, adhyai, tvā, lyap, tosun and *kasun* do not change their forms. These suffixes are used to represent the following types of verbs in Sanskrit:

- Present Participle: *śatṛ* and *śānac* suffixes are used to make present participle forms. The *śatṛ* suffix is used with *parasmaipada* and *śānac* is used with *ātmanepada*. For example- *arjayan* (*śatṛ*), *dhārayan* (*śatṛ*), *gacchan* (*śatṛ*), *paśyan* (*śatṛ*), *edhamānaḥ* (*śānac*), *nāṭyamānaḥ* (*śānac*) etc.

- Past Participle: The suffixes *kta* and *ktavatu* (i.e. *niṣṭhā* suffixes) are primarily used to form past participle, and *kvasu -kānacn* are used the sense of *liṭ lakāra* i.e. remote past. The words- *bhūtaḥ, kṛtaḥ, smṛtaḥ* etc. have *kta* suffix and *bhūtavān*, *kṛtavān, smṛtavān* etc. have *ktavatu* suffixes. The roots *sad, vas, śru* etc, in *liṭ*, take *kvasu ādesh* optionally and form the words- *sedivān*, *ūṣivān*, *śuśruvān* respectively. The *sūtra - liṭaḥ kānajvā* (P-3.2.105) assigns *kānac* suffix as *ādesh* in place of *liṭ* in *veda*. *cikyānaḥ*, *suṣuvānaḥ* etc are the examples.

- Potential Participle: The suffixes- *tavyat, tavya, anīyara, kelimara*, are used to indicate potential participle. *paṭhitavyaḥ, paṭhanīyaḥ* etc are the examples. '*pacelimā māsaḥ*' is famous example of *kelimar* suffix.

- Indeclinable Participles: The suffixes *ktvā* and *lyap* are used to make indeclinable participle. The suffix- *ktvā* is used when the agents of two actions are same and the second action is done after compleating the first one. Ex- *saḥ paṭhitvā khādati*. Here *paṭhitvā* is *pūrvakālika kriyā*. As the form of *paṭhitvā* is not changing, the suffix *ktvā* is representing indeclinable participle. The suffix lyap is also used in the sence of *pūrvakālika kriyā*. But the difference is this that the *lyap* is used with the roots which have prefix. For example- *āgatya* (*ā+gam+lyap*).

- Infinitives: The suffix *tumun* is used to indicate the purpose of the other action. For example- *saḥ paṭhituṃ gacchati*. Here the purpose of *gaman-kriyā* is being said by the word- *paṭhituṃ.* The infinitives may be used to denote the *aucitya* and *sāmarthya*.

The suffixes *kyap, yat, ṇyat* etc also indicate the verb. For example- *stu+kyap= stutyaḥ, vraj+kyap = vrajyā, pā+yat= peyaṃ, pari+vraj+ṇyat = parivrājyaṃ, pra+yuj+ṇyat = prayojyaḥ.*

2.6 Conditional Use of Lakāra

These ten *lakāra*s are used in the syntax differently. The conditional use of different words in the sentence governs the use of the *lakāra*. The time delimitation is also reflected by the use of *lakāra* in different tenses. How the use of different *lakāra* dependes on the conditionality and time delimitation, this will be discussed in this section.

2.6.1 Use of *laṭ-lakāra*

When we look into the use of *laṭ-lakāra* forms in details, we find more interesting issues in *laṭ-lakāra* mapping. When a particular *nipāta* is used in a Sanskrit sentence, the *laṭ-lakāra* can also be used to express the past or the future tense.

The sutras *laṭ sme* (P-3.2.118) and *aparokṣe ca* (P-3.2.119) say that *laṭ* occurs with the *nipāta sma* to denote the action of past tense.
Example- *krīṇanti sma prāṇamūlyaiḥ yashāṃsi = prāṇamūlya se yasha kharīdate the.*

The sutra *nanau pratipṛṣṭ-prativacane* (P-3.2.120) says that says that *laṭ* occur with *nanu* in response to a question about any action/task.
Example- (*akārṣīḥ kaṭaṃ?*)… *nanu karomi= hān, kara liyā.*

The sutra *nanvorvibhāṣā* (P-3.2.121) says that the *laṭ* optionally occurs with *na* and *nu* to denote past.
Example- (*akārṣīḥ kaṭaṃ?*)… *na karomi= hān, kara liyā.*
ahaṃ nu paṭhāmi = hān, maine paḍhā.

The sutra *vartamāne laṭ* (P-3.2.123) says that the *laṭ* is used in *vartamāna* (i.e. present tense). For example-
saḥ paṭhati. (*vaha paḍhatā hai.* Or *vaha paḍha rahā hai*).

The sutra *yāvat-purā-nipātayor-laṭ* (P-3.3.4) says that the *laṭ* is used with the *nipāta yāvat* and *purā* when the action is denoted in the future.

Example-

paṭhanti iha purā= pahale yahān paḍhegā.

vasantīha purā chātrāḥ = chātra pahale yahān rahegā.

The sutra *vibhāṣā kadā karhyoḥ* (P-3.3.5) says that *laṭ* occurs with *kadā* and *karhi* to denote the future tense. Example- *kadā bhuñkte* (or *karhi bhuñkte*) = *kaba khāenge?*

The sutra *kiṃvṛtte lipsāyāṃ* (P-3.3.6) says that that the affix *laṭ* optionally occurs after a verbal root used in conjunction with *kiṃvṛtta (kaṃ, kataraṃ & katamaṃ)*[90].

Example-

kaṃ bhavān bhojayati. kataraṃ bhavān bhojayati. katamaṃ bhavān bhojayati.

kaṃ bhavān bhojayiṣyati. kataraṃ bhavān bhojayiṣyati. katamaṃ bhavān bhojayiṣyati.

kaṃ bhavān bhojayitā. kataraṃ bhavān bhojayitā. katamaṃ bhavān bhojayitā.

The sutra *lipsyamāna-siddhau ca* (P-3.3.7) says that *laṭ* optionally occur to denote future when accomplishment is conditioned by a wish fulfilled.

Example- *yo annaṃ dadāti sa svargaṃ yāti = jo anna degā vaha svarga jāegā.*

The sutra *loḍartha-lakṣane ca* (P-3.3.8) says that *laṭ* occurs in the sense of *loṭ* (imperative).

Example- *upādhyāyaśced āgacchati, atha tvaṃ vyākaraṇaṃ adhīṣva = yadi upādhyāya āte hain to tumhe vyākaraṇa paḍhanā cāhiye.*

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The sutra *liṅ cordhvamauhūrtike* (P-3.3.9) says that the *laṭ* and *liṅ* optionally occur to denote future time exceeded by a *muhurtta* (approximate to the present).

Example- *muhurttasya paścād upādhyāyaśced āgacchati, atha tvaṃ vyākaraṇaṃ adhīṣva.*

(Or *muhurttasya paścād upādhyāyaśced āgacched, atha tvaṃ vyākaraṇaṃ adhīṣva*).

The sutra *vartamāna-samīpe vartamānād vā* (P-3.3.131) says that the *lakāra*s which are used to denote the action of present tense, optionally denotes the action of recent past or recent future (i.e. the action which happened or will happen recently).

For example-

kadā āgato'si (*kaba āe?*or *kaba āe ho?*), *ayam āgacchāmi* (*abhī āyā*).

kadā gamiṣyasi? (kaba jāoge?), eṣa gacchāmi (abhī jāungā).

[90]Sharma, Rama Nath, The Asṭādhyāyi of Panini, Vol-3, p-471.

The sutra *āśaṃsāyāṃ bhūtavacca* (P-3.3.132) says that the affixes which denote past action also optionally occur after a verbal root when *āśaṃsā* is expressed[91]. Example- *upādhyāyaśced āgamat, ete vyākaraṇaṃ adhyagīṣmahi.* Or *upādhyāyaśced āgacchati, vyakaraṇaṃ adhīmahe.*

2.6.2 Use of *liṭ lakāra*:

parokṣe liṭ (P-3.2.115) says that the *liṭ* took place when the un-witnessed (*parokṣa*) action is to be indicated. *chakāra, babhūva* etc.

haśaśvatorlaṅ (P-3.2.116) says *laṅ* and *liṭ* occurs with the verbal roots which has *ha* and śaśvad.

Example-

a) *iti ha akarot*
b) *iti ha cakāra*
c) *śaśvad akarot*
d) *śaśvad cakāra*

praśne cāsannakāle (P-3.2.117) says that *laṅ* and *liṭ* occur after a *liṭ* with a question of action of recent past.

Ex- *agacchad* (or *jagāma*) *devadattaḥ- kyā devadatta gayā*?

Puri luṅ cāsme (P-3.2.122) – says that *luṅ* occurs optionally with *laṭ* when *purā* is there and not when it is not used in conjunction with *sma*.

Ex- *vasantīha purā chātraḥ - pahale yahā chātra rahate the*.

If *laṅ* and *loṭ* are not accepted, *liṭ* will be introduced by P- 3.2.115.

Ex- *ūṣuḥ iha purā chātraḥ - sunā hai yahā pahale chātra rahate the*.

2.6.3 Use of *luṭ lakāra* :

[91] Sharma, Rama Nath, The Aṣṭādhyāyi of Panini, Vol-3, p-555.

a) *vibhāṣā kadā karhyoḥ* (P-3.3.5) – In this *sūtra* Sharma (1995) says, "the option of *laṭ* is made available against both *lṛṭ* 'general future' as well as *luṭ* 'first future'… *bhuṅkte* of *laṭ* against *bhokṣyase* of *lṛṭ* and *bhoktā* of *luṭ.*

Ex-

1. *kadā bhuñkte- kaba khāegā*
2. *kadā bhokṣyate- kaba khāegā*
3. *kadā bhoktā- kaba khāegā*
4. *karhi bhuñte- kaba khāegā*
5. *karhi bhokṣyate- kaba khāegā*
6. *karhi bhoktā - kaba khāegā*

b) *anadyatane luṭ* (P-3.3.15) says that the suffix *luṭ* occurs when a future action is denoted. That future action must not be shown as *vartamāna-sāmipya*.

Ex- *śvaḥ kartā - vaha kala karane wālā hai*, or *vaha kala karegā.*

2.6.4 Use of *loṭ lakāra-*

a) *sme loṭ* (P-3.2.165)- The *nipāt sma* will be added to the *loṭ* if there is an inspiration to do any word after the time denoted by '*muhūrta'*.

Ex- *muhūrtasya paścād śiṣyaḥ pāṭhaṃ paṭhatu sma- muhūrta bhara ke bāda śiṣya pāṭha paḍhe.*

b) *adhīṣṭhe ca* (P-3.2.166)-*loṭ* will be used with sma in the sense of *satkāra* (welcome).

Ex- *aṅ sma rājan agnihotraṃ juhudhi- he rājana! āpa agnihotra kā anuṣṭhāna kariye.*

2.6.5 Use of *lṛṭ lakāra-*

a) *bhaviṣyati gamyādayaḥ* (P-3.3.3) : This rule says that the *uṇādi* affixes are used todenote the action located at the future time. As - *āgāmi, bhāvi* etc.

Sharma (1995) clears that here the future is to be regarded as the significance of the affix *uṇ* only. The base doesn't have any future meaning.

b) *lṛṭaḥ śeṣe ca* (P-3.3.13) says that the *lṛṭ* will be used to denote action in the future tense. Ex- *kariṣyati - karegā.*

a) *ākrośe nañyaniḥ* (P-3.3.112)

b) *napuṃsake bhāve ktaḥ* (P-3.3.114)

c) *kṣipra-vacane lṛṭ* (P-3.3.133) says that the suffix *lṛṭ* is used with the words which have sense of *kṣipra* provided *āśaṃsā* is epressed.

Ex- *upādhyāyaśced kṣipraṃ āgamiṣyati, vyākaraṇaṃ adhiṣyāmahe = upādhyāya jaldī āne wāle hain (yā jaidī āyenge), vyākaraṇa paḍhenge*.

d) *nānadyatanavat-kriyā-prabandha-sāmipyayoḥ* (P-3.3.135) says that the suffixes *laṅ* (in past) and *luṭ* (in future) are denied with the verbal roots which denotes continuation of action (*kriyā-prabandha*) and *sāmipya* (immediate time). The rule introduces the suffixes *laṅ* and *lṛṭ*.

Ex- *yāvaj-jīvam-annaṃ-adāt (luṅ). yāvaj-jīvam-annaṃ- dāsyati (lṛṭ). jaba taka jīyā, anna diyā. jaba tak jīyegā, anna degā.*

e) *bhaviṣyati-maryādā-vacane-avarasmin* (P-3.3.136) – This sutra is for *akriyā-prabandha* and *asāmipya*. This indicates the *kāla-vibhāga* and *deśavibhāga*. In this sutra the word *bhaviṣyati* is used to block *bhūta-anadyatana* suffix *laṅ*. The general future suffix *luṭ* is blocked and *lṛṭ* finds scope. Here *anadyatana bhaviṣya* behaves like *adyatana* because of *maryādā vacana*.

Ex- *yo'yamadhvā gantavya āpāṭaliputrāt-tasya yadavaraṃ kauśāmbyāḥ tatra saktūn pāsyāmaḥ* (*lṛṭ*).

Here *luṭ -pātāsmaḥ* has been blocked by this *sūtra*.

f) *kālavibhāge-cānahorātrāṇāṃ* (P-3.3.137) says that the *ahorātra* (reference of day and night) will take *lṛṭ* (for *adyatana bhaviṣya*) instead of *luṭ* (for *adyatana bhaviṣya*).

Ex-

yo'yaṃ vatsara āgāmī tasya yad avara-āgrahāyaṅyāḥ tatra yuktā adhyeṣyāmahe. (adhyeṣyāmahe instead of *adhyetāsmahe*).

g) *kiṃ-vṛtte liṅ-lṛṭau* (P-3.3.144)-says that *liṅ* and *lṛṭ* occur with the word *kiṃ* in the sense of *grahā*. Here the form of *kiṃ* with the affixes *ḍatar* and *ḍatam* is included.

Ex-

1. *ko hariṃ nindet / nindiṣyati – hari kī nindā kauna karatā hai?*
2. *Kataro hariṃ nindet / nindiṣyati – do me se kaun eka hari kī nindā karatā hai?*
3. *Katamo hariṃ nindet/ nindiṣyati – aneka me se kauna eka hari kī nindā karatā hai?*

Optionally *lṛṅ* is also used. So *anindiṣyat* will also be there optionally.

Example of *akiṃvṛtta-*

The next *sūtra anavakṛptyamarṣayor-akiṃvṛtte'pi* (P-3.3.145) – says that the suffixes *liṅ* and *lṛṭ* occurs in *asambhāvanā* (incredibility) and *amarṣa* (intolerance).

Ex-

1. *na sambhāvayāmi bhavān hariṃ nindet- main nahi samajhatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*
2. *na sambhāvayāmi bhavān hariṃ nindiṣyati- main nahi samajhatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*
3. *na marṣaye bhavān hariṃ nindiṣyati- main nahi saha sakatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*
4. *na marṣaye bhavān hariṃ nindet- main nahi saha sakatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*

h) *kiṃ-kilāstyartheṣu lṛṭaḥ* (P-3.3.146) – In the sense of *asambhāvanā* (incredibility) and *amarṣa* (intolerance), lṛṭ is used with the word kiṃkila and asti. Here asti denotes asti, bhavati and vidyate. This *sūtra* blocks the use of *liṅ* which was assigned by the previous *sūtra* (P.3-3.45).

Example-

na śraddadhe kiṃkila tvaṃ sudrānnaṃ bhokṣyase – main visvāsa nahi karatā kit um sudra kā anna khāte ho.

na marṣaye kiṃkila tvaṃ sudrānnaṃ bhokṣyase – main sahana nahi karatā kit um sudra kā anna khāte ho.

tvam sūdrīṃ gamiṣyasi iti asti/bhavati/vidyate – tuma sūdrī kā gamana karate ho, aisā hai kyā?

i) *śeṣe lṛḍayadau-* if the indeclinables except *yacca* and *yadi* is there, and *chitrīkaraṇa* or *āścarya* is the possible meaning, the *lṛṭ lakāra* is used.

Example- *āścaryaṃ andho nāma kṛṣṇaṃ drakṣyati- āścarya hai ki andhā bhī kṛṣṇa ko dekhā hai.*

j) *vibhāṣā dhātau sambhāvanavacane'yadi-* if the roots denoting the meaning of possibility are in the *upapada*, the roots take *liṅ*. But the suffix *lṛṭ* can also be used optionally.
Ex- *sambhāvayāmi bhuñjīta/ bhokṣyate vā bhavān - sambhāvanā karatā hoon ki āpa khaenge.*

2.6.6 Use of laṅ lakāra:

a) *anadyatane laṅ* (P-3.2.111) : This is general rule which says that laṅ is used in *anadyatana* (past). Ex- *abhavat.*

b) *vibhāṣā sākāṅkṣe* (P-3.2.114)- In the *anadyatana bhūtakāla*, if the *smṛti-bodhaka pada* is used in the sentence with *ākāṅkṣya-bhāva*, optionally it takes *lṛṭ*.
Ex-
smarasi kṛṣṇa! vane vatsyāmastatra gāścārayāmaḥ. -yāda hai kṛṣṇa, vana me rahate the aura gāya charāte the.
(*vatsyāmaḥ= rahate the; cārayiṣyāmaḥ = carāte the*).
When the lañ is used, the sentence will be-
smarasi kṛṣṇa! vane avasāma, tatra gāḥ acārayāma.

c) *haśaṣvator-laṅ ca* (P-3.2.116)- with the word *ha* and *śaśvat*, the suffix *liṭ* is optionally used in *anadyatana parokṣa*. the suffix *laṅ* is also used.
Ex-
'iti ha cakāra'- usane aisā niścaya hī kiyā.
or 'iti ha akarot' – usane aisā niścaya hī kiyā.
'śaśvad akarot'- usane sadā aisā kiyā.
or 'śaśvat cakāra' – usane sadā aisā kiyā.

d) *praśne-cāsannakāle* (P-3.2.117)- When question is asked in *āsannakāla* of *anadyatana bhūta* and *parokṣa,* the root takes *laṅ*. Optionally it also takes liṭ.
Ex-

1. *agacchat kiṃ (lañ)- gayā thā kyā.*
2. *jagāma kiṃ? (liṭ)- gayā thā kyā.*
3. *kansaṃ jaghāna kiṃ - kansa ko mārā kyā?*

e) *puri-luṅ cāsame* (P-3.2.122)- when *purā nipāta* is used with the root in *bhūta anadyatana -kāla*, *luṅ* and *laṭ* is used. This will not happen with the *sma nipāta*.

Ex-

1. *vasantīha purā chātrāḥ (laṭ);*
2. *iha purā chātrāḥ avātsuḥ (luṅ);*
3. *iha purā chātrāḥ avasan (laṅ);*
4. *iha purā chātrāḥ ūrṣuḥ (liṭ)*

Translation-

yahān pahale chātra nivāsa karate the.

f) *iccārtheṣu liṅ-loṭau* (P-3.3.157)- if the *icchārthaka* root is present in the sentence as a *upapada*, the other root will take *liṅ* and *loṭ* suffix.

Ex-

1. *icchāmi bhuñjīta bhavān*
2. *icchāmi bhuñktāṃ bhavān*
3. *kāmaye bhuñjīta bhavān*
4. *prārthaye bhuñjīta bhavān*
5. *prārthaye bhuñktāṃ bhavān*

g) *praiṣātisarga-prāptakāleṣu-kṛtyāśca* (P-3.2.163)- The roots take *kṛt* suffix and *loṭ lakāra* in the sense of *praiṣa* (inspiration), *atisarga* (order with desire / *kāmācaritā*), and *prāptakāla* (appropriate time).

Ex-

karotu kaṭaṃ iha bhavān preṣitaḥ
karotu kaṭaṃ bhavān atiśṛṣṭaḥ
bhavataḥ prāptakālaḥ katakaraṇe
bhavān yajatāṃ
gururbhuṅktāṃ

preṣitaḥ śiṣyaḥ pāṭhaṃ paṭhatu

h) *gatvaraśca* (P-3.2.164)- In the above said *sūtra*, if the time duration of *muhurta* is to be denoted, the root will take *liṅ* and the above said *kṛtya* and *loṭ*.

Ex-

1. *muhūrtasya paścāt śiṣyaḥ pāṭhaṃ paṭhet*
2. *muhūrtasya paścāt śiṣyaḥ pāṭhaṃ paṭhatu*
3. *muhūrtasya paścāt śiṣyeṇa pāṭhaḥ paṭhanīyaḥ*

i) *sme loṭ* (P-3.2.165)- The *nipāt sma* will be added to the *loṭ* if there is an inspiration to do any word after the time denoted by '*muhūrta*'.

Ex- *muhūrtasya paścād śiṣyaḥ pāṭhaṃ paṭhatu sma- muhūrta bhara ke bāda śiṣya pāṭha paḍhe.*

j) *adhīṣṭhe ca* (P-3.2.166)- *loṭ* will be used with sma in the sense of *satkāra* (welcome).

Ex- *aṅ sma rājan agnihotraṃ juhudhi- he rājana! āpa agnihotra kā anuṣṭhāna kariye.*

k) *āśiṣī liṅ-loṭau* (P-3.2.173) –In the sense of blessing, the suffix *liṅ* and *loṭ* will be used with the root.

Ex- *deva putraste bhavatāt/ bhavet.*

2.6.7 Use of *laṇ lakāra*

a) *Anadyatane laṅ* (P- 3.2.111) – The *aparokṣa* takes *laṅ* in past tense. Ex- *agacchat.*

b) *vibhāṣā sākāṃkṣe* (P-3.2.114)- In the *anadyatana bhūtakāla*, if the *smṛti-bodhaka pada* is used in the sentence with *ākāṅkṣya-bhāva*, optionally it takes *lṛṭ.* The *laṅ lakāra* comes by default.

Ex-

smarasi kṛṣṇa! vane vatsyāmastatra gāścārayāmaḥ. -yāda hai kṛṣṇa, vana me rahate the aura gāya charāte the.

(*vatsyāmaḥ= rahate the; cārayiṣyāmaḥ = carāte the*).

When the *laṅ* is used, the sentence will be-

smarasi kṛṣṇa! vane avasāma, tatra gāḥ acārayāma.

abhijānāsi deva! Jayapure avasāma, tatra adhyayanam kurmaḥ.

c) *haśaṣvator-laṅ ca* (P-3.2.116)- when *ha* and *śaśvat* is used in the sentence, the suffix *laṅ* is used in *anadyatana parokṣa*. The suffix *liṭ* is also used.

Ex- *'iti ha cakāra'- usane aisā niścaya hī kiyā.*

or *'iti ha akarot' – usane aisā niścaya hī kiyā.*

'śaśvad akarot'- usane sadā aisā kiyā.

or *'śaśvat cakāra' – usane sadā aisā kiyā.*

d) *praśne-cāsannakāle* (P-3.2.117)- When question is asked in *āsannakāla* of *anadyatana bhūta* and *parokṣa*, the root takes *laṅ*. Optionally it also takes *liṭ*.

Ex-

agacchat kiṃ (lañ)- gayā thā kyā.

jagāma kiṃ? (liṭ)- gayā thā kyā.

kansaṃ jaghāna kiṃ - kansa ko mārā kyā?

a) *puri-luṅ cāsame* (P-3.2.122)- when *purā nipāta* is used with the root in *bhūta anadyatana -kāla, luṅ* and *laṭ* is used. This will not happen with the *sma nipāta*. The suffix *laṅ* and *laṭ* also applied.

Ex-

vasantīha purā chātrāḥ (laṭ);

iha purā chātrāḥ avātsuḥ (luṅ);

iha purā chātrāḥ avasan (laṅ);

iha purā chātrāḥ ūrṣuḥ (liṭ)

Translation-

yahān pahale chātra nivāsa karate the.

2.6.8 Use of *liṅ lakāra*

a) *liṅ-cordhva-mauhūrtike* (P-3.3.9)- If the time which is more than '*muhūrta* is to be denoted in the sense of future, the root optionally takes *liṅ lakāra*.

Ex- *muhūrtasya paścād upādhyāyaścet āgacchet, atha tvaṃ adhīṣva.*

b) *āśaṃsā-vacane-liṅ* (P-3.3.134)- if the word denoting the sense of *āśaṃsā* is in the sentence, the *liṅ lakāra* is used to denote the future tense.
upādhyāyaścet āgacchet āśaṃse yukto'adhīyīya – yadi upādhyāya āenge to āśā hai ki ṭhīka se paḍhenge.

c) *vibhāṣā-kathami liṅ ca* (P-3.3.143)- When '*kathaṃ*' is used in the *upapada* where the sense of the sentence is '*nindā*',the root takes *liṅ lakāra* and *laṭ lakāra*.
Ex- *kathaṃ nāma bhavāna brāhmaṇaṃ krokṣyati.*
kathaṃ nāma bhavāna brāhmaṇaṃ krośet.

d) *kiṃvṛtte liṅlitau* (P-3.3.144)- When the sense of '*nindā*' is denoted by *kaḥ, kataraḥ* and *katamaḥ*, the *liṅ lakāra* as well as *lṛṭ lakāra* is used with the root.
Ex- *ko nāma vṛṣalo yaṃ tatra bhavān yājayet/ yājayiṣyati.*
kataro nāma vṛṣalo yaṃ tatra bhavān yājayet/ yājayiṣyati.
katamo nāma vṛṣalo yaṃ tatra bhavān yājayet/ yājayiṣyati.

e) *jātu-yadorliṅ* (P-3.3.147)- when the sense of *asambhāvanā* and *akṣamā* is denoted and the words *jātu* and *yad* are used in the *upapada*, the root takes *liṅ lakāra*.
Ex- *na sambhavāmi yat nāma bhavān vedaṃ nindet- main soch bhī nahīn sakatā ki āpa veda kī nindā karate hain*.

f) *yacca-yatrayoḥ* (P-3.3.148)- when the sense of *asambhāvanā* and *akṣamā* is denoted and the words *yacca* and *yatra* are used in the *upapada*, the root takes liṅ *lakāra*.
Ex- *na sambhavāmi/marṣayāmi yacca (yatra vā) bhavān vedaṃ nindet*.

g) *citrīkaraṇe ca* (P-3.3.150)- when the sense of *āścarya* is denoted and the words *yacca* and *yatra* are used in the *upapada*, the root takes *liṅ lakāra*.
Ex- *āścaryametat yacca (yatra vā) bhavān vedaṃ nindet*.

h) *utāpyoḥ samarthayoḥ liṅ* (P-3.3.152)- when the words *api* and *ut*, having the same meaning, are in the *upapada*, the root takes *liṅ lakāra*. Here the *ut* and *api* words are giving special meaning instead of its general meaning.

Ex- *ut hanyādadhaṃ hariḥ - bahuta acchī bāta hai ki hari pāpon kā nāśa karate hain.*

api hanyādadhaṃ hariḥ - bahuta acchī bāta hai ki hari pāpon kā nāśa karate hain.

ut daṇḍaḥ patiśyati - kyā daṇḍa gira jāegā?

i) *kāmapravedane'kacchiti* (P-3.3.153)- The root takes the *liṇ lakāra* to express the desire when the term *kaścit* is not used.

Ex-

kāmo me bhuñjīta bhavāna- merī icchā hai ki āpa bhojana karen.

abhilāṣo me paṭhet bhavān - merī icchā hai ki āpa paḍhen.

j) *sambhāvane'lamiti-cet-siddhāprayoge* (P-3.3.154)- When the meaning of capability is denoted without using the term *alaṃ*, then the root takes *liṅ* to denote the possibility of an action.

Ex- *api giriṃ śirasā bhindyāt- śāyada sira se patthara toḍegā.*

If the term '*alam*' is used in the sentence, the root will not take the *liṅ lakāra*.

alam kṛṣṇo hastinaṃ hanisyati- śāyada kṛśṇa hāthī ko māra degā[92]

k) *vibhāṣā dhātau-sambhāvana-vacane'yadi* (P-3.3.155)- if *yat* word is not used in the sentence and the use of alam word is disproved, and the root denoting the sense of possibility (*sambhāvanā*) is in *upapada*, then root takes *liṅ lakāra*.

Ex- *sambhāvayāmi bhavān vedaṃ paṭhet (paṭhiṣyati vā)- sambhāvanā karatā hoon ki āpa veda paḍhenge*.

l) *hetu-hetumatorliṅ* (P-3.3.156)- The root takes the *liṅ lakāra* to denote *hetu-hetumadbhāva*. The words *yadi* and *ced* are used in this sense as well.

Ex- *kṛṣṇaṃ namet cet sukhaṃ yāyāt ;kṛṣṇaṃ naṃsyati cet sukhaṃ yāsyati - kṛṣṇa ko namaskāra karegā to sukha hogā.*

[92] govindāchārya, p-568

m) *icchārtheṣu liṅlolau* (P-3.3.157)- when the *icchārthaka* root is in *upapada*, the other root takes *liṇ* and *loṭ*.

Ex- *icchāmi / kāmaye /prārthaye bhuñjīta bhavān*

icchāmi / kāmaye /prārthaye bhuñktāṃ bhavān – main cāhatā hoon ki āpa bhojana Karen.

n) *liṅ ca* (P-3.3.159) – If the *iccārtha* root is in the *upapada* and there is one agent for the two action, the other action will take *liṇ lakāra*.

Ex- *bhuñjīya iti icchati - main khāūn, aisā cāhatā hai*.

o) i*cchārthebhyo vibhāṣā vartamāne* (P-3.3.160)- the *icchārthaka* roots optionally take *liṅ lakāra* and the *laṭ lakāra* is used by default.

Ex- *saḥ pustakaṃ icchet* (*icchati vā*) - *vaha pustaka kī icchā kare* (*yā karatā hai*)

p) *liṅ yadi* (P-3.3.168)- If *kāla, samaya* and *velā* words are in the *upapada*, the root takes the *liṅ lakāra*.

Ex- *kālo/samayo/velā yat bhuñjīta bhavān – samaya hai ki āpa bhojana karen*.

2.6.9 Use of *luṅ lakāra*

a) *vayasi ca* (P-3.2.10) - *luṅ* is used in simple past.

Ex- *kva bhavān uṣitaḥ? (āpa kahān rahe?); ahaṃ atra avātsam – main yahān rahā.*

b) *nanvorvibhāṣā* (P-3.2.121) – In the sense of *pṛṣṭaprativacane*, *luṅ* is used in past tense when the words *nu* and *nanu* are in the *upapada.*

Ex- *ahaṃ nu apaṭhiṣaṃ- hān maine paḍhā.*

c) *puri luṅ cāsme* (P-3.2.122)- In the past tense, if *sma* word is not used and the *purā* word is in the *upapada*, the root takes *luṅ* optionally.

Ex- *avātsuḥ purā chātrāḥ - pahale yahān chātra rahate the*.

d) *lṛṭaḥ sadvā* (P-3.3.14)- In the place of *lṛṭ*, *sat-sanjñaka śatṛ* and *śānaca* is used.

Ex-

kariṣyantaṃ devadattaṃ paśya;

kariṣyamāṇaṃ devadattaṃ paśya.

e) *nānadyatanavat-kriyā-prabandha-sāmīpyayoḥ* (P-3.3.135)- To the continuity and the *sāmipya* of the action is indicated in the sentence, the root takes luṅ and the suffix of the *laṅ* and *luṭ lakāra* is denied.
Ex- *yāvat jīvam annam adāt- jaba taka jīyā, anna diyā.*

f) *māṅi luṅ* (P-3.3.175)- when the form of *māṅ* is used in the sentence, the root takes *luṅ.* Ex- *mā bhavān akārṣī - āpa na karen*; (*āpa nahīn karenge; āpane nahīn kiyā*, may also be the meaning of this sentence)[93] .

g) *smottare laṅ ca* (P-3.3.176)- When '*mā sma*' is used in the sentence, *laṅ* and *luṅ* both *lakāra* will be there. Ex- *mā sma gamaḥ*; *mā sma gaccha*; *mā sma bhūḥ*; *mā sma bhavaḥ*.

2.6.10 Use of *lṛṅ lakāra*

a) *liṅ nimitte lṛṅ-kriyātipattau* (P-3.3.139) – When the sense of *asiddhi* of the verb is denoted in the sentence, the root takes *lṛṅ* instead if *liṅ*. Ex- *śramaśced akariṣyat, uttīrṇo abhaviṣyat. mehanata karoge to uttīrṇa ho jaoge*. Here the *lṛṅ* is indicating the sense of future as well as the past tense.

b) *bhūte ca* (P-3.3.140) – This *sūtra* tells that the action of the past tense is also denoted by the *lṛṅ lakāra*. Ex- *śramaśced akariṣyat = uttīrṇo abhaviṣyat. mehanata karate to uttīrṇa ho jāte.*

c) *vibhāṣā-kathami liṅ ca* (P-3.3.143) - When '*kathaṃ*' is used in the *upapada* where the sense of the sentence is '*nindā*',the root takes *liṅ lakāra* and *laṭ lakāra*.
Ex- *kathaṃ nāma tatra bhavāna dharmaṃ atyakṣat- āpane dharma kaise tyāgā.*

[93] Pt. Ishwar Krishna, Vol-I, P-391

d) *kiṃvṛtte liṅlitau* (P-3.3.144)- This *sūtra* tells that the *kimvṛtta* takes *liṅ* and *lṛṭ* in the sense of *garhā*. Ex- *ko hariṃ anindiṣyat- hari kī nindā kisane kī; hari kī nindā kauna karegā.*

e) In the *sūtra anavaklṛptyamarṣayorakiṃvṛtte'pi* (P-3.3.145) and *jātuyadorliṅ* (P-3.3.147), The *lṛṅ prāgvat* is also added to explain that the *lṛṅ* is always used in the future tense and it is also used in the past tense optionally. Ex- *jātu/yad/yadā yadi tvādṛśo hariṃ nindenna marṣayāmi/ anindiṣyat na marṣyāmi.*

f) *yacca-yatrayoḥ* (P-3.3.148)- Here *vā* is *anuvṛtta* from '*votāpyoḥ*'. Therefore *lṛṅ* is optionally used.
Ex- *yacca (yatra vā) tvam evaṃ akariṣyaḥ, na śraddhaye- main kalpanā nahīn kar sakatā kit um aisā karoge*.

Here, it can be noticed that the verbs in different lakāras are indicating the sense of other lakāra depending on the conditional use of particular words in a given sentence. So this becomes challenging task to create a tool to handle general usage and conditional usage of Sanskrit verbs into Hindi (and other languages) as well.

Chapter 3

Issues in Sanskrit-Hindi Verb Mapping:

3.1 Introduction: For an inflectional language like Sanskrit, there are certain Source-Language specific issues which need to be discussed before writing Transfer Rules for programming.

1. Electronic Database of all verb forms in Sanskrit
2. Morphological analysis of Sanskrit Verbs
3. Handling of prefix-root combinations in Sanskrit
4. Prefix-prefix combinations and possible verb forms
5. Similar verb forms in different Number and Person

In the second part of the chapter, Hindi verb generation issues will be discussed.

3.1.1 Electronic Database of all verb forms in Sanskrit:

For Natural Language Processing, Linguistic database needs to be created in electronic form. As the Sanskrit verb formation process is bit complicated because of addition of *vikaraṇa* according to different class of verbs, *dvitva* (doubling of root) process, insertion of different letters (i.e. *aṭāgama* (insertion of '*aṭ*'), *iḍāgama* (insertion of '*iṭ*') etc) according to the described Pāṇinian grammar and because of morphophonemic changes in verb formation, we can't simply break the verb into verbal base and suffix.

For example, we can simply notice the change in the verb form of root *bhū* in *laṭ* and *liṭ lakāra*.

laṭ lakāra:

bhavati bhavataḥ bhavanti

bhavasi bhavathaḥ bhavatha

bhavāmi bhavāvaḥ bhavāmaḥ

liṭ lakāra:

babhūva babhūvatuḥ babhūvuḥ

babhūvitha babhūvathuḥ babhūva

babhūva babhūviva babhūvima

In *laṭ lakāra*, we have '*bhava*' as a verbal base derived from root *bhū* and '*ti*' '*taḥ*' etc are suffixes. But root *bhū* has *babhū* in all the nine forms in liṭ lakāra.

So we cannot put roots from *dhatupaṭha* and all suffixes discussed in *Aṣṭādhyāyī* in a database and assume that the machine will automatically identify the verbal base and suffixes by applying rule based approach. We, firstly, need to provide the verb database for analysis and processing.

3.1.2 Morphological analysis of Sanskrit verbs:

Verb identification is mainly dependent on the process of morphological analysis. Sanskrit verb Analyzer has been developed in JNU[94] which provides the the morphological analysis of Sanskrit verbs. For example, when verb form '*paṭhati*' is the input, the following is the output:

पठति { (कर्तृवाच्य) पठ ([भ्वादिगण] [सेट्] [सकर्मक]) ([लट्]) तिप् ([परस्मै] [प्रथम-पुरुष] [एकवचन]) }

(*paṭhati* { (*kartṛvācya*) *paṭha* ([*bhvādigaṇa*] [*seṭ*] [*sakarmaka*]) ([*laṭ*]) *tip* ([*parasmai*] [*prathama-puruṣa*] [*ekavacana*]) })

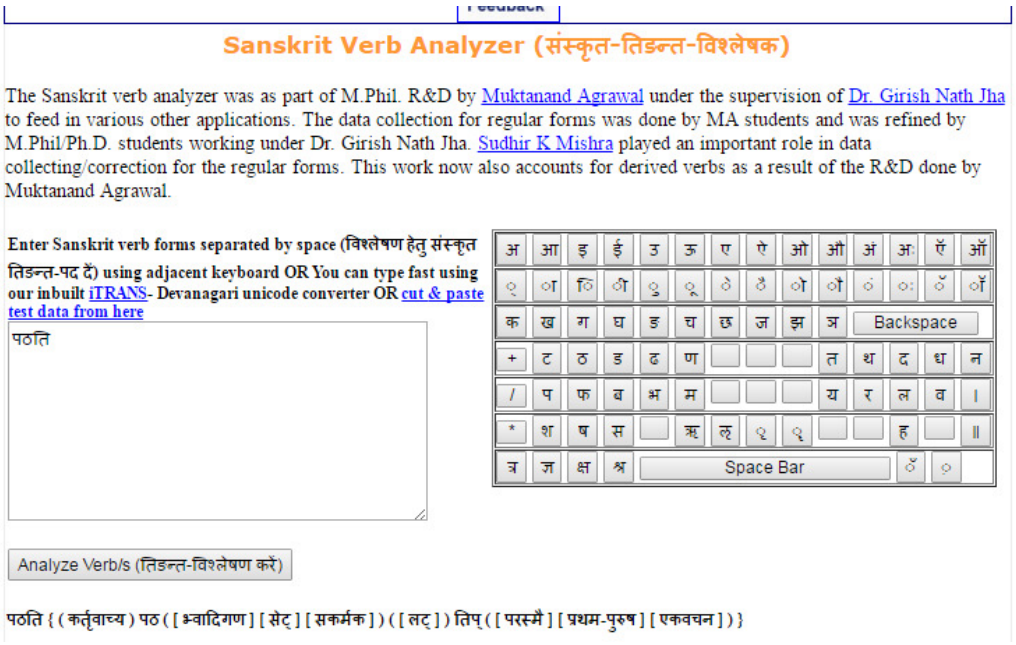


Fig. 1 Verb analysis output for '*paṭhati*'.

But when *pipaṭhiṣati* is the input, we don't get it's morph analysis. Fig 2 shows the same.

[94] http://sanskrit.jnu.ac.in/tanalyzer/tanalyze.jsp

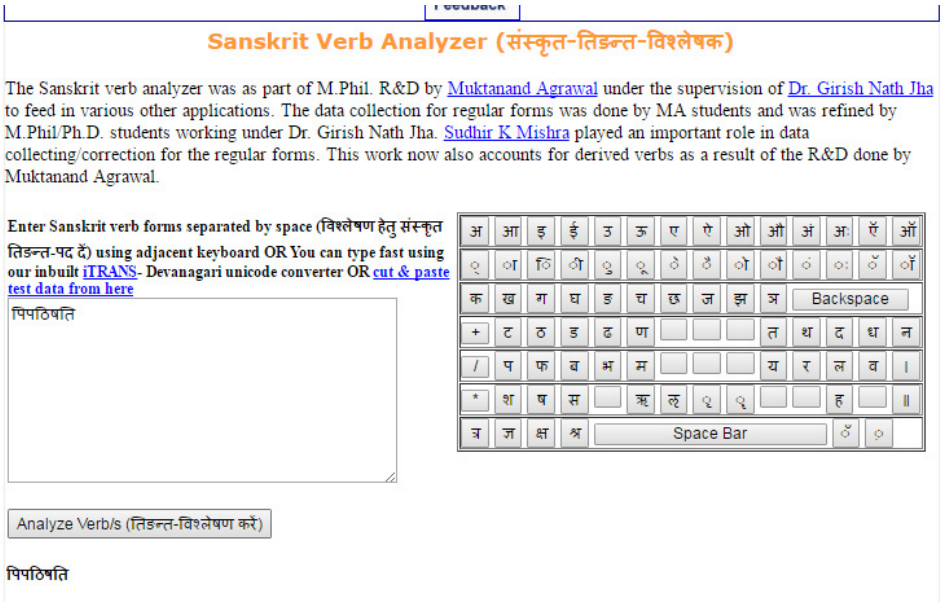


Fig. 2 Verb analysis output of '*pipaṭhiṣati'*.

This is understandable that the rule based system is not getting verbal base '*paṭha*' in 'pipaṭhiṣati'. So the tool has its limitation in analyzing the derived (secondary) verbal forms of Sanskrit. Keeping this technical difficulty in mind, we need to provide morphological analysis of each Sanskrit verb forms in verb database manually.

3.1.3 Handling of prefix-root combinations in Sanskrit:

In Sanskrit, verb has two main components: root and suffix. Apart from that, prefixes also get added to the verbs. Sometimes it changes the meaning of the verb, sometimes it doesn't. This has been discussed in Sanskrit grammatical tradition in details. In 'Nirukta[95]'- chapter-1, *'upasarganirūpaṇam'* deals abaut '*upasarga'* (prefix). While discussing the different views of the Sanskrit Grammarians, it says:

'*na nirbaddhā upasargā arthānnityāhuriti śākaṭāyanaḥ'. upasargā praparādayaḥ nirbaddhā niṣkṛṣya nāmākhyātamadhyāt baddhāḥ padavākyarūpeṇa viracitāḥ santo nārthānnirāhuriti śākaṭāyana (ācāryo manyate iti śeṣaḥ).* And'*nāmākhyātayostu karmopasaṃyogadyotakā bhavati'. nāmākhyātayorartha upasargasaṃyoge sati vyajyate. nāmākhyātaviyoge teṣāmarthābhidhāna-śaktirnāstīti bhāvaḥ ayamupasargāṇā dyotakatvapakṣaḥ*.

[95] nirukta pañcādhyāyī, meharacanda lachamanadāsa pablikeśansa naī dillī, reprint-2012.

Here, in Śākaṭāyana's view, *upasargas* (prefixes) are separate from *nāma* (nominal word) and *ākhyāta* (verb) and they don't have their own meaning, but they combine with the *ākhyāta* (verb) and indicates the special meaning of the *ākhyāta* (verb).

The next view is of Gārgya:

'*uccāvacāḥ padārthā bhavantīti gārgyaḥ'. uccāvacāḥ- bahuprakārāḥ padārthāmarthāḥ padārthāḥ bhavanti viyuktānāmapi nāmākhyātābhyāmiti gārgya ācāryo manyata iti śeṣaḥ.* And *'tad ya eṣu padārtheḥ prāhurime taṃ nāmākhyātayorarthavikaraṇam'. ya eṣūpasargeṣu svo'nekaprakāro'rthaḥ prāhureva tamime upasargāḥ pṛthagapi santaḥ nāmākhyāta-yorarthavikaraṇam arthavikriyāmityarthaḥ. tasmādarthavantaḥ upasargā iti vācakatvapakṣaḥ.*

According to Gārgya, the *upasarga*s (prefixes) are of different meanings and they have their own independent meanings as well. Then the independent meaning of each *upasarga* (prefix) has been discussed there which may be presented here:

'*ā ityarvāgarthe' , tadyathā –'ā parvatāt iti'*. The *upasarga* (prefixes) '*ā*' is used in the sense of '*arvāk*'. Monier Williams Sanskrit-English Dictionary gives the meaning of *arvāk* as: *-Arvāk*, ind. (with abl.) hitherward; on this side; from a certain point; before, after; on the lower side of, behind, downwards; (with loc.) within; near[96]. So the meaning of '*ā parvatāt*' is 'on this side of hill'.

'*praparetyetasya prātilomyam', 'praparā ityetāvupasargāvetasyaivāṅo arthasya prātilomyamāhatuḥ', (yathā- pragataḥ, parāgataḥ).*

The prefixes '*pra*' and '*parā*' have opposite meaning of '*ā*' prefix. Example- *pragataḥ, parāgataḥ* (went away or far from the distance).

'*abhītyābhimukhyam', 'abhigataḥ';* abhi is used in the sense of *'ābhimukhyam'* (in front of). Example- *abhigataḥ tvām* (Came in front of you).

pratītyetasya prātilomyam (*prati iti etasya arthāt abheḥ prātilomyam*) ['*prati*' is used in the opposite sense of prefix '*abhi*'. Example- *pratigataḥ* (came back)].

'*ati su ityabhipūjitārthe', 'ati su ityetāvabhipūjitārthe vartate'. yathā- atidhanaḥ, subrāhmaṇaḥ.* ['*ati*' and '*su*' prefixes are used in the sense of respect/worshiping. Example- *atidhanaḥ* = very rich, *subrāhmaṇaḥ* = good Brahman].

[96] http://www.sanskrit-lexicon.uni-koeln.de/scans/MW72Scan/2014/web/webtc/indexcaller.php accessed on 1st April, 2016 at 4:00 PM.

'*nirdurityetayoḥ prātilomyam nirdhanaḥ durbrāhmaṇaḥ iti'* ['*nir*' and '*dur*' prefixes are used in the opposite sense of the prefixes '*ati*' and '*su*'. Ex- '*nirdhanaḥ*', *durbrāhmaṇa*].

'*nyaveti vinigrahārthīyau nigṛhṇāti avagṛhṇāti niyantrayatītyarthaḥ'* ['*ni*' and '*ava*' is used in the sense of 'control'. For example- *'nigṛhṇāti', 'avagṛhṇāti'*].

'*udityetayoḥ prātilomyam uditi etayoḥ dvayoḥ prātilomyamāha udgṛhṇātīti utthāpayatītyarthaḥ'* ['*ud*' prefix is used in the opposite sense of '*ni*' and '*ava*' prefixes. Ex- '*udgṛhṇāti*'].

'*samityekībhāvam saṃgṛhṇātīti saṃgrahaṃ karotītyarthaḥ'* ['*sam*' is used in the sense of 'collection'. Ex- s*aṃgṛhṇāti* = collects].

'*vyapetetasya prātilomyam vigṛhṇāti apagṛhṇāti pṛthakkarotītyarthaḥ'* ['*vi*' and '*apa*' prefixes are used in the opposite sense of '*sam*' prefix. Ex- *vigṛhṇāti, apagṛhṇāti* = disject].

'*anviti sādṛśyāparabhāvam anurūpamasyedamiti sādṛśyam anugacchatītyaparabhāvaḥ'* ['*anu*' prefix is used in the sense of similarity and following. Ex- *anurupam* = similar, *anugamanam*= following].

'*apīti saṃsargam sarpiṣo'pi syāt madhuno'pi syāt'* ['*api*' is used in the sense of 'also'. Ex- *madhuno'pi* = honey also].

'*upetyupajanam upajāyate upajanamādhikyam adhikaṃ bhavati ityarthaḥ'* ['*upa*' prefix is used in the sense of 'much/more' (*ādhikya*). Ex- *upajāyate*= becomes more].

'*pari iti sarvatobhāvaḥ paridhāvati iti sarvato dhāvati iti arthaḥ'* ['*pari*' is used in the sense of '*everywhere*', ex- *paridhāvati* = runs everywhere].

'*adhi iti uparibhāvam aiśvaryaṃ vā adhitiṣṭhati lokam adhipatiḥ iti adhyakṣaḥ ityarthaḥ'* ['*adhi*' prefix is used in the sense of above or God/owner. Ex- *adhitiṣṭhati lokam* = stays above the world, *adhipatiḥ* = God / owner].

These are the prefixes used in Sanskrit and are used to convey different meaning in different context. Prefixes can combine with the roots in three ways:

- 1 prefix + root (*prabhavati= pra* + root *bhū*),
- 2 prefixes + root (*samadhigacchati= sam* + *adhi* + root *gam*),
- Multiple prefixes + root (*pravyāharati= pra+ vi* + *āṄ* +root *hṛ*).

In addition of the prefix and the root, the ending letter of prefix and the beginning letter of the root matters a lot in morphophonemic changes.

Depending on the beginning of the roots, the roots are of two types: *ajādi* and *halādi* i.e.

- Roots beginning with vowel (*ajādi*): *arc* etc
- Roots beginning with consonant (*halādi*): *dhṛ* etc.

Depending on the endings of the prefixes (*upasarga*), prefixes are of two types:

- *ajantāḥ - pra, parā, apa, anu, ava, vi, āṅ (ā), ni, adhi, api, ati, su, abhi, prati, pari, upa*,
- *halantāḥ- sam, nis, nir, dus, dur, ut*

When *sandhi* (morphophonemic changes) takes place, the meaning gets changed as it is said in the grammatical tradition: *'upasargeṇa dhātvartho balādanyatra nīyate'*.

Further three types of change have been noticed as it is said:

"*dhātvarthaṃ bādhate kaścit kaścittamanuvartate*
tameva viśiniṣṭyanyat upasargagatistridhā"

- *dhātvarthaṃ bādhate kaścit* (sometimes opposite sense is expressed) - *upacayaḥ, (vṛddhiḥ) apacayaḥ (kṣayaḥ)*
- *dhātvartham anuvartate kaścit* (sometime same meaning is expressed)– *sūte, prasūte*
- *dhātvarthaṃ viśiniṣṭyanyat* (sometimes completely different meaning is being expressed) - *sarati, anusarati*

Further it is noticed that the same prefix has different meanings as well.

pra etc prefixes are used in the following context:

1. pra

Prefix '*pra*' is used in expressing *ādikarma, udīrṇa, bhṛśārtha, aishvarya, sambhava, viyoga, niyoga, tṛpti, śuddhi, icchā, śakti, śānti, pūjā, agra, darshana*.

Example:

- *ādikarmaṇi- pragataḥ prabalo rājā*
- *udīrṇe- prabalā mūṣikā*
- *bhṛshārthe- pravadanti dāyādāḥ*
- *aishvarye prabhurdevadattaḥ*
- *saṁbhave himavato gaṁgā prabhavati*
- *viyoge preṣitaḥ niyoge prayuktaḥ*

- *tṛptau prabhuktam annam*
- *śuddhau prasannamudakam icchāyām prārthayate kanyām*
- *śaktau prashakto dyāyām*
- *śāntau praśāṁto agniḥ*
- *pūjāyām prāṁjali sthitaḥ*
- *agre pravālo vṛkṣasya*
- *darshane pralokayati kanyām*

2. *parā*

Prefix 'parā' is used in the sense of following expressions: *vadha, marṣaṇa, gati, vikrama, ābhimukhya, bhṛshārtha, aprādhānya, vimokṣa, prātilomya.*

- *vadhe- parāghātaḥ*
- *marṣaṇe - parāmṛṣū*
- *gatau - parāgataḥ*
- *vikrame - parākrāntaḥ*
- *abhimukhye - parāvṛttaḥ*
- *bhṛshārthe- parājitaḥ*
- *apradhāne - parādhīnaḥ*
- *vimokṣe - parākṣataḥ*
- *prātilomye - parāṁmukhaḥ*

3. *apa*

Prefix '*apa*' is used in the following expression: *varjana, viyoga, caurya, harṣa, nirddesha, vikṛti, vāraṇa, viparyaya.*

- *varjane - apasāṁkāshyādṛṣṭo devaḥ*
- *viyoge - apayāti*
- *caurye - apaharati*
- *nirddeshe - apadishati*
- *vikṛtau - apakṛtam*
- *vāraṇa - apasarati*
- *viparyaye - apashabdaḥ*

4. *sam*

Prefix '*sam*' is used in the following expression: *yoga, aikya, prabhava, satya, samaṁtatobhāva, vibhūṣaṇa, ābhimukhya, śleṣa, siddhi, krodha, svīkaraṇa.*

- *yoge - saṁgataḥ putreṇa*
- *viyoge - saṁviyuktaḥ priyeṇa*
- *aikye - sampravadanti mukhyāḥ*
- *prabhave - sambhavati agniḥ kāṣṭhaiḥ*
- *satya - samvādaḥ*
- *samakṣe - saṁkathā vartate*
- *samaṁtatābhāve - saṁkīrṇaḥ*
- *bhūṣaṇe - saṁskṛtā kanyā*
- *abhimukhye - saṁmukham vartate*
- *śleṣe - samdhate kāryam*
- *siddhau - samsiddhiḥ*
- *krodhe - saṁkṛddhaḥ*
- *svīkaraṇe - saṁgṛhṇāti*

5. *anu*

Prefix '*anu*' is used in expressing following context: *pashcādbhāva, adhiṣṭhāna, sāmīpya, svādhyāya, anubaṁdha, visarga, sādṛshya, ābhimukhya, lakṣaṇa, hīna*.

- *pashcādbhāve- anuratham padātayaḥ*
- *adhiṣṭhāne- anuṣṭhānam pāṭaliputram*
- *sāmīpye - amumegham gaganam*
- *svādhyāye - vyākaraṇamanuvadati*
- *anubandhe - anushayaḥ*
- *visarge - anujñāto gacchati*
- *sādṛshye - anukṛtiḥ*
- *ābhimukhye - anuvatso mātaram dhāvati*
- *lakṣaṇe - anuvanamasau nirgataḥ*
- *hīne - anvarjanam yoddhāraḥ*

6. *ava*

Prefix '*ava*' is used in the following sense: *vijñāna, avalambana, shuddhi, īṣadartha, vyāpti, paribhava, viyoga.*

- *vijñāne- avagato arthaḥ*

- *avalambane - avaṣṭabhya yaṣṭim gacchati*
- *shuddhau - avadāttam mukham*
- *īṣadarthe - avabhuktam*
- *vyāptau - avakīrṇam pāṁśubhiḥ*
- *paribhave- avahasati*
- *viyoge - avamuktā kāntā*

7. *nir*

Prefix '*nir*' is used in the following sense: *viyoga, bhṛśārtha, pāpa, atyaya, avadhāraṇa, ādesha, atikrama, lābha.*

- *viyoge - niḥshalyam*
- *bhṛśārthe - nirnītaḥ*
- *pāpe - nirmaryādaḥ*
- *atyaye - nirdādham gamanam*
- *avadhāraṇe - nishcitaḥ*
- *ādeshe - nirdiṣṭaḥ*
- *atikrame - niṣkrāntaḥ*
- *lābhe - nirviśeṣaḥ*

8. *dur*

Prefix '*dur*' is used in the sense of following expression: *īṣadartha, kutsana, vaivarṇya, asampatti, alābha.*

- *īṣadarthe - durgṛhītaḥ*
- *Kutsane - durbalaḥ*
- *vaivarṇye - durvarṇaḥ*
- *asampattau - durgataḥ*
- *alābhe - duṣprāpyaḥ*

9. *vi*:

Prefix '*vi*' is used in expressing the following condition:
nānārtha, viyoga, atishaya, bhaya, dūrārtha, bhṛshārtha, kalaha, aishvarya, moha, paiśūnya, utkarṣa, kutsana, īṣadartha, anābhimukhya, anavasthāna, aprādhānya, darshana, shaurya.

- *nānārthe - vicitrā kṛtiḥ pāṇineḥ*

- *viyoge - viyuktaḥ*
- *atishaye - vikīrṇaḥ*
- *bhaye - vibhīṣaṇaḥ*
- *īṣadarthe - viprakṛṣṭamadhvānam*
- *bhṛshārthe - visuddhā nadī*
- *kalahe - vibhajya dhanam*
- *aishvarye - vibhurdevadattasya*
- *mohe - vimanaskaḥ*
- *paiśūnye - vikaraḥ*
- *utkarṣe - vismito devadattaḥ*
- *kutsane - virupaḥ*
- *īṣadarthe -vilopitaḥ*
- *anābhimukhye - vimukhaḥ*
- *anavasthāne - vibhrāntaḥ*
- *apradhānye - viniṣṭaḥ*
- *darśane - vilokanīyā kanyā*
- *śaurye -vikrāntaḥ*

10. āṅ-

Prefix '*āṅ*' is used to express the following conditions:

prāpti, icchā, bandhana, bhaya, vākya, śleṣa, abhividhi, sādhya, kṛcchra, ādikarma, grahaṇa, nilaya, sāmīpya, vikriyā, nimantraṇa, nivṛtti, āshīḥ, ādānā, antarbhāva, spardhā, ābhimukhya, ūrdhvakarma, vismaya, pratiṣṭhā, nirddesha, shakti, maryādā:

- *prāptau - āsāditamanena*
- *icchāyām - ākānkṣati*
- *bandhane - āmuñcati kavacam*
- *bhaye - ākampitaḥ*
- *vākye - jñāpayati*
- *abhividhau - ākṛmāram yasha pāṇineḥ*
- *śleśe - ālingayati*
- *sādhye - ācarati kapaṭena*

- *kṛcchre - āpadgataḥ*
- *ādikarmaṇi - ārabhate kartum*
- *grahaṇe - ālaṁbate*
- *nilaye - āvasatham*
- *sāmīpye - āsannam kalyāṇam*
- *vikriyāyām - āsvādayati*
- *nimantraṇe - āmantraṇam*
- *nivṛttau - āramate*
- *āśiṣi - āśāste*
- *ādāne - rasāyanam*
- *antarbhāve - āpītamudakam sikatābhiḥ*
- *spardhāyām - mallo mallamāhvayati*
- *ābhimukhye - āgacchati devadattaḥ*
- *urdhvakarmaṇi - ārohati hastipakaḥ*
- *vismaye - ānanditāḥ*
- *pratiṣṭhāyām - āspadam*
- *nirdeshe - ādishati*
- *shaktau - ākramate gaganam candramāḥ*
- *maryādāyām - āilāvardhanātsampannaḥ shālayaḥ*

11. *ni-*

Prefix '*ni*' is used in the following conditions: *nivesha, rāshi, bhṛshārtha, adhobhāva, nivāsa, dārakarma, darshana, uparama, bandhana, kaushalya, antarbhāva, sāmīpya, mokṣa, āshraya*.

- niveshe - niveshitam
- rāshau - nikaro dhānyasya
- bhṛshārthe - nigṛhītaḥ
- adhobhāve - nipatitaḥ
- nivāse - nivasito naram
- dārakarmaṇi - niviṣṭo devadattaḥ
- darshane - nishāmayati rupam

- uparame - nivṛtaḥ
- bandhane - niyamitaḥ
- kaushalye - nipuṇaḥ
- antarbhāve - nipītamudakam sikatābhiḥ
- sāmīpye - nikṛṣṭakālaḥ
- mokṣe - nisṛṣṭaḥ
- āshraye - nilayaḥ

12. *adhi*

Prefix '*adhi*' is used in the following expression: *vaśīkaraṇa, adhiṣṭhāna, adhyayana, aishvarya, smaraṇa, adhika.*

- *vaśīkaraṇe - adhikaroti arthī*
- *adhiśṭhāne - adhiguṇaḥ*
- *adhyayane - adhīte vyākaraṇam*
- *aiśvarye - adhipatiḥ*
- *smaraṇe - kṣetramadhismarati*
- *ādhikye - adhikṣetre rājñaḥ*

13. *api-*

Prefix '*api*' is used in the following sense: *sambhāvana, nivṛtti, apekṣā, samuccaya, sambhava, garhā, āshīḥ, amarṣaṇa, prashna.*

- *sambhāvane - api sincenmūlasahasram*
- *nivṛttau - māṁsamapi juhyāt*
- *apekṣāyām - athāyamapi vidvān*
- *samuccaye - tvahamapi ayamapi*
- *sambhave - api sambhavati ahiḥ stuhiṣu*
- *garhāyām - api vṛṣalam yācayet*
- *āśiṣi - api varṣam śatam jīyāḥ*
- *amarṣaṇe - api bhajanna namet*
- *bhūṣaṇe - api nahvati hāram*
- *prashne - api gacchati*

14. *ati*

Prefix '*ati*' is used in the following sense: *atishaya, bhṛshārtha, atikrānti, atikramaṇa, vṛddhi*.

- *atishayo - atimānuṣam yasya vijñānam*
- *bhṛshārthe - atitaptā āyaḥ*
- *atikrāntau - atirathim*
- *atikramaṇe - hastinātikramati*
- *vṛddhau - atimegham gaganam*

15. *su*

Prefix '*su*' is used in the following sense: *pūjā, bhṛśārtha, anumati, samṛddhi, praśaṁsā, kṛcchra*

- *pūjāyām- susādhuḥ*
- *bhṛshārthe - sutaptā āyaḥ*
- *anumatau - sukṛtam*
- *samṛddhau - sumudram*
- *praśaṁsāyāṁ - sukṛṣim*
- *kṛcchre - suduṣkaraḥ*

16. *ut*

Prefix '*ut*' is used in the following sense: *prābalya, viyoga, ūrdhvakarma, lābha, prakāsha, asvastha, mokṣa, abhāva, bandhana, prādhānya, śakti.*

- *prābalye - udvilasatsarpaḥ*
- *viyoge - utpathena gacchati*
- *urdhvakarmaṇi - uttiṣṭhati shayanāt*
- *lābhe - utpannam dravyam*
- *prakāshe - uccaranti nabhasi meghāḥ*
- *asvasthe - utsukaḥ*
- *mokṣe - udvāsaḥ*
- *abhāve - utpathaḥ*
- *bandhane - udbaddhā kanyā*
- *prādhānye - utkṛṣṭaḥ*
- *shaktau - utsāhaḥ*

17. **abhi**:

Prefix '*abhi*' is used to express the following sense*: pūjā, ābhimukhya, bhṛshārtha, sādṛshya, prayoga, vyāpti, nṛtta, sārupya, vacana, ādāna, āmnāya*

- *pūjāyām - abhivādayati*
- *ābhimukhye - abhimukham sthitaḥ*
- *bhṛśārthe - abhirataḥ*
- *sādṛśye - abhijñātaḥ*
- *prayoge - abhijānāti*
- *icchāyām - abhilaṣati*
- *vyāptau - abhisyandaḥ*
- *nṛtte - abhinayaḥ*
- *sārupye - abhirupaḥ*
- *vacane - abhivacanam*
- *ādāne - abhyavaharati*
- *āmnāye - abhyasyati*

18. *prati*

Prefix '*prati*' is used in the sense of: *sādṛshya, ādāna, hiṁsā, tadyoga, vinimaya, pratinidhi, nivṛtti, vyādhi, ābhimukhya, vyāpti, vāraṇa.*

- *sādṛshye - pratikṛtam devadattena*
- *ādāne - pratigṛhṇāti*
- *hiṁsāyām - pratiharati*
- *tadyoge - pratipannamanena*
- *vinimayo - tolanaghṛtam pratidadāti*
- *pratinidhau - praticchandaḥ*
- *nivṛttau - pratikrāntaḥ*
- *vyādhau - pratishyāyaḥ*
- *abhimukhye - pratisūrye gacchati*
- *vyāptau - pratikīrṇam pāṁśubhiḥ*
- *vāraṇe - pratinivṛttaḥ*

19. *pari*

Prefix '*pari*' is used in the following sense: *samantatobhāva, vyāpti, doṣākhyāna, uparama, bhūṣaṇa, pūjā, varjana, āliṁgana, nivasana, vyādhi, shoka, vīpsā*

- *samantatobhāve - parikramati*
- *vyāptau - parigato aginā grāmaḥ*
- *doṣākhyāne - paribhramati*
- *uparame -paripūrṇaḥ kumbhaḥ*
- *bhūṣaṇe - pariṣkaroti kanyām*
- *pūjāyām - paricaryā*
- *varjane - paritrigartebhyāvṛṣṭo devadevaḥ*
- *āliṁgane - pariṣvajate kanyām*
- *nivasano- paridhānam*
- *vyādhau - parigatā sphoṭakāḥ*
- *shoke - paridevanā*
- *vīpsāyām - vṛkṣam vṛkṣam parisiñcati*

20. upa-

Prefix '*upa*' is used to express the following meaning: *sāmīpya, sāmarthya, vyāpti, ācāryakaraṇa, doṣākhyāna, dāna, dākṣiṇya, vīpsā, ārambha, pūjā, tadyoga, pratyaya, sharaṇa*

- *sāmīpye - upakuntam*
- *sāmarthye - upakaroti devadattaḥ*
- *vyāptau - upakīrṇam pāṁshubhiḥ*
- *ācāryakaraṇe - upadishati śiṣyebhyaḥ*
- *doṣākhyāne - upaghātaḥ*
- *dāne - upaharatyartham devadattāyāḥ*
- *dākṣiṇye - upacāraḥ*
- *vīpsāyām - upayācate*
- *ārambhe - upakramate bhoktum*
- *pūjāyām - upāsitaḥ*
- *tadyoge - upapannam dhyānamāha*
- *pratyaye - upapannam dhanam*
- *śaraṇe - upagato devadattaḥ*
- *pratyaye - upasargadharmaḥ*

So the Sanskrit prefixes are used in expressing multiple contextual meanings and thus prefix-root combination in Sanskrit verb mapping is becoming a challenge for verbal database creation. In this condition, such prefix-verb combinations should be considered as a separate verbal base with certain meaning.

3.1.4 Prefix-prefix combinations and possible verb forms:

The combinations of different suffixes have been noticed in the book titled Upasargārthachandrika[97]. Based on that work, more than 200 combinations of prefixes have been listed in a tiñant generator tool which is available online[98]. Along with those prefix combinations, one can make n-number of verbs by adding Sanskrit root to those prefix combinations. The following list shows the use of the multiple prefixes in the Sanskrit verbs:

ati	*atisarjanam, atipadyeta, atiṣkandati, atikrāmati,*
Atinis	*atinirhāriṇibhiḥ,*
atipra	*atiprayāti, atipṛccati,*
ativi	*ativiśinaṣṭi, ativicarati,*
ativyā	*ativyākaroti, ativyākriyate*
atisam	*atisaṃskaroti, atisaṃskriyate,*
Atyati	*atyatiyāti, atyaticalati,*
atyabhi	*atyabhinandati, atyabhinananda,*
atyā	*atyādriyate, atyādriyete,*
atyud	*atyudbhavati, atyudgaccati,*
atyupa	*atyupakaroti, atyupakriyate,*
adhi	*adhikurute, adhikurvāte,*
Adhini	*adhiniyamayati, adhinimimīte,*
adhinis	*adhinissarati, adhinimajyate,*
Adhivi	*adhiviceṣṭate, adhivikurute,*
adhyava	*adhyavasyati, adhyavasyataḥ,*
adhyā	*adhyāsayati, adhyāsayataḥ,*
adhyupa	*adhyupayāti, adhyupayātaḥ,*
anu	*anugaccati, anucarati,*

[97] Charudeva Shastri,
[98] http://www.sanskritworld.in/sanskrittool/SanskritVerb/tiGanta.html accessed on 19th April 2016 at 3:45 AM.

anuni	*anuniśāmyati, anunibhālayati, anuniviśate,*
anunis	*anuniścalati, anuniṣkaroti, anuścalati, ,*
anuparā	*anuparābhavati, anuparājayate,*
Anupari	*anuparicinoti, anuparicāyayati,*
anuparyā	*anuparyāgaccati, anuparyāharati, anuparyagāt,*
anupra	*anuprayaccati, anuprayāti,*
anuprati	*anupratikaroti, anupratigaccati,*
anuvi	*anuvibhāvayati, anuvicārayati,*
anuvyava	*anuvyavadhatte, anuvyavadhatse,*
anuvyā	*anuvyāharati, anuvyāharataḥ*
anusam	*anusambhavati, anusañcārayati,*
anusampra	*anusampravadate, anusampravadante*
anūd	*anūdbhavati, anūdbhavataḥ*
anvapa	*anvapakaroti, anvapakurutaḥ*
Anvava	*anvavalambate, anvavalambete, ,*
anvā	*anvāgaccati, anvāyāhi,*
apa	*apavadati, apavadate,*
Apani	*apanimīyate, apanihāryate, apanimajjati,*
apanis	*apaniścalati, ,*
apaparā	*apaparābhavati,*
apaparyā	*apaparyāgaccati,*
apapra	*Apapraharati*
apavyā	*apavyākaroti,*
apā	*apākaroti,*
Apāti	*apātīyate,*
api	*apiyāti, apiyāhi, apinayati,*
apipari	*apiparicarati, apipariharati,*
apod	*Apoddharati*
apyati	*, apyatikaroti,*
abhi	*abhinayati, abhimantrayati, abhimanyate,*
abhini	*abhinicunute,*
abhinis	*abhinistanati, ,*

abhiparā	*abhiparābhavati,*
abhipari	*abhipariṇayati,*
abhiparyā	*abhiparyāgaccati,*
abhipra	*abhipraharati,*
abhivi	*abhivicārayati,*
abhivyā	*abhivyāharati, ,*
abhisamā	*abhisamāharati,*
abhisam	*abhisambhavati, abhisañcarati,*
abhyati	*, abhyatikrāmati,*
abhyadhi	*abhyadhikaroti,*
abhyanu	*abhyanuminoti,*
abhyapa	*abhyapakaroti,*
abhyava	*abhyavaharati,*
abhyā	*abhyācarati, abhyāharati, abhyāharataḥ,*
abhyudā	*abhyudāharati,*
abhyud	*abhyuddharati,*
abhyupa	*abhyupagaccati, abhyupagamyate,*
abhyupā	*abhupānahyati,*
Abhyupāva	*Abhyupāvagaccati*
Ava	*avaśinaṣṭi, avabudhyati, avagaccati,*
Avani	*avaścayati,*
avā	*avānīyate,*
ā	*ānayati, āharati, āyāti, āyāhi,*
Utpra	*utprabhavati, utpravahati, utprakaroti, utpraharati,*
Udava	*udavanayati, udavamanyate,*
udā	*udāharati, udānayati,*
ud	*uddharati, udbharati, uddharati, udgaccati,*
udvi	*udvicalati, udvilasanti,*
unni	*unnimajjati, unnimīlayati,*
upa	*upakaroti, upanayati, upāhvayate,*
upani	*upanidhīyate, upanimīlate, ,*
upanis	*upaniścalati, upaniścālayati,*

upanyā	*upanyācalati, upanyāharati,*
upapari	*upaparicayati, uapapariharati,*
upaparyā	*upaparyāharati, upaparyānayati,*
upapra	*upapraharati, upapracarati,*
upavi	*upavivadati, upavivādayati,*
upavyā	*upavyahanti, upavyaghnataḥ,*
upasamni	*upasannipatati, upasannidadhāti,*
upasamā	*upasamāharati, upasamācaṣṭe,*
upasam	*upasambhavati, upasannayati,*
upā	*upānayati, ,*
upāti	*upātikaroti, apātikrāmati,*
upāva	*upāvaharati, upāvagaccati,*
upodā	*upodāharati, upodāharataḥ,*
upod	*upodghātayati,*
upopa	*upopamīyate,*
duḥsam	*duḥsambhavati,*
duranu	*duranubhavati, duranuminoti,*
durava	*duravagaccati, duravabudhyati*
durā	*durāgṛhṇāti, durācarati, durācarati,*
durud	*duruddharati, duruccarate,*
durupa	*durupayujyati, durupayujyate, durupayunakti,*
durni	*durnihārayati, durnimīlate,*
duṣpari	*duṣparibhavati, duṣparicayati, ,*
duṣpra	*duṣprabhavati, duṣkaroti, duṣprabhāvayati*
dus	*duṣkaroti, duṣcalati*
ni	*nimīlate, nimajjati, nicīyate*
nipra	*niprakarṣati*
nirati	*niratikrāmati, niratīyate,*
niradhi	*naradhikaroti, niradhimanyate,*
niranu	*niranunaśyati, ,*
nirapa	*nirapakaroti, nirapaharati*
nirabhi	*nirabhimanyate, nirabhibhavati*

nirava	*niravatiṣṭhate, niravacinatti*
nirupā	*nirupādhīyate, nirupādīyate*
nirvi	*nirvikaroti, nirviharati, nirvivadate*
nivyā	*nivyākaroti, nivyāhanti*
niṣpra	*niṣprabhavati, niṣpraharati,*
nis	*niścalati, niścayati, niścinute,*
nyā	*nyādarśayati, nyānayati, nyācarati,*
parā	*parājayate, parābhavati,*
pari	*paribhavati, pariṇayati,*
parini	*parinimajjati,*
parinis	*pariniṣkaṣati,*
paripra	*paripraharati, paripraharataḥ*
parivi	*, parivicārayati, parivinaśyati, ,*
parivyā	*parivyāharati, parivyākaroti*
parisam	*parisañcarati, parisammānayati*
paryadhi	*paryadhigaccati, paryadhyavasyati*
paryanu	*paryanubhavati, paryanubhāvayati*
paryava	*parvagaccati, parvavagaccataḥ*
paryā	*paryāharati, paryānayati,*
paryud	*paryudgaccati, paryudbhavati*
paryupa	*paryupakaroti, paryupamimīte,*
pra	*prasiddhaḥ, prasiddhyati, prayāti, prabhavati,*
prati	*pratitiṣṭhati, pratikaroti,*
pratini	*pratinidhīyate, pratimīyate,*
pratinis	*pratinistanati,*
pratiparā	*pratiparākramate,*
pratipari	*pratipraricinoti, pratiparicinute,*
pratipra	*pratipraharati, pratiprahārayati*
prativi	*prativiśinaṣṭi, prativiharati, prativicārayati, , ,*
prativyā	*prativyāhanti, prativyāhataḥ,*
pratisam	*pratisambhavati, pratisañcarati, pratisaṃskaroti, ,*
pratyadhi	*pratyadhikurute, pratyadhikurvāte,*

pratyanu	*pratyanubhavati, pratyanumimīte, ,*
pratyapa	*pratyapakaroti, pratyapasarati,*
pratyapi	*pratyapigṛhṇāti, pratyapibhavati,*
pratyabhi	*pratyabhimanyate, pratyabhimanyete*
pratyava	*pratyavabhāsate, ,*
pratyā	*pratyākhyāti, pratyāharati, pratyānayati*
pratyudā	*pratyudāharati, pratyudyaccate,*
pratyud	*pratyudgaccati, pratyudbhavati*
pratyupa	*pratyupakaroti, pratyutpadyate,*
pratyupā	*pratyupāharati, pratyupānayati*
pravi	*pravibhanakti, pravinayati, pravibhajate, pravibhajete,*
pravyā	*pravyāharati, pravyāharataḥ,*
prasam	*prasannayati, prasannnaumi,*
prā	*prāramati, prārabhate,*
prādhi	*prādhikaroti, prādhikurutaḥ,*
prod	*proddharati, proddharataḥ,*
vi	*virājate, viśinaṣṭi, vijayate, vibhāvayati,*
vini	*vinimimīte, vimimāte,*
vinis	*viniścayati, viniścayataḥ,*
viparā	*viparājayate, ,*
vipari	*vipariyāti, viparisarati, vipariṇayati,*
viparyā	*viparyāsyati, viparyāsyataḥ,*
vipra	*vipravadate, vipravadase,*
viprati	*vipratipadyate, vipratipannaḥ,*
visam	*visambhavati,*
Vyati	*, vyatigaccati, vyatighnanti,*
vyanu	*vyanuminoti, vyanubhavati,*
vyanvā	*vyanvāharati, vyanvāhanti,*
vyapa	*vyapakaroti, vyapasarati, vyapakārayati, ,*
Vyapā	*vyapādayati, ,*
vyabhi	*vyabhicarati, vyabhicaryate*
vyava	*vyavaharati, vyavacidyate,*

vyā	*vyakaroti, vyakurutaḥ,*
vyud	*vyuccalati, vyudbhavati,*
vyupa	*vyupakaroti, vyupakurutaḥ,*
saṃvi	*saṃvidhatte, saṃvidhehi,*
saṃvyava	*saṃvyavatiṣṭhate, saṃvyavatiṣṭhete*
saṃvyā	*, saṃvyāhanti, saṃvyāhataḥ,*
sanni	*sanniveśayati, sanniveśayataḥ,*
samati	*samatikrāmati, samatikrāmataḥ,*
samadhi	*samadhigaccati, samadhigaccataḥ,*
samanu	*samanubhavati, samanubhāvayati*
samanuvi	*samanuvibhāvayati, samanuvibhāvayataḥ,*
samanvā	*samanvācarati, samanvācarataḥ,*
samapa	*samapasarati, samapamanyate,*
samapi	*samapiyāti, samapivāñcati*
samabhi	*samabhimanyate, samabhyeti*
samabhivyā	*samabhivyāharati, samabhivyāharataḥ*
samabhisam	*samabhisañcarati, samabhisañcinute,*
samabhisampra	*samabhisamprāpnoti, samabhisampravadati,*
samabhyava	*samabhyavaharati, samabhyavagaccati,*
samabhyā	*samabhyāharati, samabhyānayati*
samabhyud	*samabhyudyaccate, samabhyudgāyati,*
samava	*samavaiti, samavanayati, ,*
samavā	*samavākṣipati, samavākṣipyati,*
samā	*samāharati, samācarati,*
samudā	*samudāharati, samudācarati*
samud	*samuccarati, samudbhavati, samuccāyayati*
samupa	*samupaharati, samupanayati, samupakaroti, samupakurutaḥ*
samupā	*samupāharati, samupāharataḥ, samupāhvayate*
sam	*sammimīte, sambhavati, sañcarati,*
samparā	*samparājayate, samparājayete, samparāyāti, samparābhavati*
sampra	*sampravadate, sampravadante*

samprati	*sampratīyate, sampratinīyate,*
samprā	*Samprāharat*
samprod	*sampronnayati, sampronnayataḥ, ,*
sampari	*sampariṣkaroti, sampariṣkurutaḥ,*
su	*susahate, suminoti, subhāṣate, subhāṣete,*
supari	*suparicayati, suparibhāṣate, supariciṇoti, supariciṇutaḥ,*
suvi	*suvicarati, suvinayati, suvicarati, suvicārayati*
susamā	*susamācarati, susamānayati, susamāharati, susamāharataḥ,*
svanu	*svanumantrayati, svanuminoti, svanubhavati,*
svabhi	*svabhinayati, svabhinayataḥ, svabhinandati, svabhinandataḥ,*
svabhyā	*svabhyāharati, svabhyāharataḥ, svabhyāharati,*

3.1.5 **Similar verb forms in different Number and Person:** In *liṭ lakāra*, 1st person singular number, 2nd person plural number and 3rd person singular number of *parasmaipada* have similar verb forms and 1st person singular number, and 3rd person singular number of *ātmanepada* have similar verb forms. It is difficult for a machine to understand the actual meaning of the given verb form unless the agent of the verb is present. Here agent of the action can decide the possible translation of the given verb form.

For example- *babhūva* can be used with three agent because of similar forms. *saḥ babhūva (vaha huā), yūyam babhūva (tum sab hue), aham babhūva (maiñ huā)* are the usage. But when only verb will be the input, tool will be unable to identify the possible agent, and therefore the correct contextual mapping will be a challenging task.

3.2 Issues in Hindi Verb Generation:

In the transfer rules section, in forthcoming chapter, the general rules have been written to generate Hindi verbs forms. Hindi verb generation requires some additional post-script modification because of morpho-phonemic changes during Hindi verb-form generation. Past form generation, future form generation, *mātrā* addition and causative form generations are the issues in the Hindi verb generation.

3.2.1 Past form generation:

It needs some special rules for computational programming. For example- *paḍhatā hai* (present) gets changed into *paḍhā* in past tense. Here it simply taking the Hindi root *paḍh* and adding '*ā*' to get the output *paḍhā.* But '*hotā hai* 'cannot become '*hoā* (*ho* + *ā)*'. Wherever '*ho*' is available in the Hindi verbs, it gets changed as '*hu*' in past. Such as - in '*hotā hai*', past tense form is '*huā* (*hu*+*ā*)'. Same is the case with '*karatā hai*. Here '*karatā hai'* becomes 'kiyā'. So when imperative '*kara*' takes '*ā*', *kara* becomes '*ki* + *ā*'. Further '*ā*' becomes 'y*ā*'. Finally, it becomes *kiyā.* In the same way, verb forms '*letā hai*' and '*detā hai'* have '*le*' and '*de'* forms which takes '*ā*' suffix in past. Here imperative '*le*' and '*de*' becomes *'li'* and '*di'*, and *'ā*' becomes '*yā*'. Finally both forms are '*liyā*' and '*diyā*' in past. In the verbs which have *'ā-ending'* in their imperative forms, their *'ā-ending* gets changed into '*yā*'. For example- *khāyā, gāyā, pāyā, lāyā* etc. Same is the case with the *i*-ending words. For example- *diyā, liyā, kiyā, pīyā* etc. So changing '*ho*' into '*hu*', *kara* into '*ki*', '*ā*' into '*yā*' ('*le*' into '*liyā*', '*de*' into '*diyā*', *kiyā* etc) need to be handled during Hindi Verb form generation in past tense.

3.2.2 Hindi mātrā (symbol) addition:

In *paḍha+ā, 'ā'* should be added as symbol (*mātrā/* '◌ा', i.e. पढ़ + ◌ा = पढ़ा). Same is the case with other Hindi suffixes '*o', 'e', 'egā', 'oge', 'ūṁgā'* etc. There also, *mātrā* (symbol) needs to be attached properly. So, adding proper *mātrā* to the Hindi verbs is also an issue in Hindi Verb generation.

3.2.3 Future form generation:

In Hindi verb generation, '*ho* + *e'* becomes '*hue*' instead of '*hoe*'. In '*ho* + *egā*' the final form should be '*hogā*. Here the rule '*ho+e= hue'* will conflict because the machine will get *o+e* combination, and will lead to incorrect output (i.e. *huegā*). In another example, *khonā* verb, we can find *kho+e = khoe*. This '*kho+e*' will not change into '*khue*'. The rule '*o+e= ue'* will create problems in many such cases. Further, it will not be '*khogā'* like '*hogā*. So we cannot assume that the

Hindi verb formation pattern will be similar in all cases. In this condition, transfer rules will be conflicting.

3.2.4 Causative form generation:

In Hindi causative form generation, a thorough study of Hindi causatives is needed because *'āyā* and '*vāyā*' are two possible additions in this case. Ex- *paḍha + āyā, khul + vāyā* etc. In the two given example, *paḍhāyā* and *paḍhavāyā* both forms are possible, but the verb '*khulanā'* never becomes *khulāyā*. It becomes *khulavāya*. In the same way, '*karatā hai'* becomes '*karawātā hai'*, not '*karātā hai'*. In the present task, correct Hindi causative form generation is a challeng. Causative verbal base is changing, so there, some exceptional rules need to be written for programming purpose.

The above discussed issues will be a challenging task to handle in generating Hindi output.

Chapter 4

COMPARATIVE STUDY OF SANSKRIT-HINDI VERB FORMS

4.1. Introduction:

For a semantically-based grammar, the verb is central because the verb uniquely determines the number of co-occurring nouns and also the nature of their relationship to it (Kapoor, K., 1985:22). In the Indian tradition, the meaning of verb, what the verb stands for, in constrain to the noun, has been the subject of much meaningful discussion. Both the term *ākhyāta* and *dhātu* has been used in Sanskrit literature to mean the verb. In course of time, the term '*dhātu'* got restricted to root, while *ākhyāta*, came to signify the verbal form. … For Yāska, the verb denotes a change in state. It is accepted that while the grammatical words (connectors) perform the purely formal function of relating words in a sentence, the adjectives and adverbs, expend, modify or delimit the indices of the basic proposition. In the basic proposition, only two elements appear- the noun and the verb. Of the two, which is primary? The answer is the verb (Kapoor, K., 1985:23). The sentence is present in its verb just as a whole bunyan tree is present in its seed (Kapoor, K., 1985:25).

The verb is the primary element in the sentence for the following reasons:

- It is always present in a sentence.
- It uniquely determines the number of co-occurring nominals.
- It indirectly determines the number and nature of subsidiary concepts (such as those denoted by adjectives) which may be present in a sentence.
- It directly determines the nature of adverbial modifications, temporal and spatial (Kapoor, K., 1985:26).

A verb is an obligatory constituent of a sentence (Y.Kachru, 2006:139). A sentence can only have a verb-root as well. For example- '*le*' (take) for a second person singular number form. A finite verb, depending on the verb class it belongs to, may take a direct object, or a direct and an indirect object or a complement or a direct object with a complement that refers back to it (Y. Kachru, 2006:139).

4.2. Types of Hindi Verbs:

In Hindi, the verbs are of two types: **Intransitive and Transitive**. The Intransitive verbs have only one obligatory argument, a subject. They indicate event or action. For

example- *khilanā, giranā, jaganā* etc. The intransitive verbs have no object. Transitive verbs have a direct object. For example - *khānā, cakhanā* etc.

There are two transitive categories: complex transitive and double transitive. Complex transitive needs a complement that refers back to the direct object. For example- *mānanā* (to consider X to be Y). The double transitive verb needs a recipient as well. For example- *denā, bhejanā, batānā* etc. The causative and double causative forms are derived from the transitive and intransitive category.

4.3. More verbal categories: Apart from transitive and intransitive classification, the verbs are further classified into following categories: link Verb, light verbs, complex verb, compound verb and conjunct verb.

4.3.1 Link Verb: Apart from transitive and intransitive verbs, there is a category of link verb in Hindi. There are three link verbs - *rahanā, honā* and *bananā*. The linking verb '*honā'* takes adjectival or adverbial complement; *rahanā* takes an adjective, a noun phrase or an adverbial phrase as a complement; *bananā* takes only a noun phrase as a complement.

Ex- *baḍā hotā hai,*
śānti se rahatā hai,
rājā banatā hai, etc.

4.3.2 Complex verb: it is made up of more than one word. This complex verb is divided into compound and complex verbs[99]. **Compound verbs** consist of two verbs and conjunct verbs are made up of nominal followed by a verb. In compound verb, a main verb is followed by a lexical verb which carries the tense, aspect and agreement markers. For example- *vaha ro paḍā, chora sāmāna le gayā,* etc. Here the second verbs are affixed to show aspect-tense-mood and gender number person distinction as a finite verb. These second verbs are also called **light verbs.** The main light verbs are: *ā, jā, le, de, uṭha, baiṭha, paḍa, dāla, rakha, choḍa, māra, nikal, dhamaka, pahunca* etc. Not all light verbs occur with all main verbs[100].

For example-

[99] Kachru, 2006:85
[100] Kachru, Y. , 2006:86

ā → nikala āyā, chalā ā rahā hai,

jā → kamare se nikala gayā, ronā ā gayā, vaha ruka gayī

le → khā le, kara letī hai

de → khānā pakā denā, kapaḍe dho diyā, usakā kāma kara diyā

uṭha →laḍakā ro uṭhā, cīkha gunja uṭhī

baiṭha → hātha jalā baiṭhā, vo laḍa baiṭhā

paḍa → cala paḍā, gira paḍā, ro paḍā

dāla →māra ḍālā, kāma kara dālā

rakha →unako kaha rakhī hai, le rakhī hai, de rakhī hai

choḍa →khetī ke liye jamīna rakha choḍī hai,

māra → kyā bakawāsa likha mārā hai, patthara de mārā,

nikal → sāmane se bhāga nikalā,

dhamaka →ā dhamakā

pahunca →ā pahuncā, jā pahuncā

4.3.3 Conjunct verbs: Conjunct verbs are made up of a nominal followed by a verb. The following words and their forms are present as the verb with nominal: *ho, kara, de, ā, and laga.*

For example-

ho *→ kapaḍe sāfa hue?*

kara *→ meja sāfa karo*

de *→usane sudhāra diyā,*

ā *→ use dayā āī,*

laga *→ ghūmanā acchā lagatā hai.*

4.3.4 Tense, Aspect and Moods: verbal forms agree with the tense aspect and moods.

4.3.4.1 Tense: The tense has been categorized as Past, Present and Future which has the auxiliaries *thā, hai* and *hogā* respectively. The forms of auxiliaries depend upon person, number and gender as well. Ex- *hai, hain, ho, thā, thī, the, hogā, hogī, honge, hovoge* etc.

The categories of aspects and moods are same for all three tenses. The tense auxiliaries only refer the action in that particular time but the aspect and mood shows the manner of the action.

4.3.4.2 Aspects: All the verbs have three aspects: imperfect, perfect and progressive. Imperfect aspect is indicated by *tā/tī/t*e ending of the verbs. The imperfect participle combines with tense auxiliaries to form present imperfect and past imperfect. The imperfect aspect is used to denote habitual actions. For example- *paḍhatā hai.*

The perfect aspect has *ā*-ending in the verb which changes into *–e/ī* according to gender, number and person. The Progressive aspect is indicated by *rahā*- auxiliary which also changes into *–e/ī* according to gender, number and person.

All the verb phrase carry information about mood, aspect, tense, and agreement with the subject or object in number, gender and person (Y Kachru 2006:143).

The other aspects- inceptive, continuative, durative and frequentative are indicated by compound verbs.

Inceptive has the inflected infinitive verb form followed by participle form *lag* and tense auxiliary. For example- *kutte se dar kar bacchā rone lagā.* Inceptive does not have a progressive form.

Continuative has the imperfect participle of the verb followed by continuative auxiliary *rah*. Ex- *seemā din bhar kām kartī rahī hai.* But it does not denote repetitive action. Durative takes the imperfect participle form of the verb followed by durative auxiliary *jā*. It (durative) includes the duration of the process over a period. Ex- *sardī ā rahī hai, din chotā hotā jā rahā hai*. The durative does not denote continuation of the activity in relation to a reference of time, but it does indicate repetitive action.

Frequentative has a perfect participle of the verb followed by frequentative auxiliary *kara*. Ex- *ham cinemā jāyā karate the*. It indicates almost frequent action which shows imperfect participle form followed by tense auxiliary.

4.3.4.3 Moods: The moods, in Hindi, are of six types:

- Imperative (*khā*)
- Optative (*khāe*)
- Indicative (*khātā hai*)
- Presumptive (*khātā hogā*)

- Contingent (*yadi khātā ho to*)
- Past-Contingent (*khātā hotā*)

Imperative is indicated by the root forms of the verbs which are unmarked for gender, number and person. Ex- *khā, jā, paḍha* etc.

Optative is indicated by an inflection on the verb which also informs about the number and person of the subject.

Indicative, presumptive, contingent and past-contingent are indicated by the concatenated participle forms of the verbs with an inflected form of the auxiliaries. These four categories are marked for agreement feature of Gender, Number and Person. In the indicative, interrogative and negative, the verb root or aspectual form is followed by either the present or the past auxiliary. In Presumptive, contingent and past contingent, the verb root or aspectual form is followed by the auxiliaries *hogā, ho*, and *hotā* respectively[101].

4.3.4.4 Auxiliaries:

There are three categories of auxiliaries: Tense Auxiliaries, Aspect Auxiliaries and Modal Auxiliaries.

Tense Auxiliaries: there are three tense auxiliaries: hai, thā and V+gā which follows the agreement features according to the Number Gender and Person of the tense. The *hai* auxiliary has four forms: *hai, ho, hoon* and *hain*. The *thā* auxiliary has also four forms: *thā, thī, the* and *thīn*. The future auxiliary has '*gā*' ending which is added to the roots to form the future form of the verb. In future imperfect and future perfect, '*ho*' is invariable. The future auxiliary forms are *hogā, hogī, honge, hongī, houngā, hovoge*.

Aspect auxiliary:

There are two mail aspectual auxiliaries: Imperfect and Perfect.

Imperfect auxiliary is indicated by *tā/tī/te* suffixes on the verb. It denotes the habitual action or normal process or incomplete action. Perfect auxiliary is indicated by *-ā/-ī/-e* suffixes on the verb. Perfect aspect is used to indicate a complete action without any specific time reference. Progressive aspect has auxiliary *rahā/rahī/rahe*.

[101] Yamuna Kachru:2006, p-146

Modal Auxiliary: The modal auxiliaries in Hindi are: *sakanā, pānā, honā, paḍanā, denā, chukā and chāhiye*. Kachru (2006:83) says that these modal verbs do not occur themselves; they do not take the full range of aspect-tense-mode or gender-number-person affixes; they do not occur in passive or personal voice; they do not have adjectival, adverbial or conjunct participal forms; they do not take clausal or infinitival complements; and semantically they denote ability, necessity, obligation, permission etc.

The modal sakanā takes the full range of aspect-tense and gender-number-person affixes. For example - *turanta ghara jā sako; subaha uṭha sako* etc.

chuknā- it occurs with the root form of the verb and is common with the perfect aspect and past tense. For example - *tuma khā cuke; vaha jā cukā,* etc.

Pānā, honā and paḍanā follows a lexical verb in its root form. For example - *vaha nahi khā pāyi, ab usako jānā hogā, mujhe kahanā paḍegā* etc. The modal verb denā takes a main verb. Example - *jāne diyā.* The modal verb *cāhiye* takes infinitive forms of the main verbs and it does not take any aspect-tense or gender-number, person affixes. It is however used with the auxiliary *thā*. Example - *hame jānā cahiye*; *usako dekhanā cāhiye thā.*

4.3.5 Verbal forms in active, passive and causative:

The active verb occurs in all aspect-tense forms and shows agreement feature of gender number and person. The passive verb is marked by the passive auxiliary *jā* which follows the past participle form of the main verb. The word *jā* shows the number person and gender agreement. For example- *roṭī pakāyī gaī, rāvaṇa rāma ke dvārā mārā gayā, usake dvārā paḍhāī kī gayī* etc. Periphrastic causative verbs are members of the class of conjunct verbs. For example-*'sāfa honā and sāfa karanā', 'rājī honā and rājī karanā'* have same relationship as non-causal and causal verbs such as *ronā*, 'to cry', and *rulānā*, 'to make someone cry'[102].

In Hindi, the verb has to main components: main verb and auxiliary verb which have been discussed above. The morphological representation of the verb can be shown as:

Main verb +auxiliary verb

[102] Kachru, Y. , 2006:93.

Where main verb can be presented as:

- Root+tā (*jātā*)
- Root+tī (*jātī*)
- Root+te (*jāte*)
- Root+tīn (*jātīn*)
- Root+ ā (*paḍhā*)
- Root+ī (*paḍhī*)
- Root+e (*paḍhe*)
- Root+īn (*paḍhīn*)
- Root+ nā (*karanā*)
- Root+nī (*karanī*)
- Root+ne (*karane*)
- Root (*kar*, *jā, dekha* etc.)

Here main verb can take t or n before adding *ā/ī/e* letters. Or it can only be a root word.

Further it can take the tense auxiliaries - *hai, thā, hogā* which can agree with the person-number and gender depending on the nature of the agent.

4.3.6 Kṛdanta forms in Hindi:

Hindi verb forms are maximum kṛdanta forms. Apart from hai auxiliaries, verbs of present tense are *kṛdanta*. *laḍakā paḍhatā hai, laḍakī paḍhatī hai* etc. The verb forms in perfect tenses are *kṛdanta*. For example- *laḍakā gayā, laḍakī gayī* etc. The verb forms *kiyā, āyā, gayā, soyā, sulāyā* etc. are masculine forms of *kṛdanta* and *kī, āyī, gayī* etc are feminine forms[103]. The kṛdanta froms are divided into the following categories: *vartamāna-kālika (karatā huā), bhūta-kālika (kiyā huā), kriyārthaka sañjyā (karanā), pūrvakālika (khā kara) and tātkālika (āte hī, jāte hī, hote hī* etc).

Examples:-

1. *Sote hue ko mata jagāo. (vartamāna-kālika)*
2. *rāma dauḍatā huā ā rahā hai (vartamāna-kālika)*
3. *maratā kyā na karatā. (vartamāna-kālika)*
4. *paḍhane ke liye school jātā hai (kriyārthaka sañjyā)*

[103] Vajpayee, Kishoridas, 1988, p-420.

5. *khā kara so gayā (pūrvakālika)*
6. *garmī āte hī bāriśa huī (tātkālika*), etc.

Possible Verb Forms:

Depending on the classification of tense and aspect, discussed above, the Hindi grammarians have listed the verb forms in the following four categories: *sāmānya* (indefinite), *pūrṇa* (perfect), *apūrṇa* (continuous) and *pūrṇāpūrṇa* (perfect continuous). These four aspectual categories are available in the tree tenses: *vartamāna* (present), *bhūta* (past) and *bhaviṣyata* (future). So there are 12 verb forms depending on the tense and aspect. Other forms of verbs are depending on modal auxiliaries. Narayan Kumar Chaudhary[104] presents the 25 forms of a given root (including causative form which is helpful in understanding the verb forms in Hindi.

Following are the possible verb forms of a given root:

Root:- *kara*

1. Imperative (2SG/2PL) – *kara*
2. Infinite (MSG)- *karanā*
3. Infinite (FSG)- *karanī*
4. Infinite (PL)- *karane*
5. Imperfect (MSG)- *karatā*
6. Imperfect (FSG)- *karatī*
7. Imperfect (FSGH)- *karatīn*
8. Imperfect (PL)- *karate*
9. Perfect (MSG)-*kiyā*
10. Perfect (FSG)-*kī*
11. Perfect (FSGH)-*kīn*
12. Perfect (PL)- *kare, kie*
13. Future 3MSG- *karegā*
14. Future 3MSGH- *kariegā*
15. Future 3FSG- *karegī*
16. Future 3FSGH- *karengī*
17. Future PL- *karenge*

[104] In His PhD thesis titled 'Automatic Identification and Analysis of Verb Groups in Hindi', p-57

18. Future 2MSGNH- *karoge*
19. Future 2FSGNH- *karogī*
20. Future 1MSG- *karūngā*
21. Future 1FSG- *karūngī*
22. Optative1SG- *karūn*
23. Optative/imperative Plural Honorific- *karen*
24. Imperetive honorific- *karie, kījīe*
25. Imperetive non-honorific- *karo*

4.3.7 Verb Forms with Modal Auxiliaries: *sakanā, pānā, honā, paḍanā, denā, chukā* and *chāhiye* are used in Hindi which can be used as the following examples in the Hindi texts:

1. *turanta ghara jā sako*
2. *subaha uṭha sako*
3. *tuma khā cuke,*
4. *vaha jā cukā.*
5. *vaha nahi khā pāyi,*
6. *ab usako jānā hogā,*
7. *mujhe kahanā paḍegā*
8. *jāne diyā.*
9. *hame jānā cahiye.*
10. *Usako dekhanā cāhiye thā.*

4.3.8 Costrastive Study Of Sanskrit-Hindi Verbs:

The Sanskrit verb form has been discussed in the second chapter. The Hindi verb has been discussed in the first part of this chapter. After comparing these two languages, the following difference can be noticed at the verb level:

	Sanskrit Verb	Hindi Verb
1.	Sanskrit is inflectional thus suffixes are inflected with the verbs. Example- *paṭhanti*. Here jhi suffix	Hindi verbs are periphrastic in nature. So the verbs are generally combination of words. For example-

	is added with the paṭh root where *jh* has *ant-ādesha.*	*paḍhatā hai, paḍha rahā hai etc. although paḍhe, paḍho, paḍhūn* etc are single-word verb forms.
2.	Sanskrit has *tiṅaṅta* and kṛdanta verb forms. *paṭhati, pathanaṃ karoti*.	Hindi verb forms are also divided into *tiṅaṅta* and *kṛdanta*. Example- *padhatā hai, padhāī karatā hai.*
3.	The verbal roots are classified into 10 gaṇas and well arranged in the *dhātupāṭha.*	Hindi doesn't have a well classified *dhātupāṭha*.
4.	Takes different *vikaraṇa* in all the *gaṇa*s.	Hindi verbs don't take *vikaraṇa* in verb formation.
5.	Sanskrit doesn't have auxiliary verbs.	Hindi has auxiliary verbs.
6.	Sanskrit doesn't have modal auxiliary verbs. *kṛdanta* expresses the sense of modal auxiliaries.	Hindi has modal auxiliary verbs which takes another verb as the mail verb in Hindi. *karanā hogā, khanā paḍegā* etc.
7.	Sanskrit *tiṅaṅta* verb doesn't agree with the gender of the agent. Example- *rāmaḥ paṭhati, sītā paṭhati*.	Hindi verb forms agree with the gender of the agent. Example- *rāma paḍhatā hai, sītā paḍhatī hai.*
8.	Sanskrit doesn't have double causative verb forms. Example- *pāṭhayati*.	Hindi has double causative forms. Example- *paḍhātā hai, paḍhavātā hai*.
9.	Sanskrit has *sananta, yaṅanta, yaṅluṅanta* and *nāmadhātu*.	Hindi doesn't have *sananta, yaṅanta, yaṅluṅanta* and *nāmadhātu* verb forms.
10.	Sanskrit has two *lakāra*s for future tense and three *lakāra*s for past tense depending on the division of *anadyatana*, and *adyatana*. Example- in third person singular	Hindi has time division based on *anadyatana, adyatana and sāmānya* but the verbal forms of these tenses have not been expressed by different verb forms. *paḍhegā* denotes the

	number, *paṭhiṣyati* and *paṭhitā* are two verbal forms to denote the future tenses. The verb forms *apaṭhat, papāṭha, apāṭhīt* are there to denote the past tense in third person singular number.	future tense in both the conditions- *adyatana* and *anadyatana*. Same as- *paḍhatā thā* denote all the meaning of *parokṣa, anadyatana and sāmānya bhūta*.
11.	Sanskrit has no aspect. Example- *paṭhati* denotes both- simple as well as progressive action.	Hindi has aspect. Thus it has aspectual forms: *paḍhatā hai, paḍha rahā hai.*
12.	In passive voice, Sanskrit verb doesn't agree with the object. Thus the *karmaṇī prayoga* remanes same in every condition.	In passive voice, Hindi verb agrees with the object. So the verb forms get changed according to the gender of the object.
13.	Sanskrit has no gramaticalization	Hindi shows grammaticalization where two or more verbs come together and one verb drops its original meaning and gives a new meaning. Example- *kara lenā, dekha lūngā* etc. Here *lenā* drops the meaning of '*take*'.
14.	Sanskrit has no light verbs	Hindi has light verbs.
15.	Sanskrit has karmakartṛ forms which denote the verbs which happen automatically. Example- *sthāli (svayameva) pacyate*.	Hindi has the verb forms which denote that the action happens automatically. Example- *khulanā.*
16.	Sanskrit verbs are divided into *ātmanepada, parasmaipada and ubhayapada*.	Hindi verbs are not classified into *ātmanepada, parasmaipada and ubhayapada*. But Hindi also has sense of *ātmanepada*.
17.	The conditional use of *lakāra* sometimes gives the meaning of other tense. Example- *paṭhati sma,*	The Hindi verb form doesn't show the meaning of different tense. The auxiliary '*hai*' never expresses the

	here *paṭhati* is *laṭ* form but, with the *sma nipāta*, it shows the meaning of past tense.	meaning of past or future.
18.	Sanskrit has dual number thus the verbs have the forms of dual number. Example- *paṭhataḥ.*	Hindi has lost its dual form. Thus the plural verb form is used to denote the dual verbs.
19.	Sanskrit participle forms are expressed through the *kridanta* verbs. Example- *pītvā,*	Hindi has '*kara*' to express such meanings.

4.3.9 Sanskrit-Hindi Verb Pattern:

Sanskrit-Hindi verb patterns can be shown in the following manner:

laṭ lakāra

Sanskrit root + *ti* = Hindi root +*tā hai/tī hai/ te hain/rahā hai/ rahī hai/ rahe hain/rahī hain*

Sanskrit root + *taḥ* = Hindi root + *te hain/ tī hain/ rahe hain/ rahi hain*

Sanskrit root + *anti* = Hindi root + *te hain/ tī hain/ rahe hain/ rahi hain*

Sanskrit root + *si* = Hindi root + *te ho/ tī ho/ rahe ho/ rahī ho*

Sanskrit root + *thaḥ* = Hindi root + *te ho/ tī ho/ rahe ho/ rahī ho*

Sanskrit root + *tha* = Hindi root + *te ho/ tī ho/ rahe ho/ rahī ho*

Sanskrit root + *mi* = Hindi root + *tā hoon/ tī hoon/ rahā hoon/ rahī hoon*

Sanskrit root + *vaḥ* = Hindi root + *te hain/ rare hain*

Sanskrit root + *maḥ* = Hindi root + *te hain/ rare hain*

loṭ lakāra

Sanskrit root + *tu* = Hindi root + *e/en*

Sanskrit root + *tām* = Hindi root + *en*

Sanskrit root + *antu* = Hindi root + *en*

Sanskrit root + *hi* (:) = Hindi root + *o*

Sanskrit root + *tam* = Hindi root + *o*

Sanskrit root + *ta* = Hindi root + *o*

Sanskrit root + *āni* = Hindi root + *ūn*

Sanskrit root + *āva* = Hindi root +*en*

Sanskrit root + *āma* = Hindi root + *en*

laṅ lakāra-

Sanskrit root + *ta* = Hindi root +*ā/ī/e*

Sanskrit root + *tāṃ* = Hindi root +*ā/ī/e*

Sanskrit root + *an* = Hindi root +*ā/ī/e*

Sanskrit root + *s (ḥ)* = Hindi root +*ā/ī/e*

Sanskrit root + *tam* = Hindi root +*ā/ī/e*

Sanskrit root + *ta* = Hindi root +*ā/ī/e*

Sanskrit root + *am* = Hindi root +*ā/ī/e*

Sanskrit root + *va* = Hindi root +*ā/ī/e*

Sanskrit root +*ma* = Hindi root +*ā/ī/e*

vidhiliṅ lakāra

Sanskrit root + *it* = Hindi root + *nā* + *chāhiye* (or Hindi root+*e*)

Sanskrit root + *itāṃ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*e*)

Sanskrit root + *iyuḥ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*e*)

Sanskrit root + *iḥ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*o*)

Sanskrit root + *itaṃ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*o*)

Sanskrit root + *ita* = Hindi root + *nā* + *chāhiye* (or Hindi root+*o*)

Sanskrit root + *iyaṃ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*ūn*)

Sanskrit root + *iva* = Hindi root + *nā* + *chāhiye* (or Hindi root+*en*)

Sanskrit root + *ima* = Hindi root + *nā* + *chāhiye* (or Hindi root+*en*)

liṭ lakāra

Sanskrit root + *a* = Hindi root + *ā* + *thā*

Sanskrit root + *atuḥ* = Hindi root + *e* + *the*

Sanskrit root + *uḥ* = Hindi root + *e* + *the*

Sanskrit root + *(i)tha* = Hindi root + *e* + *the*

Sanskrit root + *athuḥ* = Hindi root + *e the*

Sanskrit root + *a* = Hindi root + *e* +*the*

Sanskrit root + *a* **=** Hindi root + *ā thā*

Sanskrit root + *(i)va* **=** Hindi root + *e* +*the*

Sanskrit root + *(i)ma* **=** Hindi root + *e* + *the*

luṭ lakāra

Sanskrit root + *tā* **=** Hindi root + *egā /egī/enge*

Sanskrit root + *tārau* **=** Hindi root + *enge/ engī*

Sanskrit root + *tāraḥ* **=** Hindi root + *enge/engī*

Sanskrit root + *tāsi* **=** Hindi root + *oge/ogī*

Sanskrit root + *tāsthaḥ* **=** Hindi root + *oge/ogī*

Sanskrit root + *tāstha* **=** Hindi root + *oge/ogī*

Sanskrit root + *tāsmi* **=** Hindi root + *ūngā/ūngī*

Sanskrit root + *tāsvaḥ* **=** Hindi root + *enge*

Sanskrit root + *tāsmaḥ* **=** Hindi root + *enge*

lṛṭ lakāra

Sanskrit root + *ṣyati* = Hindi root + *egā /egī/enge*

Sanskrit root + *ṣyataḥ* = Hindi root + *enge/ engī*

Sanskrit root + *ṣyanti* = Hindi root + *enge/engī*

Sanskrit root + *ṣyasi* = Hindi root + *oge/ogī*

Sanskrit root + *ṣyathaḥ* = Hindi root + *oge/ogī*

Sanskrit root + *ṣyatha* = Hindi root + *oge/ogī*

Sanskrit root + *ṣyāmi* = Hindi root + *ūngā/ūngī*

Sanskrit root + *ṣyāvaḥ* = Hindi root + *enge*

Sanskrit root + *ṣyāmaḥ* **=** Hindi root + *enge*

āśirliṅ ***lakāra***

Sanskrit root + *yāt* = Hindi root + *e*

Sanskrit root + *yāstāṃ* = Hindi root + *en*

Sanskrit root + *yāsuḥ* = Hindi root +*en*

Sanskrit root + *yāḥ* = Hindi root + *o*

Sanskrit root + *yāstaṃ* = Hindi root + *o*

Sanskrit root + *yāsta* = Hindi root + *o*

Sanskrit root + *yāsaṃ* = Hindi root + *ūn*

Sanskrit root + *yāsva* = Hindi root + *en*

Sanskrit root + *yāsma* = Hindi root + *en*

luṅ lakāra

Sanskrit root + *t* = Hindi root + *ā/ī/e*

Sanskrit root + *tāṃ* = Hindi root + *ā/ī/e*

Sanskrit root + *an* = Hindi root + *e/īn*

Sanskrit root + *aḥ* = Hindi root + *e/ī*

Sanskrit root + *taṃ* = Hindi root + *e/ī*

Sanskrit root + *ta* = Hindi root + *e/ī*

Sanskrit root + *am* = Hindi root + *ā/ī*

Sanskrit root + *va* = Hindi root + *e/īn*

Sanskrit root + *ma* = Hindi root + *e/īn*

lṛṅ lakāra

Sanskrit root + *ṣyat* = Hindi root + *tā/te/tī/egā/egī/enge*

Sanskrit root + *ṣyatām* = Hindi root + *te/tīn/ egā/engī/enge*

Sanskrit root + *ṣyan* = Hindi root + *te/tīn/ engī/enge*

Sanskrit root + *ṣyaḥ* = Hindi root + *te/tī/oge/ogī*

Sanskrit root + *ṣyataṃ*= Hindi root + *te/tī/oge/ogī*

Sanskrit root + *ṣyata* = Hindi root + *te/tī/oge/ogī*

Sanskrit root + *ṣyaṃ* = Hindi root + *tā/tī/ūngā/ūngī*

Sanskrit root + *ṣyāva* = Hindi root + *te/enge*

Sanskrit root + *ṣyāma* = Hindi root + *te/ enge*.

Keeping these differences in mind, transfer grammar rules have to be written in the next chapter to map the Sanskrit-Hindi verbs. The rules will cover prāthamika, ṇijanta, yaṅanta sananta and kṛdanta verb forms. To handle the bugs in correct Hindi form geberation, some conditional rules may also be written after tool analysis.

Chapter 5

Transfer Grammar Rules for Verb Mapping:

5.1 Introduction:

In this chapter, the rules are to be written for structural transfer of verbs for Sanskrit-Hindi Verb Mapping. The structural transfer, lexical transfer and transliteration are the methods used to provide the desired output in Machine translations. For example, this method has been implemented in the Sampark system of IIIT Hyderabad (Avinesh, 2010). In machine translation, a set of Transfer Grammar (TG) Rules are required for mapping syntactic representations of a source language into the target language representations. The TG engine which has been developed at IIIT, Hyderabad deals with transfer of the sentence structures of one Indian language (IL-1) to another Indian language (IL-2). The module uses a set of rules which give corresponding structures of IL-1 into IL-2. The same concept is being addopted to write necessary TG rules for Sanskrit-Hindi verb mapping for the desired output in SHMT to deal with the syntactic differences. For writing TG rules for Verb Mapping for Sanskrit-Hindi Translator, the morphological information of Sanskrit verb forms stored in the database is crucial. These are unique information of each type of Sanskrit verb forms and once that information is fetched by the system, it only needs to provide corresponding Hindi suffix and the Hindi meaning of Sanskrit root stored in RootMeaning file. Here 'X' can be replaced with the Hindi meaning of the Sanskrit root and rest suffix part can be added to generate the Hindi output of the given Sanskrit Verb.

5.2 Transfer Rules for Verb Mapping: In this section, transfer rules for tiṅanta verbs and kṛdant verbal forms have been written.

5.2.1 For tiṅanta verbs:

prāthamikaḥ-laṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*tā hū*
prāthamikaḥ-laṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*te ho*
prāthamikaḥ-laṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*tā hai*
prāthamikaḥ-laṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*te haiṃ*
prāthamikaḥ-laṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*te ho*
prāthamikaḥ-laṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*te haiṃ*
prāthamikaḥ-laṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*te haiṃ*

prāthamikaḥ-laṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- *X-te ho*

prāthamikaḥ-laṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*te haiṃ*

prāthamikaḥ-laṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-laṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā jātā hai*

prāthamikaḥ-loṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ūṃ*

prāthamikaḥ-loṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*o*

prāthamikaḥ-loṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*e*

prāthamikaḥ-loṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*aiṃ*

prāthamikaḥ-loṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*o*

prāthamikaḥ-loṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*e*

prāthamikaḥ-loṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*aiṃ*

prāthamikaḥ-loṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*o*

prāthamikaḥ-loṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*aiṃ*

prāthamikaḥ-loṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-loṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-vidhiliṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*nā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-vidhiliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā jānā cāhie*

prāthamikaḥ-laṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ā*

prāthamikaḥ-laṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*e*

prāthamikaḥ-laṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*ā*

prāthamikaḥ-laṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*e*

prāthamikaḥ-laṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*e*

prāthamikaḥ-laṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*ā*

prāthamikaḥ-laṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*e*

prāthamikaḥ-laṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*e*

prāthamikaḥ-laṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*e*

prāthamikaḥ-laṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-laṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā gayā*

prāthamikaḥ-lṛṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X- *ū×gā*

prāthamikaḥ-lṛṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*oge*

prāthamikaḥ-lṛṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*egā*

prāthamikaḥ-lṛṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*eṃge*

prāthamikaḥ-lṛṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*oge*

prāthamikaḥ-lṛṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*egā*

prāthamikaḥ-lṛṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*eṃge*

prāthamikaḥ-lṛṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*oge*

prāthamikaḥ-lṛṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*oge*

prāthamikaḥ-lṛṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-lṛṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā jāegā*

prāthamikaḥ-liṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ā thā*

prāthamikaḥ-liṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*ā thā*

prāthamikaḥ-liṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*e the*

prāthamikaḥ-liṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-liṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā gayā thā*

prāthamikaḥ-luṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*tā thā*

prāthamikaḥ-luṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*te the*

prāthamikaḥ-luṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*tā thā*

prāthamikaḥ-luṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*te the*

prāthamikaḥ-luṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*te the*

prāthamikaḥ-luṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*te the*

prāthamikaḥ-luṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*te the*

prāthamikaḥ-luṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*te the*

prāthamikaḥ-luṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-te the

prāthamikaḥ-luṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jātā thā*

prāthamikaḥ-luṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-luṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā jātā thā*

prāthamikaḥ-luṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-luṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-luṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-luṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-luṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-luṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā jātā the*

prāthamikaḥ-lṛṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*tā*

prāthamikaḥ-lṛṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*tā*

prāthamikaḥ-lṛṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*te*

prāthamikaḥ-lṛṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-lṛṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*ā jātā*

prāthamikaḥ-āśīrliṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ū*×

prāthamikaḥ-āśīrliṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*o*

prāthamikaḥ-āśīrliṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*e*

prāthamikaḥ-āśīrliṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*eṃ*

prāthamikaḥ-āśīrliṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*o*

prāthamikaḥ-āśīrliṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*e*

prāthamikaḥ-āśīrliṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*eṃ*

prāthamikaḥ-āśīrliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*o*

prāthamikaḥ-āśīrliṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*eṃ*

prāthamikaḥ-āśīrliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*ā jāe*

prāthamikaḥ-āśīrliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- *X-ā jāe*

prāthamikaḥ-āśīrliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-āśīrliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-āśīrliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-āśīrliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-āśīrliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-āśīrliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-āśīrliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ā jāe*
prāthamikaḥ-luṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ūgā*
prāthamikaḥ-luṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*oge*
prāthamikaḥ-luṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*egā*
prāthamikaḥ-luṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*eṃge*
prāthamikaḥ-luṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*oge*
prāthamikaḥ-luṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*egā*
prāthamikaḥ-luṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*eṃge*
prāthamikaḥ-luṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*oge*
prāthamikaḥ-luṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*oge*
prāthamikaḥ-luṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*āyā jāegā*
prāthamikaḥ-luṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*āyā jāegā*
yaṅantaḥ-laṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*tā hū*
yaṅantaḥ-laṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*te ho*
yaṅantaḥ-laṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*tā hai*

yaṅantaḥ-laṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*te haiṃ*
yaṅantaḥ-laṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*te ho*
yaṅantaḥ-laṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*te haiṃ*
yaṅantaḥ-laṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*te haiṃ*
yaṅantaḥ-laṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*te ho*
yaṅantaḥ-laṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*te haiṃ*
yaṅantaḥ-laṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-laṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jātā hai*
yaṅantaḥ-loṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ū*×
yaṅantaḥ-loṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*o*
yaṅantaḥ-loṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-loṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*eṃ*

yaṅantaḥ-loṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*o*
yaṅantaḥ-loṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-loṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra X-eṃ*
yaṅantaḥ-loṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*o*
yaṅantaḥ-loṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*eṃ*
yaṅantaḥ-loṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-loṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-vidhiliṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*
yaṅantaḥ-vidhiliṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*nā cāhie*

yaṅantaḥ-vidhiliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jānā cāhie*
yaṅantaḥ-laṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā*
yaṅantaḥ-laṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-laṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā*
yaṅantaḥ-laṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-laṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-laṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā*
yaṅantaḥ-laṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-laṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-laṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*e*
yaṅantaḥ-laṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā*

		gayā
yaṅantaḥ-laṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-laṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā*
yaṅantaḥ-lṛṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*èṃgā*
yaṅantaḥ-lṛṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*oge*
yaṅantaḥ-lṛṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*egā*
yaṅantaḥ-lṛṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*eṃge*
yaṅantaḥ-lṛṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*oge*
yaṅantaḥ-lṛṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*egā*
yaṅantaḥ-lṛṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*eṃge*
yaṅantaḥ-lṛṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*oge*
yaṅantaḥ-lṛṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*oge*
yaṅantaḥ-lṛṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*

yaṅantaḥ-lṛṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-lṛṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
yaṅantaḥ-liṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā thā*
yaṅantaḥ-liṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-liṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā thā*
yaṅantaḥ-liṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-liṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-liṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-liṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-liṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-liṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*e the*
yaṅantaḥ-luṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*tā thā*
yaṅantaḥ-liṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā thā*
yaṅantaḥ-liṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā the*
yaṅantaḥ-liṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā thā*
yaṅantaḥ-liṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā the*
yaṅantaḥ-liṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā the*
yaṅantaḥ-liṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā the*
yaṅantaḥ-liṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā gayā the*

yaṅantaḥ-liṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā gayā the*

yaṅantaḥ-liṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā gayā the*

yaṅantaḥ-luṅ-kartari-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*tā thā*

yaṅantaḥ-luṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-kartari-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*tā thā*

yaṅantaḥ-luṅ-kartari-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-kartari-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*te the*

yaṅantaḥ-luṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jātā thā*

yaṅantaḥ-luṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-luṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jātā thā*

yaṅantaḥ-luṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-luṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-luṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-luṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-luṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-luṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jātā the*

yaṅantaḥ-lṛṅ-kartari-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*tā*

yaṅantaḥ-lṛṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-kartari-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*tā*

yaṅantaḥ-lṛṅ-kartari-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-kartari-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*te*

yaṅantaḥ-lṛṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-lṛṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jātā*

yaṅantaḥ-āśīrliṅ-kartari-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* *X*-*ūn*

yaṅantaḥ-āśīrliṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*o*

yaṅantaḥ-āśīrliṅ-kartari-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*e*

yaṅantaḥ-āśīrliṅ-kartari-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*eṃ*

yaṅantaḥ-āśīrliṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*o*

yaṅantaḥ-āśīrliṅ-kartari-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*e*

yaṅantaḥ-āśīrliṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*eṃ*

yaṅantaḥ-āśīrliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*o*

yaṅantaḥ-āśīrliṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*eṃ*

yaṅantaḥ-āśīrliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jāe*

yaṅantaḥ-āśīrliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jāe*

yaṅantaḥ-āśīrliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jāe*

yaṅantaḥ-āśīrliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jāe*

yaṅantaḥ-āśīrliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jāe*

yaṅantaḥ-āśīrliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jāe*

yaṅantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
yaṅantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāe*
sannantaḥ-laṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatā hū*
sannantaḥ-laṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate ho*
sannantaḥ-laṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatā hai*
sannantaḥ-laṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karate haiṃ*
sannantaḥ-laṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate ho*
sannantaḥ-laṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karate haiṃ*
sannantaḥ-laṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karate haiṃ*
sannantaḥ-laṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate ho*
sannantaḥ-laṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karate haiṃ*
sannantaḥ-laṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī*

		jātī hai
sannantaḥ-laṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-laṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī hai*
sannantaḥ-loṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karūn*
sannantaḥ-loṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karo*
sannantaḥ-loṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-loṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃ*
sannantaḥ-loṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karo*
sannantaḥ-loṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-loṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃ*
sannantaḥ-loṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karo*
sannantaḥ-loṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃ*
sannantaḥ-loṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*

sannantaḥ-loṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-loṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-vidhiliṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*

sannantaḥ-vidhiliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahanī cāhie*
sannantaḥ-laṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī*
sannantaḥ-laṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-laṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī*
sannantaḥ-laṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-laṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-laṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī*
sannantaḥ-laṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-laṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-laṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-laṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī*

		jātī rahī
sannantaḥ-laṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-laṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī*
sannantaḥ-lṛṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karūgā*
sannantaḥ-lṛṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-lṛṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karegā*
sannantaḥ-lṛṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃge*
sannantaḥ-lṛṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-lṛṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karegā*
sannantaḥ-lṛṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃge*
sannantaḥ-lṛṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-lṛṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-lṛṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-lṛṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-lṛṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-lṛṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-lṛṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā*

		karatī rahī jāegī
sannantaḥ-lṛṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-lṛṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-lṛṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāegā*
sannantaḥ-lṛṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-liṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī thī*
sannantaḥ-liṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī thī*
sannantaḥ-liṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kie the*
sannantaḥ-liṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī thī*
sannantaḥ-liṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-liṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī*

		jātī rahī thī
sannantaḥ-liṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-liṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-liṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-liṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-liṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-liṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī rahī the*
sannantaḥ-luṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatā thā*
sannantaḥ-luṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatā thā*
sannantaḥ-luṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karate the*
sannantaḥ-luṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī*

		jātī thī
sannantaḥ-luṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-luṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī thī*
sannantaḥ-lṛṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatā*
sannantaḥ-lṛṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate*
sannantaḥ-lṛṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatā*
sannantaḥ-lṛṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karate*
sannantaḥ-lṛṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karate*
sannantaḥ-lṛṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karate*
sannantaḥ-lṛṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karate*
sannantaḥ-lṛṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā*

		karate
sannantaḥ-lṛṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karate*
sannantaḥ-lṛṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-lṛṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī*
sannantaḥ-āśīrliṅ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karū*
sannantaḥ-āśīrliṅ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karo*
sannantaḥ-āśīrliṅ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-āśīrliṅ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃ*
sannantaḥ-āśīrliṅ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karo*
sannantaḥ-āśīrliṅ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kare*
sannantaḥ-āśīrliṅ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃ*
sannantaḥ-āśīrliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karo*
sannantaḥ-āśīrliṅ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā*

		kareṃ
sannantaḥ-āśīrliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
sannantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāe*
ṇijantaḥ-laṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ātā hū*
ṇijantaḥ-laṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*āte ho*
ṇijantaḥ-laṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ātā hai*
ṇijantaḥ-laṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*āte haiṃ*
ṇijantaḥ-laṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*āte ho*
ṇijantaḥ-laṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*āte haiṃ*
ṇijantaḥ-laṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*āte haiṃ*
ṇijantaḥ-laṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*āte ho*
ṇijantaḥ-laṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*āte haiṃ*
ṇijantaḥ-laṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*āyā jātā hai*
ṇijantaḥ-laṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*āyā jātā hai*
ṇijantaḥ-laṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*āyā jātā hai*
ṇijantaḥ-laṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*āyā jātā hai*

ṇijantaḥ-laṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jātā hai*

ṇijantaḥ-laṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jātā hai*

ṇijantaḥ-laṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jātā hai*

ṇijantaḥ-laṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jātā hai*

ṇijantaḥ-laṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jātā hai*

ṇijantaḥ-loṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*āū*

ṇijantaḥ-loṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āo*

ṇijantaḥ-loṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*āe*

ṇijantaḥ-loṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āaiṃ*

ṇijantaḥ-loṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āo*

ṇijantaḥ-loṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āe*

ṇijantaḥ-loṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āaiṃ*

ṇijantaḥ-loṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āo*

ṇijantaḥ-loṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āaiṃ*

ṇijantaḥ-loṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-loṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-vidhiliṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*ānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-vidhiliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jānā cāhie*

ṇijantaḥ-laṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*āyā*

ṇijantaḥ-laṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āe*

ṇijantaḥ-laṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*āyā*

ṇijantaḥ-laṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āe*

ṇijantaḥ-laṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āe*

ṇijantaḥ-laṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āyā*

ṇijantaḥ-laṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āe*

ṇijantaḥ-laṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āe*

ṇijantaḥ-laṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āe*

ṇijantaḥ-laṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-laṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā gayā*

ṇijantaḥ-lṛṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*āūgā*

ṇijantaḥ-lṛṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-lṛṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*āegā*

ṇijantaḥ-lṛṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āeṃge*

ṇijantaḥ-lṛṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-lṛṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āegā*

ṇijantaḥ-lṛṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āeṃge*

ṇijantaḥ-lṛṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-lṛṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-lṛṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-lṛṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-liṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*āyā thā*

ṇijantaḥ-liṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*āyā thā*

ṇijantaḥ-liṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āye the*

ṇijantaḥ-liṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā gayā the*

ṇijantaḥ-liṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-liṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā gayā thā*

ṇijantaḥ-luṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ātā thā*

ṇijantaḥ-luṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*ātā thā*

ṇijantaḥ-luṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āte the*

ṇijantaḥ-luṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jātā the*

ṇijantaḥ-luṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-luṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jātā thā*

ṇijantaḥ-lṛṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*ātā*

ṇijantaḥ-lṛṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*ātā*

ṇijantaḥ-lṛṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āte*

ṇijantaḥ-lṛṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-lṛṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jātā*

ṇijantaḥ-āśīrliṅ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*āūṃ*

ṇijantaḥ-āśīrliṅ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āo*

ṇijantaḥ-āśīrliṅ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*āe*

ṇijantaḥ-āśīrliṅ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āaiṃ*

ṇijantaḥ-āśīrliṅ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āo*

ṇijantaḥ-āśīrliṅ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āe*

ṇijantaḥ-āśīrliṅ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āaiṃ*

ṇijantaḥ-āśīrliṅ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āo*

ṇijantaḥ-āśīrliṅ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āaiṃ*

ṇijantaḥ-āśīrliṅ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-āśīrliṅ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jāe*

ṇijantaḥ-luṭ-kartari-ekavacanam-uttamapuruṣaḥ :- X-*āūgā*

ṇijantaḥ-luṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-luṭ-kartari-ekavacanam-prathamapuruṣaḥ :- X-*āegā*

ṇijantaḥ-luṭ-kartari-dvivacanam-uttamapuruṣaḥ :- X-*āaiṃge*

ṇijantaḥ-luṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-luṭ-kartari-dvivacanam-prathamapuruṣaḥ :- X-*āegā*

ṇijantaḥ-luṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- X-*āegā*

ṇijantaḥ-luṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-luṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- X-*āoge*

ṇijantaḥ-luṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- X-*āyā jāegā*

ṇijantaḥ-luṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ :- X-*āyā jāegā*

yaṅantaḥ-luṭ-kartari-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ūgā*

yaṅantaḥ-luṭ-kartari-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*oge*

yaṅantaḥ-luṭ-kartari-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*egā*

yaṅantaḥ-luṭ-kartari-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*aiṃge*

yaṅantaḥ-luṭ-kartari-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*oge*

yaṅantaḥ-luṭ-kartari-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*egā*

yaṅantaḥ-luṭ-kartari-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*egā*

yaṅantaḥ-luṭ-kartari-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*oge*

yaṅantaḥ-luṭ-kartari-bahuvacanam-prathamapuruṣaḥ :- *bāra bāra* X-*oge*

yaṅantaḥ-luṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ :- *bāra bāra* X-*ā jāegā*

yaṅantaḥ-luṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ :- *bāra bāra* X-*ā*

		jāegā
yaṅantaḥ-luṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	*bāra bāra* X-*ā jāegā*
sannantaḥ-luṭ-kartari-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karūgā*
sannantaḥ-luṭ-kartari-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-luṭ-kartari-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karegā*
sannantaḥ-luṭ-kartari-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃge*
sannantaḥ-luṭ-kartari-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-luṭ-kartari-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karegā*
sannantaḥ-luṭ-kartari-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā kareṃge*
sannantaḥ-luṭ-kartari-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-luṭ-kartari-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karoge*
sannantaḥ-luṭ-karmaṇi-ekavacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-luṭ-karmaṇi-ekavacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-luṭ-karmaṇi-ekavacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-luṭ-karmaṇi-dvivacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-luṭ-karmaṇi-dvivacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-luṭ-karmaṇi-dvivacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā*

		karatī rahī jāegī
sannantaḥ-luṭ-karmaṇi-bahuvacanam-uttamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*
sannantaḥ-luṭ-karmaṇi-bahuvacanam-madhyamapuruṣaḥ	*:-*	X-*ne kī icchā kī jātī jāegā*
sannantaḥ-luṭ-karmaṇi-bahuvacanam-prathamapuruṣaḥ	*:-*	X-*ne kī icchā karatī rahī jāegī*

5.2.2 For kṛdanta forms:

The kridant forms which are behaving as indeclinable are also used as verbs unlernatively to express the meanings expressed by the tiñanta. In JNU's kridanta Analyzer, we get the kridant analysis for which Hindi counterparts are being provided as follows**:**

tavyat - X-*nā cāhie*
tavya - X-*nā cāhie*
kta - X-*ā gayā*
lyap - X-*kara*
yat - X-*ne yogya hai*
ṇyat - X-*ne yogya hai*
śatṛ - X-*tā huā*
śadhyain - X-*ne ke lie*
śadhyai - X-*ne ke lie*
ṇamul - X-*ne ke lie*
ktavatu - - X-*ā gayā*
ktvā - X-*kara*
anīyar -X-*nā cāhie*
tumun - X-*ne ke lie*
atṛn - X-*tā huā*
athuc - X-*tā huā*

The above disucussed rule will be applied in the programming of the system. These are general rules. Depending on particular Hindi verb form, some special rules may be added in the programming to handle the bug.

CHAPTER 6

SANSKRIT-HINDI VERB MAPPING TOOL AND EVALUATION

6.1 Introduction

This chapter is describing the Sanskrit-Hindi verb mapping tool and its evaluation. The tool is rule based. The database has the files which provide root and morphological information of the verb forms. Based on that information, Hindi counterparts are being provided to produce output. The Database structure, Programming Aspect, User Interface and output Analysis are discussed in this chapter.

6.2 Database structure

Database has 133000 verbs and their morphological analysis. It contains following tables:

Dhaturoop: This table has verbs with their morphological analysis. This needs to be provided for any rule based translation system. In inflectional language like Sanskrit, although, the suffix is indicates the *lakāra* etc., the machine will fail in indentifying those verb forms where suffixes look similar. For example, *liṭ* forms of 1st person singular number, 2nd person plural number and 3rd person singular number in *parasmaipada* have similar verb forms and 1st person singular number and 3rd person singular number in *ātmanepada* have similar verb forms. In laṅ, luṅ and lṛṅ where '*a*' is added in the beginning of the roots, the base/root cannot be easily identified by the machine. For example- *in 'sevadhvam', 'asevadhvam', 'sevedhvam', 'seviṣīdhvam', 'aseviṣyadhvam' and 'asevidhvam'*, if machine will try to identify the root and suffix (or base and suffix), machine will break it into two parts and mark *dhvam* as suffix and rest (*seva, aseva, seve, seviṣī, aseviṣya*) as root (or base). Here, although the root is '*sev*' only, the base-forms are being modified because of *āgamas/vikaraṇas*. Because of this, machine will not be able to capture the meaning of '*sev*' automatically. So, the verb-forms need to be manually stored with their

morphological information. The morphological information contains the information about root, *lakāra, puruṣa, vacana, kartari-karmaṇī*, primary-derived (i.e. *prāthamika, ṇijanta, sananta, yaṅanta*). The information has been stored with key-values, so that machine can process it easily.

RootMeaning: The verbforms which are stored in the *database* are stored with their roots as well. So this file contains the Hindi meaning of the Sanskrit roots which is being used for producing Hindi output.

Lakara: This table contains numeral value assigned to each *lakāra* to make processing easy. For example, लट् (*laṭ*) is given numeral value 1. लिट् (*liṭ*) is given numeral value 2 and so on.

Purusha: This table contains numeral value assigned to each *puruṣa*. For example, *prathama puruṣa* is given the numeral value 1, *madhyama puruṣa* is given numeral value 2, and *uttama puruṣa* is given numeral value 3.

Vacana: This table contains numeral value assigned to each *vacana*. For example, *ekavacana* is assigned numeral value 1, *dvivacana* has numeral value 2 and *bahuvacana* has numeral value 3.

KartariKarmaṇi : For *kartari* and *karmaṇi* as well, the numeral value 1 and 2 has been used in the *dhatūroop* file. So this file has numeral value 1 for *kartari* and numeral value 2 for *karmaṇi.*

PrimaryDerived: In this table, numeral values have been assigned to the verb categories *prāthamika, ṇijanta, yaṅanta* and *sananta*.

KridantRoop: In this table, *kridanta* forms are stored with their root and suffix information. The suffixes have also numeral values which are separately stored in a file named 'KritSuffix'.

TinantaTranslation: When the preprocessing of given verb is finished, and if the verb is tiṅanta, the TinantaTranslation file provides the information about Hindi counterparts of Sanskrit verbal suffixes. The numeral values stored against *lakāra* etc. create unique key combination which takes particular Hindi counterpart (in masculine form) which gets attached with root meaning.

KridantaTranslation: After pre-processing, if the verb is not tiṅanta, the processor will search for *kṛdanta* and and KridantaTranslation file provides the Hindi counterparts of Sanskrit *kṛt*-suffixes.

6.3 Programming Aspect:

The programming has been done in Java. The flowchart, brief codes, system description, user interface and tool evaluation has been discussed below.

6.3.1 Flowchart:

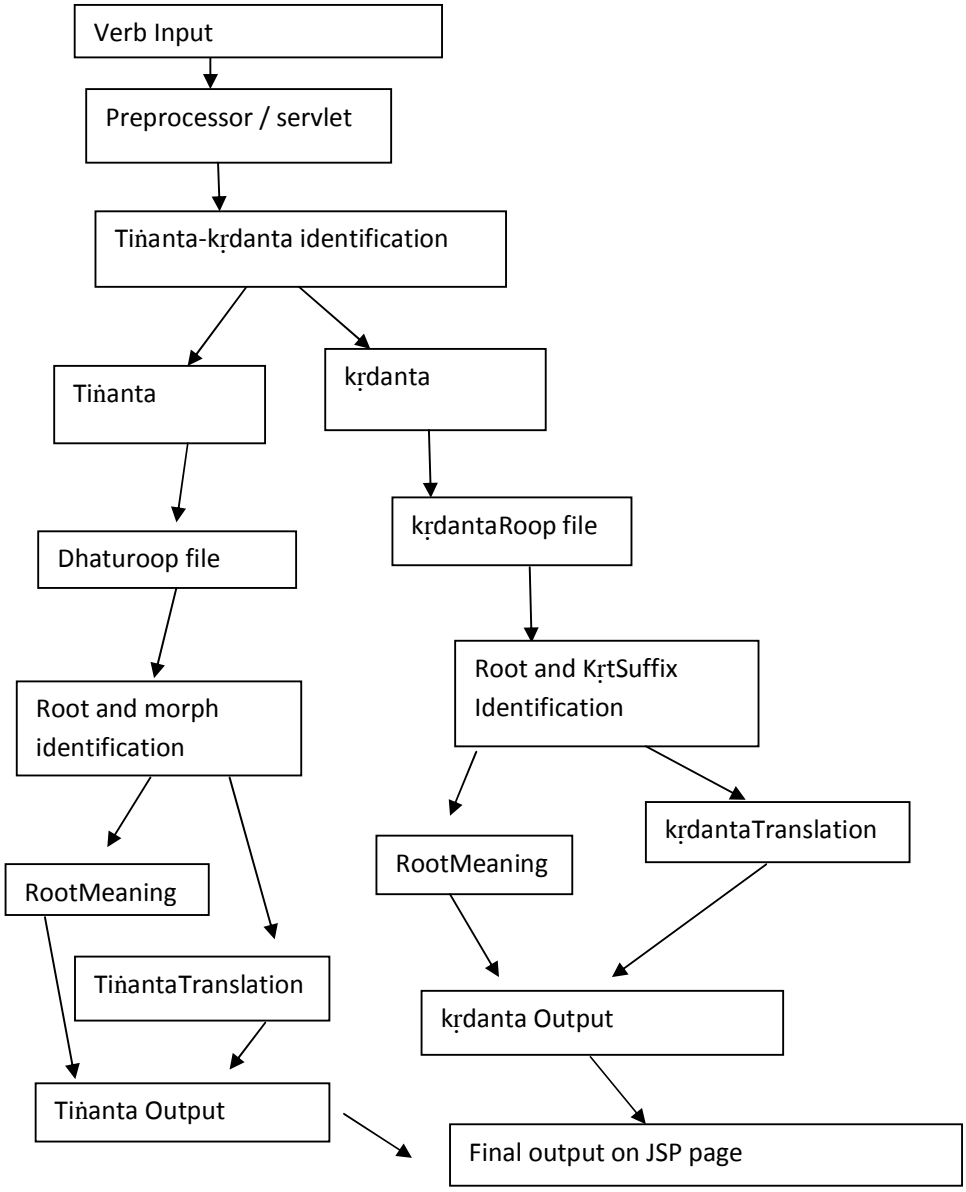


Figure 6.1: The flowchart of Sanskrit-Hindi Verb Mapping tool

The flowchart of the system is showing step by step process of Verb Mapping for Sanskrit-Hindi Translator.

6.3.2 System Description

The Sanskrit-Hindi Verb Mapping tool is available on the website http://sanskrit.jnu.ac.in/Sahit . When the verb is given as an input, preprocessing gets started. Here Sahit processor (servelet) processes the input to identify the verb as *tiṅanta* or *kṛdanta*. If the verb input is identified as *tiṅanta*, it connects to the *Dhaturoop* file for the verb morphology which provides the information regarding *tiṅanta* forms. If the verb input is *kṛdanta*, it gets morph information from *Kridantaroop* file**.** Once the morphological information is retrieved, the tool gets Hindi meaning of Sanskrit root. Form TinantaTranslation file, it gets the Hindi counterpart of Sanskrit tiṅanta suffix to provide Hindi verb output on JSP page. From "KridantaTranslation" file, it gets the Hindi counterpart of *kṛdanta* suffix to provide *kṛdanta's* output in Hindi. After combining the suffix counterpart of Hindi, it displays the output on the JSP page.

6.3.3 Samples of source code:

Programming has been done in Java. Here is described the code of different major classes and functions of the system.

6.3.3.1 Code for Servlet Controller: It controls the input and output.

```
public class sahitProcess extends HttpServlet {

        private static final long serialVersionUID = 1L;

   public sahitProcess() {

      super();

      // TODO Auto-generated constructor stub

   }

        protected void doPost(HttpServletRequest request, HttpServletResponse
response) throws ServletException, IOException {
```

```
        }
}
```

6.3.3.2 Method for retrieving data: It retrieves data from database and generating output:

```
public abstract class DaoFactory
{
  public abstract void connectionClose();

                public abstract Dhaturoop data(String verb);
                public abstract RootMeaning RootMeaningData(String root);
                public abstract Tigant Tigantdata(String tigant);
                public abstract String compundingRootandMeaning(String root,String meaning,String matra,String matra_word);
                public abstract Kridant kridata(String verb);
                public abstract KridantTranslation Kridantdata(String krisuffix);

}
}
```

6.3.3.3 Code for database connection:

```
public class DbConnection
{
        static Connection conn = null;
```

```
public static Connection getSqlConnection()
        {
                try
                {
                        System.out.println("Connection Start");
                if(conn == null){

        Class.forName("com.microsoft.sqlserver.jdbc.SQLServerDriver");
                        System.out.println("Connection Start 2");
                        conn                                                    =
DriverManager.getConnection("jdbc:sqlserver:……");
                        System.out.println("Connection Ok");
                        }


                }
                catch(Exception e)
                {
                         e.printStackTrace();
                }
                return conn;
        }

}
```

6.3.3.4 Code for compounding the Hindi root/base and suffix: This is being used to generate the Hindi output.

```
String data = "";

try {

        System.out.println(root+" : "+meaning+" : "+matra+" : "+matra_word);

String newroot = root+matra;

        String newmeaning = meaning.replace(matra_word.trim(), "").trim();

        data = newroot.trim()+""+newmeaning.trim();

        System.out.println(newroot+" : "+newmeaning);

        } catch (Exception localException) {

                System.out.println("Error ="

                                + localException.getMessage());

}
```

6.4 User Interface and Tool Evaluation

User Interface: The front end of the system is the Graphical User Interface (GUI), visible to the users, which is created by using JSP and HTML components. It allows the user to enter the input in Devanagari utf-8 format using HTML textarea. On clicking the button labeled “Click to process”, it calls the Java object “Sahit” to process the input. The output returned by the Java objects is displayed to the user in Devanagari utf-8 format.

Image of the user interface is below:

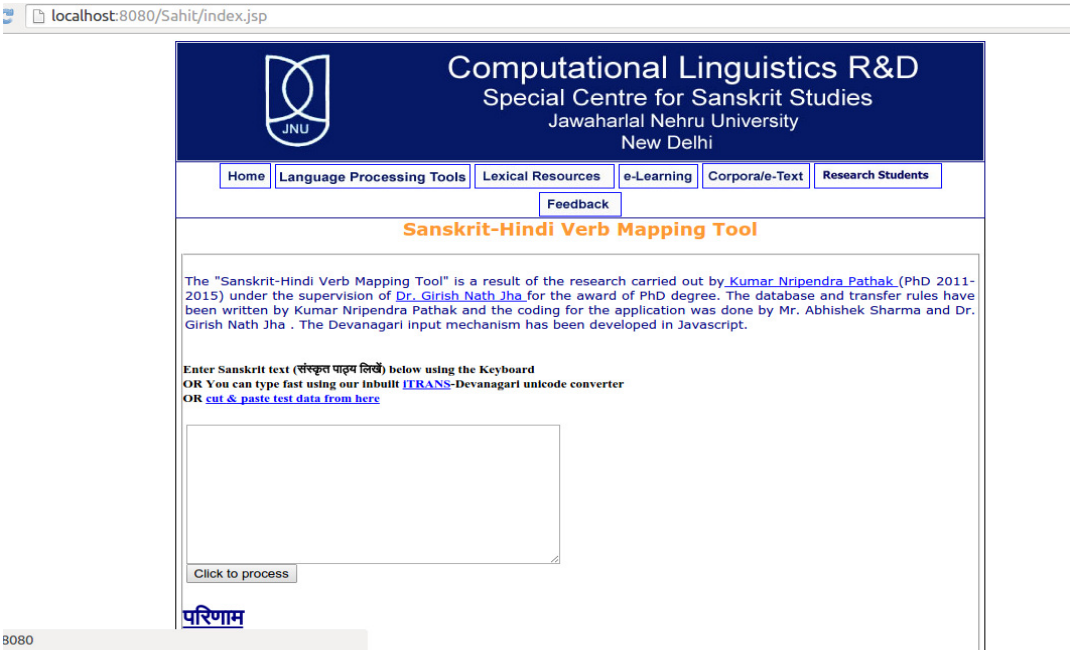


Figure 6.2: The user interface for Sanskrit-Hindi verb Mapping Tool.

Tool Evaluation: The verb mapping tool processes the primary verbs as well as derived verbs *(ṇijanta, yaṅanta, sananta* and *nāmadhātu*) in all the tenses and moods and produces the Hindi output. Here the only condition is that the input verb must be available in the database with their morphological information, so that morphological information can be fetched by the tool to implement the Hindi generation rules. Some prefix added verb forms with their morphological information have been added to the database to test the tool. This tool generates their output as well.

Following are the examples of verb mapping for Sanskrit-Hindi Translator where primary and the secondary verb forms (*yaṅanta, sananta* and *ṇijanta*) are mapped:

Tiṅanta output examples:

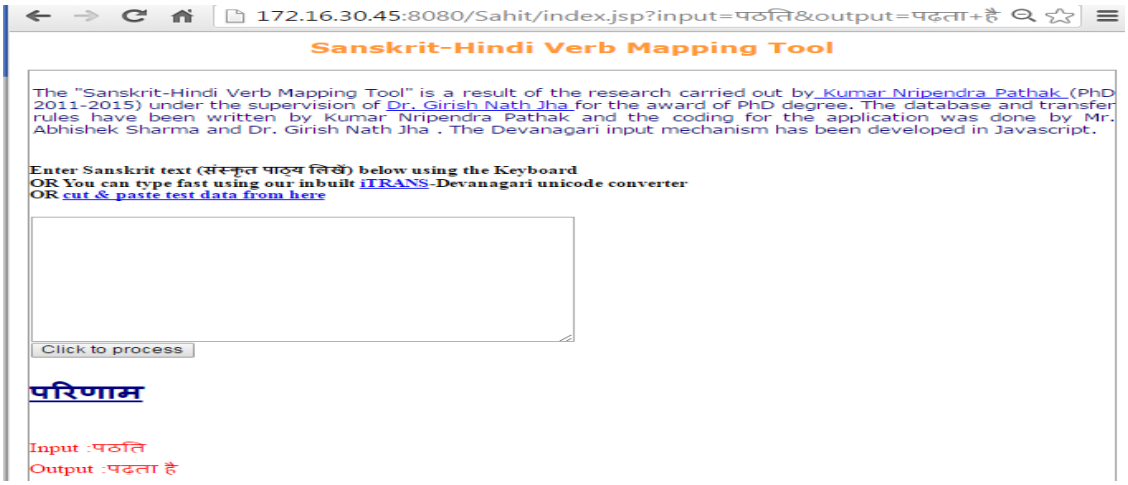


Figure 6.3: output of verb in *laṭ lakāra* third person singular number.

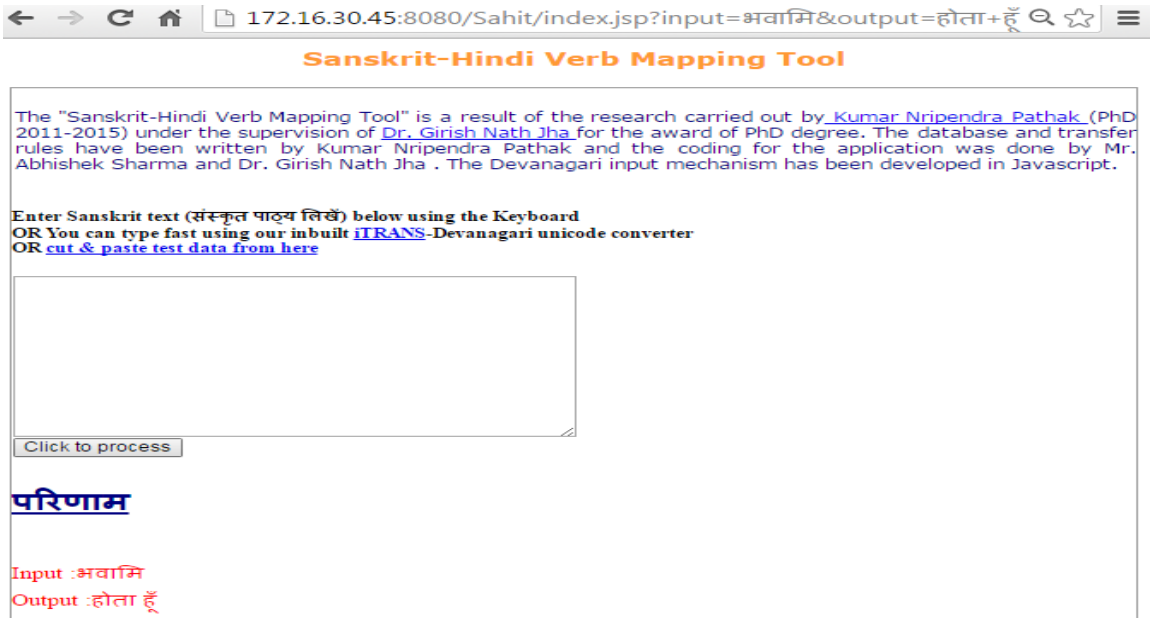


Figure 6.4: output of verb in *laṭ lakāra* first person singular number

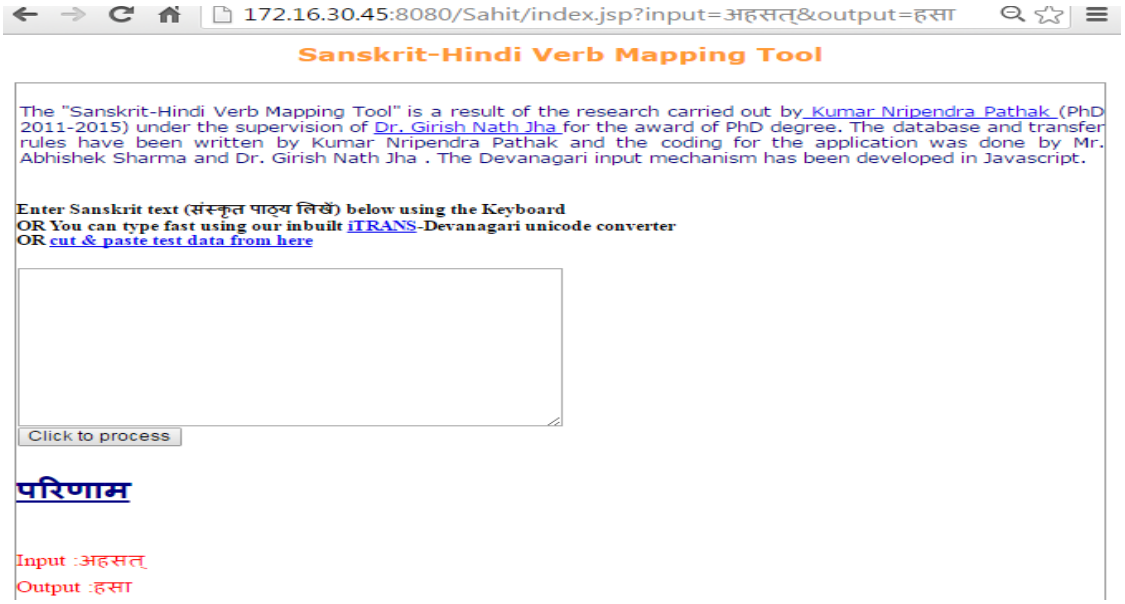


Figure 6.5: output of verb in *laṅ lakāra* third person singular number

Figure 6.6: output of verb in *luṭ lakāra* third person singular number

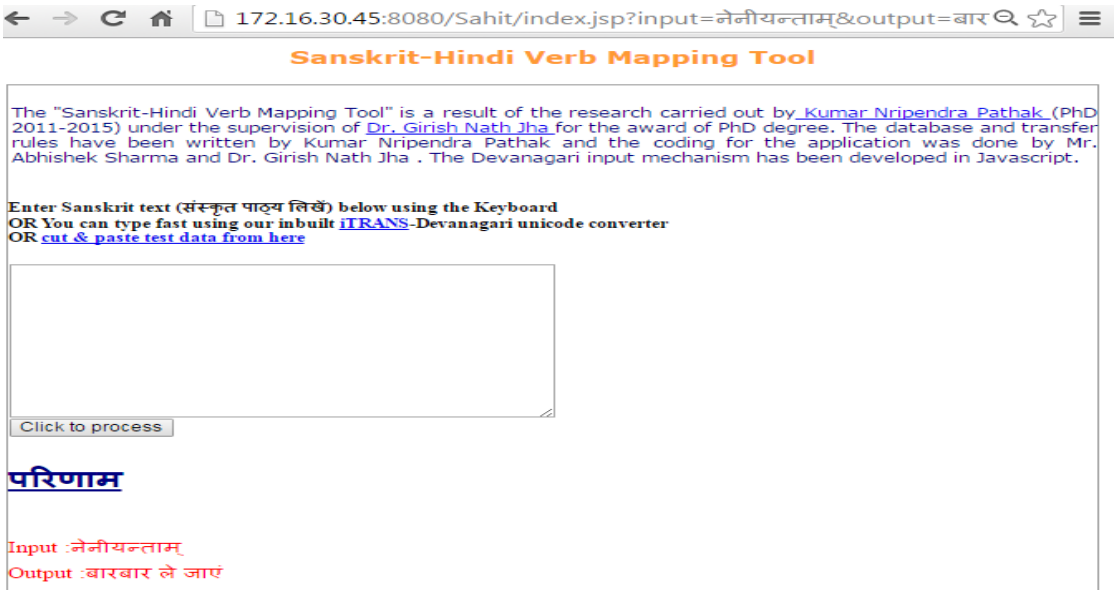


Figure 6.7: output of *yaṅanta* verb form

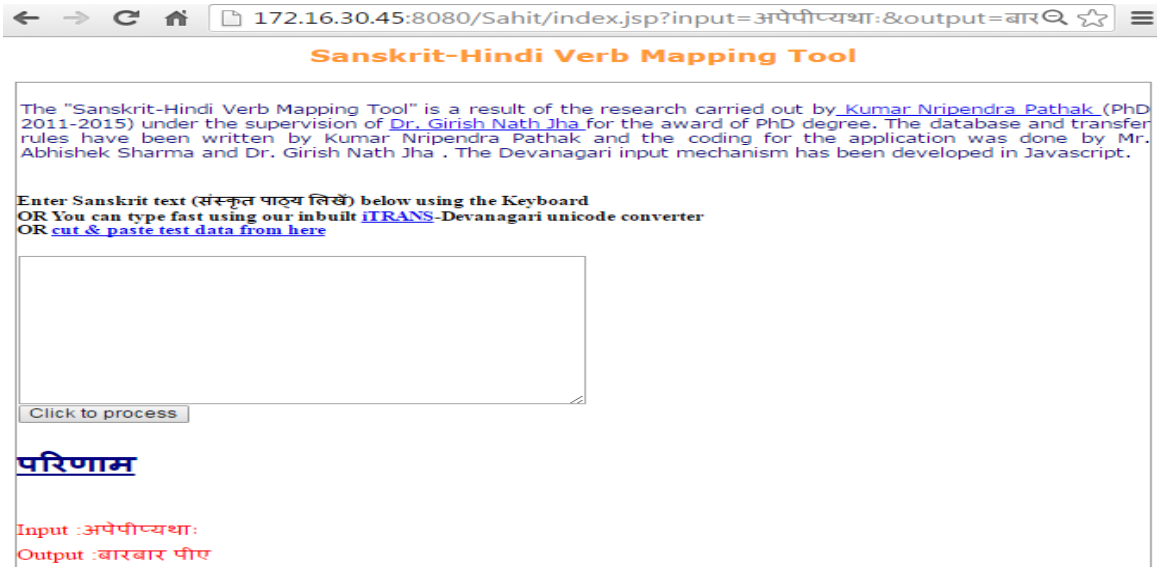


Figure 6.8: output of *yaṅanta* form

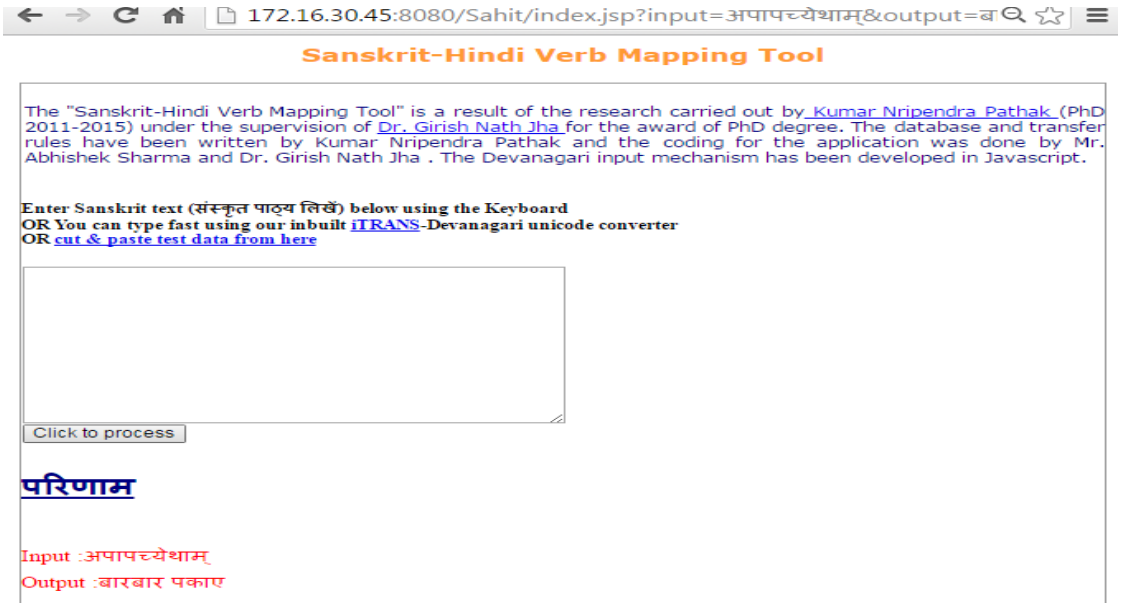


Figure 6.9: output of *yaṅanta* form

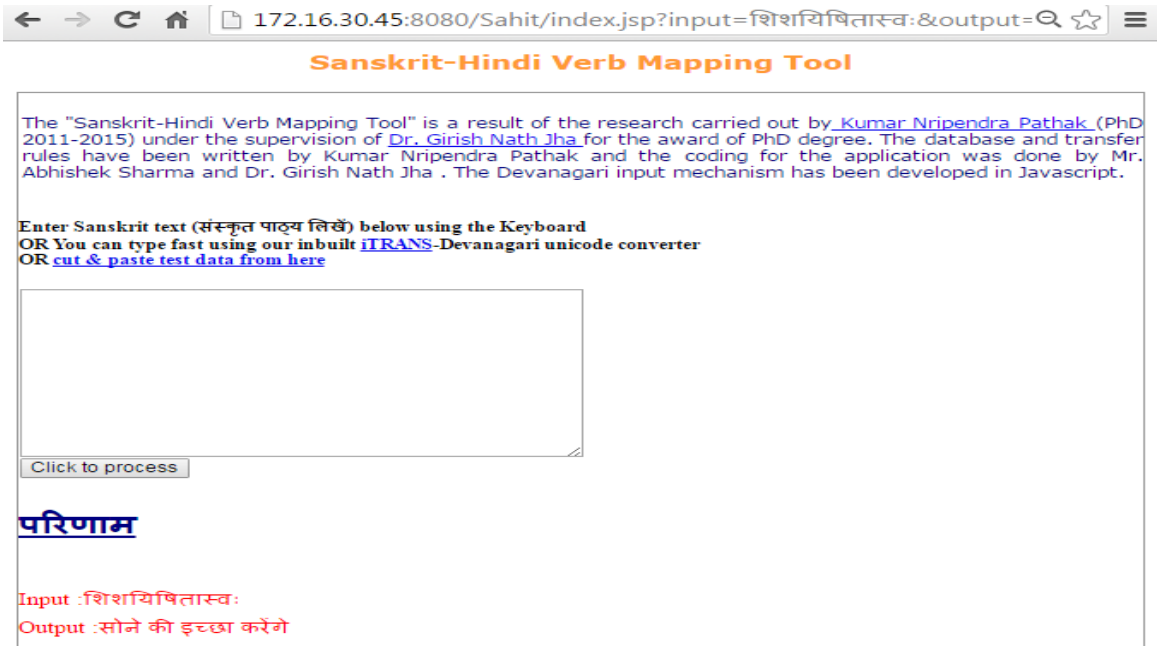


Figure 6.10: output of *sananta* form

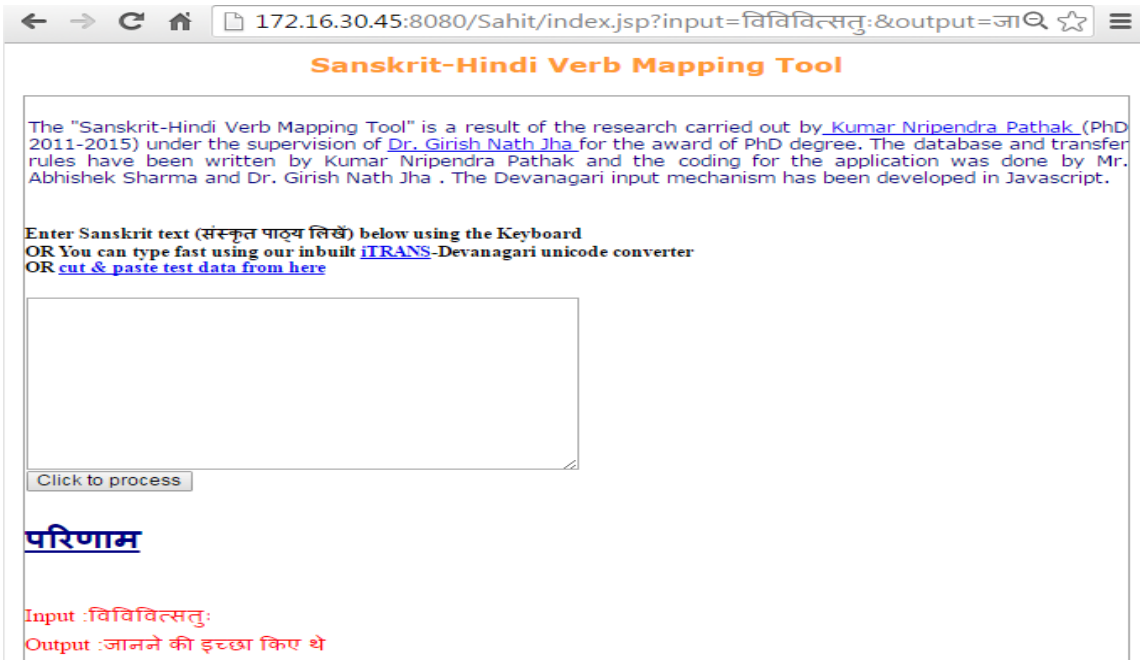


Figure 6.11: output of *sananta* form

Figure 6.12: output of *sananta* form

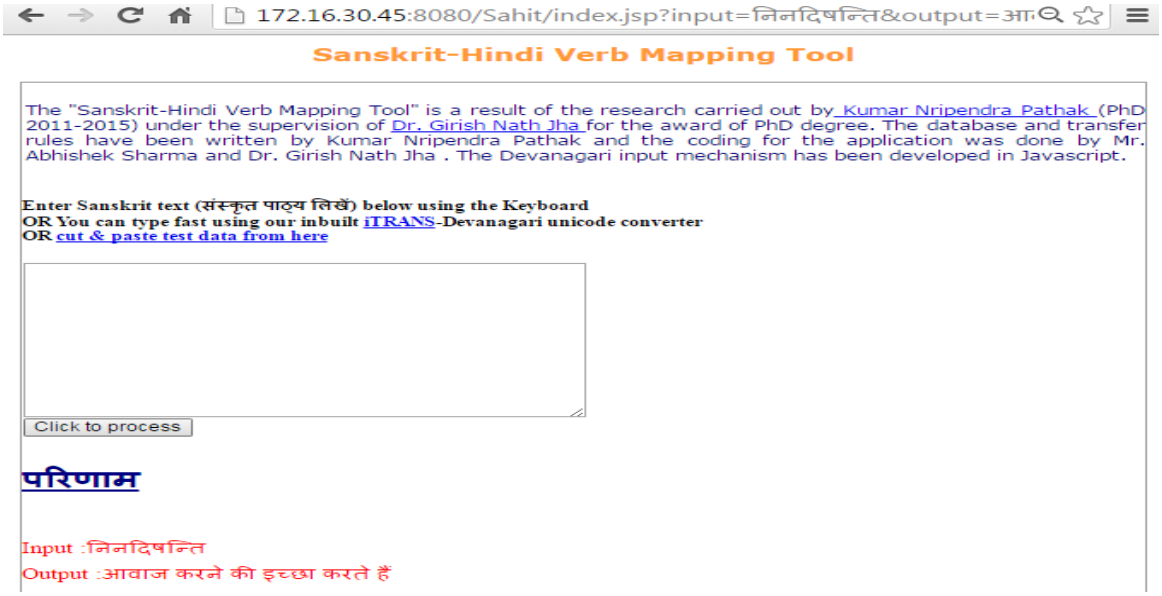


Figure 6.13: output of *sananta* form

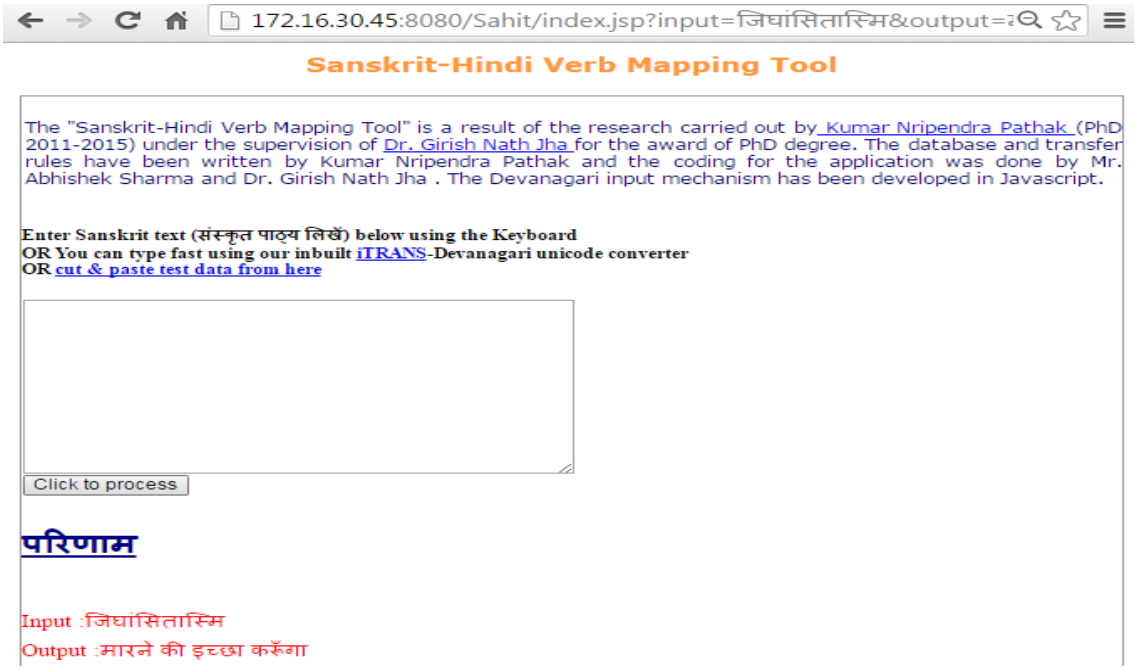


Figure 6.14: output of *sananta* form

Figure 6.15: output of *sananta* form

Figure 6.16: output of *sananta* form

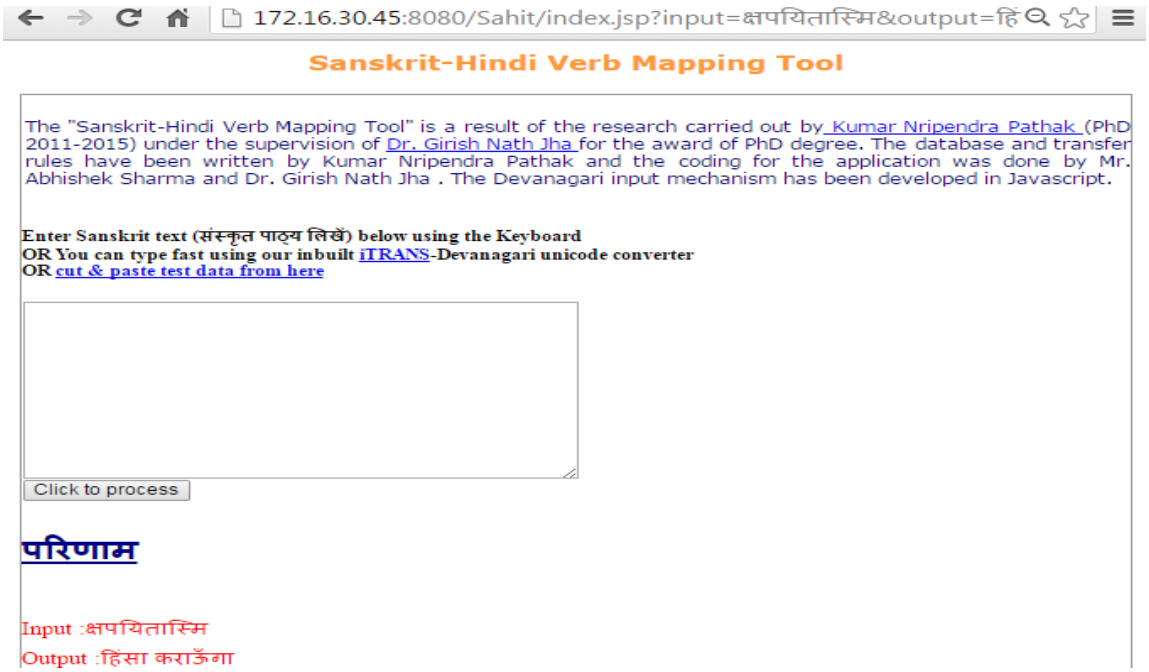


Figure 6.17: output of *ṇijanta* form

Figure 6.18: output of *ṇijanta-karmaṇi-loṭ* form

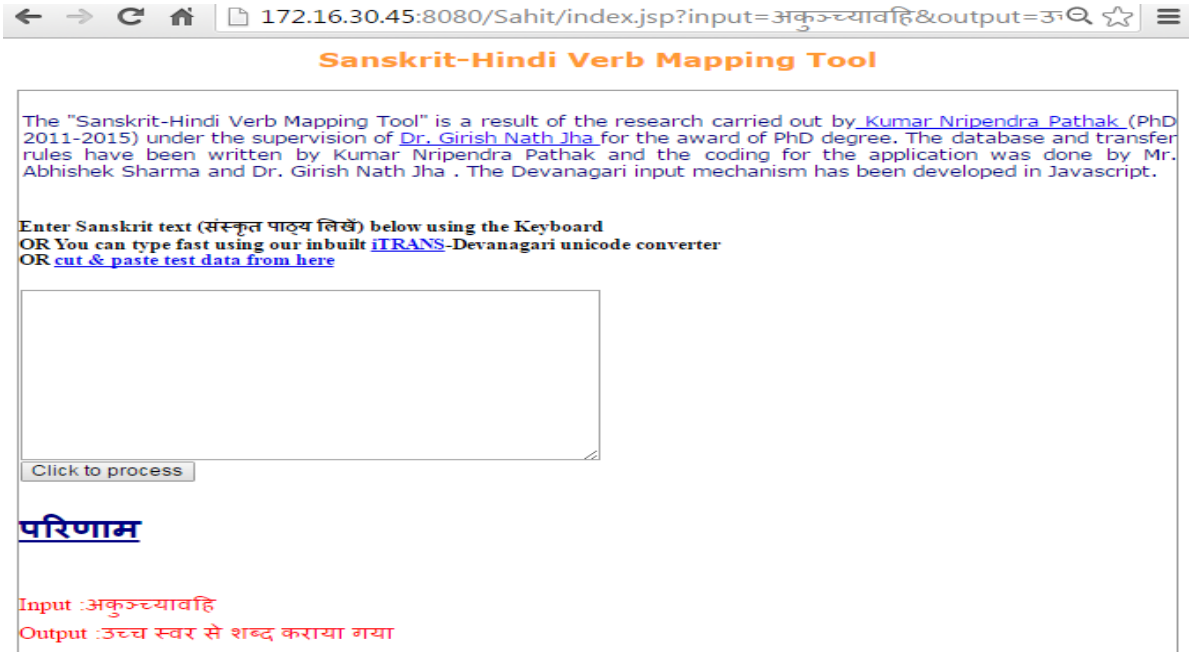


Figure 6.19: output of *ṇijanta* form

Figure 6.20: output of *nāmedhātu - kaṇvāyate*

Figure 6.21: output of *nāmadhātu - kaṇvāyadhvam*

Figure 6.22: output of the prefix added verb **प्रणेता** which has **प्र** suffix and **नी** root in *lu lakāra* form.

Figure 6.23: output of prefix added verb which has **प्र** prefix and **बुध्** root

Kṛdanta Output examples:

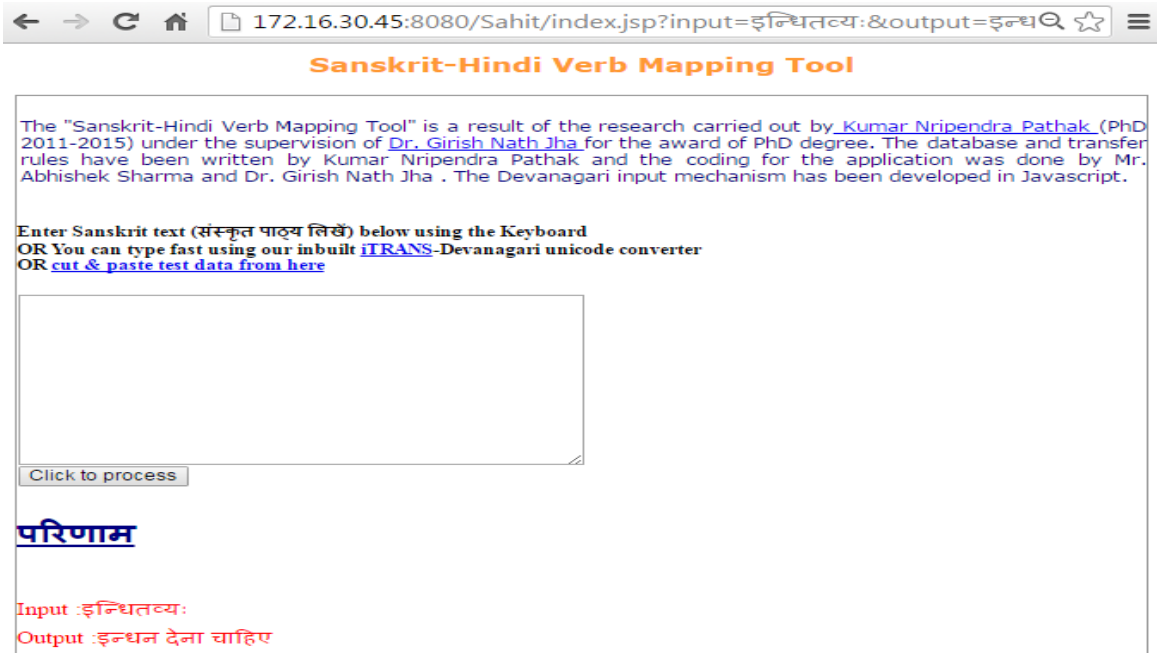


Figure 6.24: output of *kṛdanta* form "*indhitavyaḥ*"

After evaluation of the tool, it is noticed that Hindi verbs हो, कर, ले, and दे gets changed in past and causative cases. For example, ho becomes hu, kara becomes ki, le becomes li, and

de becomes di. The suffix part "आ" remains "आ" with हु, (हुआ). "आ" becomes या with ki, li, di. (किया, दिया, लिया) So, these changes can be handled according to these rules:

- Wherever हो is being added before आ suffix, it becomes हुआ,
- Wherever कर is being added before आ, it becomes किया,
- Wherever कर is being added before आया, it becomes करवाया
- Wherever ले is being added before आ, it becomes लिया
- Wherever दे is being added before आ, it becomes दिया
- Wherever दे is being added before आया, it becomes दिलवाया

After fixing these bugs, the output has been generated to test the tool.

Figure 6.24: output of abhavat (huā).

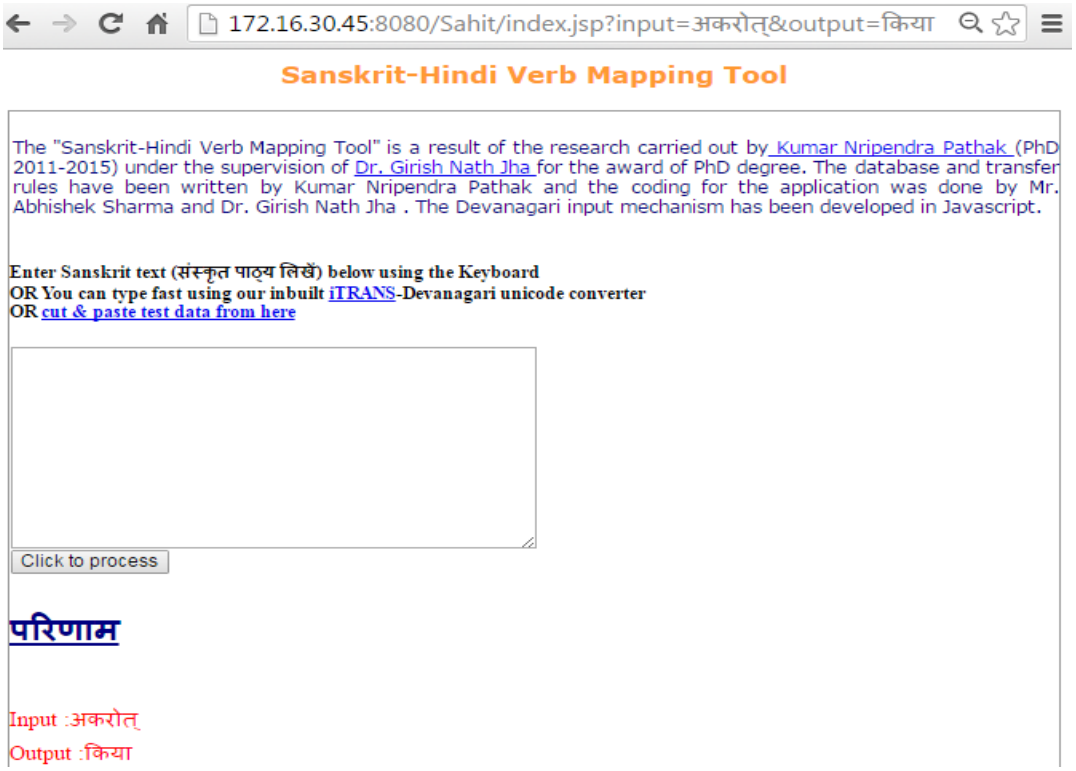


Figure 6.25: output of akarot (kiā).

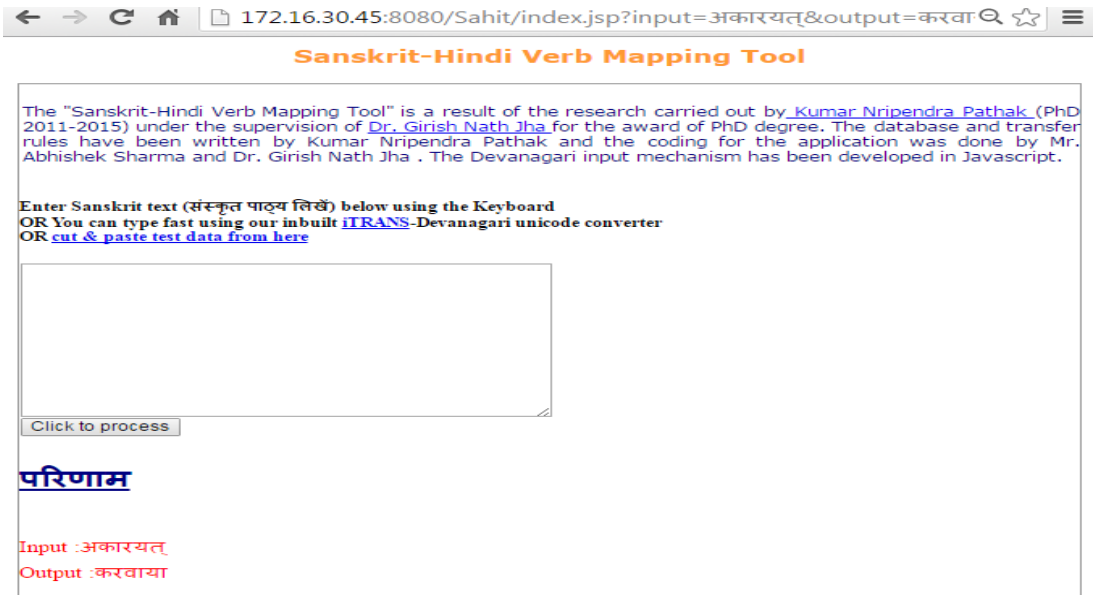


Figure 6.26: Example shows the output of akārayat (karavāyā).

Figure 6.27: output of agṛhṇāt (liyā)

Figure 6.28: output of adadat (diyā)

Figure 6.29: output of agṛāhyat (dilvāyā)

In this section of tool evaluation, this is observed that tool can handle all types of Sanskrit verb forms. The Sanskrit verbs must be in the database along with their morphological information and the tool will generate Hindi output with the help of that data.

Conclusion

In conclusion, the following five points are discussed: a) Goal achieved through this system, b) strength of this system c) Limitations of the system d) Challenges faced and e) Future scope of the research.

a) Goals achieved through this system:

The goal of present research was to develop a rule based system for Sanskrit-Hindi Verb Mapping for Sanskrit-Hindi Translator. Morphological analysis of Sanskrit verbs was pre-requirement to develop a system. So, a database of 133000 verbs has been created and their morphological analysis has been done. Depending on the types of morphological information, 722 tiṅanta transfer rules and 17 kṛdant transfer rules have been written to generate Hindi verb output. These rules are capturing all types of Sanskrit verbs (*prāthamika, ṇijanta, yañanta* and *sanant*) and verbal kṛdanta. Some nāmadhātu forms and prefix-added verb forms have also been added to the database to test the system. The output of different types of verbs has already me shown in the 6th chapter.

b) Strength of this system:

At present no other system is handling *ṇijanta, yañanta* and *sananta* verb forms of Sanskrit at MT level. So this system is capable of mapping those Sanskrit verbs into Hindi which have been stored in the *dhāturoop* database. Further this system can be added to the rule based Sanskrit-Hindi Translation system to generate Hindi verb output.

c) Limitations of the system:

There are some Hindi causatives and past forms of some root which can be called its limitation. Different types of verbs have been tested and the output is given the 6th

chapter. This rule based system is having difficulty in generating such causative verb forms where base of the root (Hindi root) is changing. For example- khānā gets changed into khilānā in causative. Here the base of causative form is changed so the system has limitation in producing such output. Further the double causative form generation in Hindi can also be called limitation of the system.

For ex-

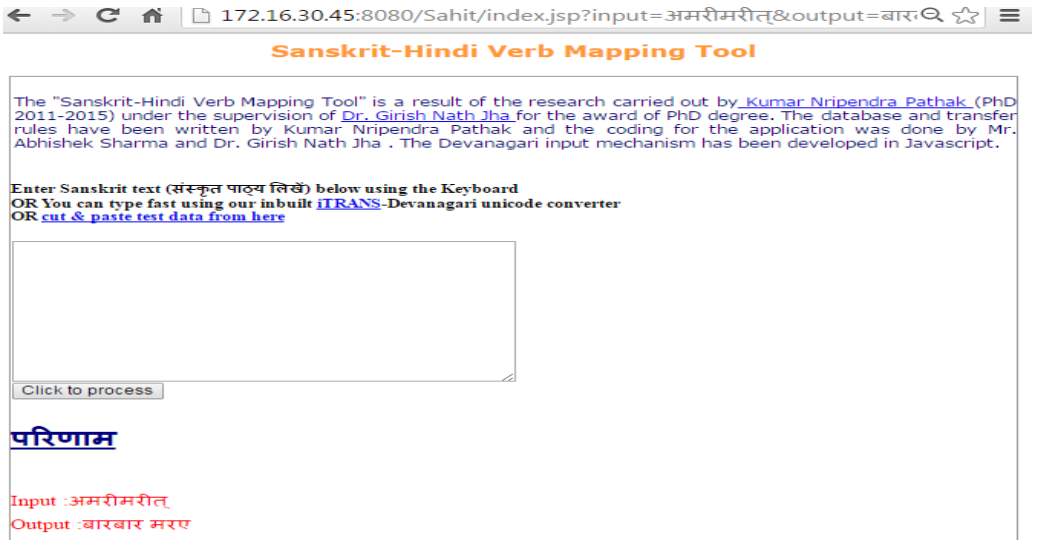
Pic shows the output of verb in causative.

Here karavāyā may also be there. Sanskrit has no separate form for double causative and Hindi has double causative forms as well. The Hindi root can take two possible suffix '*āyā*' and '*vāya*' with different verbs. For example- *paḍhāyā (paḍha + āyā); khulavāyā (khula + vāyā)* etc. Here in the *khulavāyā* (*khula + vāyā*), the imperative form *khola* is also changing in *khula*. So, the causative outputs will have to be cross checked and post edited by the users.

Further it is noticed that some mātrā (symbols) addition can be reported as bug for this system.

For example-

The output of *akuṇḍayat* shows extra "*mātrā*" in जलाया



Pic shows the bug in Hindi output "मरए" instead of "मरे".

These bugs are due to Hindi generation issues which needs post editing.

d) Challenges faced:

Fully Automated morphological analysis of Sanskrit verb according to the requirement of MT is not done anywhere so far. To develop this rule based Sanskrit-Hindi Verb Mapping Tool, the morphological analysis of 133000 Sanskrit verb data has been stored manually. The most challenging task was to write rules for verb mapping. If only the suffix-ending of Sanskrit verb would have been the basis for rule writing, the similarity (in some cases) of suffix-ending would have been created a lot of conflict in rule writing. So, the unique morphological analysis of verb (i.e.

prāthamikaḥ-laṭ-kartari-ekavacanam-uttamapuruṣaḥ) is provided to the system which is being replaced with Hindi suffix and RootMeaning table is providing the meaning of Sanskrit root to generate the final Hindi output. In Hindi generation, mātrā addition is creating some problems in some cases which needs to be improved. Post-editing of past tense forms in verbs like *kiyā, huā, liyā, diyā* and causatives *karavāyā, dilawāyā* etc have been fixed carefully. The prefix-root combinations can generate almost 46 lakh verb forms and *nāmadhātu* forms are also huge in numbers. Adding these data in the system is a challenge which gives scope for tool improvement.

e) Future Scope of the Research:

In future the database needs to be upgraded to map all the verb forms in Sanskrit-Hindi MT system. The Sanskrit verb analysis is already available and patterns of all the Sanskrit verb forms have already been identified in this research. So this system can easily be implemented to generate verbs in Sanskrit to other Indian Languages. Only target language rule files and root-meaning file needs to be replaced with the desired target language.

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Appendix-I

Sanskrit Roots and Possible Prefix-Root Combinations

ईण्	गा	प्रवस्	उपकृ
अभिगा	गृ	प्रवृ	उपास्
अभीष्	इष्	प्रावृ	उपास्
अभिवृ	कृ	समनुगा	उपाश्
अभ्यस्	क्षि	समस्	उपसिध्
अधिगा	नश्	समश्	वस्
आगा	नी	संगा	विचि
आकृ	निवस्	संगृ	विद्
अनुगा	पा	संहा	विधाव्
अनुकृ	पराकृ	संकृ	विकृ
अनुविद्	परिभुज्	समुद्ध	विनिकृ
अपचि	परिचि	समुपाश्	विप्रकृ
अपाकृ	परिगा	संविद्	विवस्
अस्	परिकृ	संवृ	वृ
अश्	परिपा	शी	अभिगा
आवृ	परिविद्	सिध्	अभीष्
भुज्	परिवृ	शिक्षय्	अभिवृ
चि	पृ	उद्ध	अभ्यस्
दा	प्रभुज्	उद्गा	अधिगा
धा	प्रगा	ऊह्	आगा
धाव्	प्रतिकृ	उपगा	आकृ

अनुगा	परिचि	शी	आभास्
अनुकृ	परिगा	सिध्	आभाष्
अनुविद्	परिकृ	शिक्षय्	आभासय्
अपचि	परिपा	उद्भू	आभासीभू
अपाकृ	परिविद्	उद्गा	अभवस्तृ
अस्	परिवृ	ऊह्	अभी
अश्	पृ	उपगा	अभिबाध्
आवृ	प्रभुज्	उपकृ	अभिबन्ध्
भुज्	प्रगा	उपास्	अभिभा
चि	प्रतिकृ	उपाश्	अभिभाष्
दा	प्रवस्	उपसिध्	अभिभू
धा	प्रवृ	वस्	अभिचक्ष्
धाव्	प्रावृ	विचि	अभिचर्
गा	समनुगा	विद्	अभिचिन्तय्
गृ	समस्	विधाव्	अभिचोदय्
इष्	समश्	विकृ	अभिचुम्ब्
कृ	संगा	विनिकृ	अभिदा
क्षि	संगृ	विप्रकृ	अभिदंश्
नश्	संहा	विवस्	अभिदापय्
नी	संकृ	वृ	अभिदर्शय्
निवस्	समुद्भू	आबाध्	अभिदास्
पा	समुपाश्	आबन्ध्	अभिधा
पराकृ	संविद्	आभा	अभिधारय्
परिभुज्	संवृ	आभज्	अभिधर्षय्

अभिधाव्	अभिहन्	अभिक्लृप्	अभिलुल्
अभिधेयीकृ	अभिहारय्	अभिकृ	अभिमद्
अभिधृ	अभिहर्षय्	अभिक्रम्	अभिमन्
अभिधृष्	अभिहिंस्	अभिक्रामय्	अभिमानय्
अभिध्वंस्	अभिहिङ्कृ	अभिकृष्	अभिमन्थ्
अभिध्यै	अभिहृ	अभिकृत्	अभिमर्दय्
अभिदीपय्	अभिहृष्	अभिक्रुध्	अभिमर्षय्
अभिद्रावय्	अभिहु	अभिक्रुश्	अभिमिह्
अभिदृश्	अभिजल्प्	अभीक्ष्	अभिमोहय्
अभिद्रु	अभिजन्	अभिक्षन्	अभिमृद्
अभिद्रुह्	अभिजप्	अभिक्षर्	अभिमृश्
अभिदुह्	अभिजि	अभिक्षिप्	अभिमुच्
अभिदूषय्	अभिज्ञा	अभिकुष्	अभिमुह्
अभिगम्	अभिजुष्	अभिलभ्	अभिमुखीभू
अभिगमय्	अभिज्वल्	अभिलक्ष्	अभिमुखीकृ
अभिगर्ज्	अभिकल्पय्	अभिलक्षय्	अभिमूर्छ्
अभिगर्व्	अभिकामय्	अभिलङ्घय्	अभिनद्
अभिघारय्	अभिकम्प्	अभिलप्	अभिनादय्
अभिघातय्	अभिकम्पय्	अभिलष्	अभिनह्
अभिघ्रा	अभिकाङ्क्ष्	अभिलाषीभू	अभिनम्
अभिगृ	अभिकर्शय्	अभिलेखय्	अभिनन्द्
अभिग्रह्	अभिखन्	अभिली	अभिनन्दय्
अभिग्राहय्	अभिख्या	अभिलिख्	अभिनर्द्
अभिगुप्	अभिख्यापय्	अभिलिङ्ग्	अभिनी

अभिनिधा	अभिनिष्पू	अभिपिश्	अभिप्ररुह्
अभिनिध्यै	अभिनिसृ	अभिप्लावय्	अभिप्रसद्
अभिनिहन्	अभिनिवर्तय्	अभिप्लु	अभिप्रसादय्
अभिनिःसृ	अभिनिवेदय्	अभिपृ	अभिप्रशामय्
अभिनिःश्वस्	अभिनिवेशय्	अभिप्रच्छ	अभिप्रशंस्
अभिनिमुच्	अभिनिविश्	अभिप्रचोदय्	अभिप्रशोधय्
अभिनिन्द्	अभिनिवृत्	अभिप्रधाव्	अभिप्रस्था
अभिनिपीडय्	अभिनोदय्	अभिप्रदूषय्	अभिप्रस्थापय्
अभिनिरस्	अभिनुद्	अभिप्रग्रह्	अभिप्रसू
अभिनिर्भर्त्स्	अभिन्यस्	अभिप्रहन्	अभिप्रस्वप्
अभिनिर्दिश्	अभिपच्	अभिप्रजन्	अभिप्रतप्
अभिनिर्गम्	अभिपद्	अभिप्रज्ञा	अभिप्रतर्पय्
अभिनिर्हृ	अभिपालय्	अभिप्रज्वल्	अभिप्रथय्
अभिनिर्जि	अभिपरी	अभिप्रकम्प्	अभिप्रती
अभिनिर्मा	अभिपरिग्ला	अभिप्रक्रम्	अभिप्रतिपद्
अभिनिर्मुच्	अभिपरिप्लु	अभिप्रमन्थय्	अभिप्रतिपादय्
अभिनिर्णुद्	अभिपरिष्कृ	अभिप्राण्	अभिप्रवर्धय्
अभिनिर्वर्तय्	अभिपरिष्वञ्ज्	अभिप्रणम्	अभिप्रवर्तय्
अभिनिर्वृत्	अभिपरिवारय्	अभिप्रणुद्	अभिप्रविश्
अभिनिर्या	अभिपश्	अभिप्राप्	अभिप्रव्रज्
अभिनिषिच्	अभिपत्	अभिप्रपच्	अभिप्रवृध्
अभिनिष्क्रम्	अभिपातय्	अभिप्रपद्	अभिप्रवृष्
अभिनिष्पद्	अभिपठ्	अभिप्रपीडय्	अभिप्रवृत्
अभिनिष्पत्	अभिपीडय्	अभिप्रपूजय्	अभिप्रया

अभिप्रे	अभिसमाया	अभिसंमुह्	अभिसंस्था
अभिप्रेक्ष्	अभिसम्बन्ध्	अभिसंनह्	अभिसंस्थापय्
अभिप्रेरय्	अभिसम्भू	अभिसंनी	अभिसंस्तु
अभिप्रेषय्	अभिसंबुध्	अभिसम्पद्	अभिसंतप्
अभिप्रीणय्	अभिसंछद्	अभिसंपादय्	अभिसंत्रस्
अभिपूजय्	अभिसंचिन्तय्	अभिसम्पत्	अभिसंत्यज्
अभिपूरय्	अभिसंधा	अभिसम्प्लु	अभिसंविश्
अभिराधय्	अभिसंदिह्	अभिसम्प्राप्	अभिसंवृ
अभिरक्ष्	अभिसमे	अभिसम्प्रपद्	अभिसंवृध्
अभिरम्	अभिसंगम्	अभिसम्प्रवर्तय्	अभिसंव्यध्
अभिरमय्	अभिसंगुप्	अभिसम्प्रया	अभिसंयम्
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अभिरोचय्	अभिसमीरय्	अभिसंरञ्ज्	अभिशङ्क्
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अभिरुद्	अभिसंकृ	अभिसंसीव्	अभिसारय्
अभिरुह्	अभिसंक्रम्	अभिसंस्कृ	अभिसर्जय्
अभिषह्	अभिसंक्रुध्	अभिसंश्लिष्	अभिशास्
अभिसमाधा	अभिसंक्रुश्	अभिसंस्मृ	अभिसत्कृ
अभिसमागम्	अभिसंक्षिप्	अभिसंश्रि	अभिषेचय्
अभिसमस्	अभिसंमद्	अभिसंसृज्	अभिषेकय्
अभिसमावृत्	अभिसम्मन्	अभिसंस्तम्भ्	अभिसेव्

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अभिव्याहारय्	अभ्यह्	अभ्यर्चय्	अभ्याविश्
अभिव्याह्व	अभ्याहन्	अभ्यर्दय्	अभ्यावृत्
अभिव्याख्या	अभ्याह्व	अभ्यश्	अभ्याया
अभिव्यञ्ज्	अभ्याख्या	अभ्यासादय्	अभ्यायम्
अभिव्यञ्जय्	अभ्याकृ	अभ्यासय्	अभ्ये
अभिव्याप्	अभ्यालभ्	अभ्यासिच्	अभ्यृछ्
अभिया	अभ्यलंकृ	अभ्यासीकृ	अभ्युच्छ्र
अभियाच्	अभ्यानी	अभ्यती	अभ्युद्ध
अभियज्	अभ्यञ्ज्	अभ्यतिक्रम्	अभ्युद्गम्
अभियोजय्	अभ्यञ्जय्	अभ्यतिवृत्	अभ्युद्गृ
अभियुध्	अभ्यनुगम्	अभ्यवचारय्	अभ्युदि
अभियुज्	अभ्यनुज्ञा	अभ्यवधा	अभ्युदीक्ष्
आभृ	अभ्यनुज्ञापय्	अभ्यावह्	अभ्युदीर्
आभ्रामय्	अभ्यनुमन्	अभ्यवहारय्	अभ्युदीरय्
आभ्रंशय्	अभ्यनुमोदय्	अभ्यवह्व	अभ्युद्या
आभू	अभ्यनुशास्	अभ्यवकृ	अभ्युद्यम्
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अनुदुष्	अनुक्रीड्	अनुनादय्	अनुप्रदा
अनुगाह्	अनुकृष्	अनुनामय्	अनुप्रदर्शय्
अनुगम्	अनुकृत्	अनुनन्द्	अनुप्रधाव्
अनुगर्ज्	अनुक्षम्	अनुनी	अनुप्रहि
अनुग्रह्	अनुक्षि	अनुनिशम्	अनुप्रह्व
अनुगृध्	अनुकूज्	अनुनिशामय्	अनुप्रमद्
अनुगुप्	अनुलेपय्	अनुनिविश्	अनुप्रणम्
अनुहन्	अनुली	अनुपा	अनुप्राप्
अनुह्व	अनुलिह्	अनुपद्	अनुप्रपद्
अनुहुंकृ	अनुलिप्	अनुपालय्	अनुप्रसद्
अनुजागृ	अनुमा	अनुपरी	अनुप्रशंस्
अनुजन्	अनुमज्ज्	अनुपरिक्रम्	अनुप्रस्था
अनुजीव्	अनुमन्	अनुपरिक्रामय्	अनुप्रस्तृ
अनुज्ञा	अनुमानय्	अनुपरिया	अनुप्रतिपद्
अनुज्ञापय्	अनुमापय्	अनुपर्युक्ष्	अनुप्रवच्
अनुकल्पय्	अनुमार्जय्	अनुपश्	अनुप्रवेशय्
अनुकम्प्	अनुमि	अनुपत्	अनुप्रविश्
अनुकम्पय्	अनुमीलय्	अनुपातय्	अनुप्रव्रज्
अनुकाङ्क्ष्	अनुमोदय्	अनुपठ्	अनुप्रवृध्
अनुकारय्	अनुमृ	अनुपायय्	अनुप्रवृत्
अनुकर्शय्	अनुमृज्	अनुपीडय्	अनुप्रया
अनुकीर्तय्	अनुमृश्	अनुप्लु	अनुप्रयम्
अणूकृ	अनुमुद्	अनुप्रभू	अनुप्रयुज्

अनुपृच्	अनुसंज्वर्	अनुशिक्ष्	अनुवद्
अनुप्रेक्ष्	अनुसंक्रम्	अनुशिष्	अनुवादय्
अनुपूजय्	अनुसम्मन्	अनुसीव्	अनुवाहय्
अनुपूरय्	अनुसंपिष्	अनुस्मृ	अनुवल्
अनुरक्ष्	अनुसम्प्राप्	अनुस्पृश्	अनुवारय्
अनुरम्	अनुसंसाधय्	अनुसृ	अनुवर्तय्
अनुरञ्ज्	अनुसंस्मृ	अनुश्रावय्	अनुवस्
अनुरञ्जय्	अनुसंसृ	अनुश्रि	अनुवेष्टय्
अनुरोचय्	अनुसंसृज्	अनुसृज्	अनुविभज्
अनुरुद्	अनुसंस्था	अनुसृप्	अनुविचर्
अनुरुध्	अनुसंतन्	अनुश्रु	अनुविचिन्तय्
अनुरुह्	अनुसंवेदय्	अनुष्टन्	अनुविधा
अनुसाधय्	अनुसंवृ	अनुष्ठा	अनुविहन्
अनुसह्	अनुसंव्रज्	अनुष्ठापय्	अनुवीज्
अनुसमाह्व	अनुसंया	अनुशुच्	अनुविकस्
अनुसंबन्ध्	अनुषञ्ज्	अनुतप्	अनुवीक्ष्
अनुसंचर्	अनुषञ्जय्	अनुतापय्	अनुविमृश्
अनुसंचारय्	अनुसारय्	अनूत्पत्	अनुविनादय्
अनुसंचि	अनुशास्	अनुतृप्	अनुविश्
अनुसंचिन्तय्	अनुसेचय्	अनुतृष्	अनुविषद्
अनुसंधा	अनुसेव्	अनूत्था	अनुविसृप्
अनुसंदिह्	अनुशी	अनुतुष्	अनुवृ
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अपरुध्	अपवर्तय्	आपृ	आरोहय्
अपास्	अपावर्तय्	आप्रच्छ्	आरोपय्
अपसंह्व	अपविद्	आप्रयम्	अर्पय्
अपसारय्	अपावृ	आप्री	आरुध्
अपसर्पय्	अपवृज्	आपूजय्	आरुह्
अपसिध्	अपवृत्	आपूरय्	आरुज्
अपस्मृ	अपावृत्	आप्या	आस्
अपसृ	अपव्यध्	आप्यायय्	आश्
अपासृ	आपय्	आरभ्	आसद्
अपाश्रि	अपया	आरचय्	आसादय्
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आपत्	अपेक्ष्	आरम्	आसनीकृ
अपतर्पय्	अपेक्षय्	आरम्भय्	आसञ्ज्
आपातय्	अपी	आरञ्ज्	आसञ्जय्
आपाटय्	आपीडय्	आरट्	आशङ्क्
अपत्रप्	अपिधा	अर्च्	आशास्
अपत्रस्	अपिग्रह्	अर्चय्	असत्कृ
अपवद्	अपिनह्	अर्दय्	आसय्
अपवादय्	अपिनी	अर्धय्	आशय्
अपवध्	आप्लावय्	आर्द्रीकृ	आश्चोतय्
अपवह्	आप्लु	अर्ह्	आसेचय्
अपवाहय्	आप्लुष्	अर्हय्	आसेधय्

आसेव्	आस्तृ	अतिदिश्	अतिपद्
आसेवय्	आस्त्यै	अतिद्रु	अतिपारय्
आशी	आसु	अतिगा	अतिपरि
आसिच्	असुलभीभू	अतिगाह्	अतिपत्
आसिध्	आस्वद्	अतिगम्	अतिपातय्
आसिञ्ज्	आस्वादय्	अतिघ्रा	अतिपीडय्
आश्लिष्	आश्वस्	अतिहन्	अतिपृ
आशोधय्	आश्वासय्	अतिह्व	अतिप्रणुद्
आस्पन्द्	आश्या	अतिजीव्	अतिप्रसद्
आस्फालय्	अत्	अतिकालय्	अतिप्रस्नु
आस्फोटय्	अट्	अतिख्या	अतिप्रतम्
आस्पृश्	आताडय्	अतिकोपय्	अतिप्रवृध्
आशृ	आतन्	अतिक्रम्	अतिप्रवृत्
आस्रावय्	आतप्	अतिक्रामय्	अतिप्रेरय्
आश्रावय्	आतर्जय्	अतिक्रुश्	अतिराज्
आश्रि	अती	अतिक्षिप्	अतिरेचय्
आसृज्	अतिभा	अतिलालय्	अतिरिच्
आसृप्	अतिभावय्	अतिलङ्घय्	अतिरोचय्
आस्नु	अतिभूषय्	अतिलोलय्	अतिरोपय्
आश्नु	अतिब्रू	अतिमद्	अतिरुच्
अस्तंगमय्	अतिचर्	अतिमन्	अतिरुह्
आस्था	अतिचेष्ट्	अतिमुच्	अतिसंधा
आस्थापय्	अतिदा	अतिनी	अतिसंरुध्
अस्थिरीभू	अतिदर्पय्	अतिनिःश्वस्	अतिशंस्

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अवगम्	अवजि	अवलेहय्	अवनामय्
अवागम्	अवज्ञा	आवल्ग्	आवन्द्
अवगमय्	अवजृम्भ्	अवली	अवनी
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अवघर्षय्	अवक्लिद्	अवलिख्	अवनिष्ठीव्
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अवघोषय्	अवकृ	अवलोडय्	अवाप्
अवघ्रा	अवाकृ	अवलोकय्	आवप्
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क्लेशय्	कृष्	क्षु	लगय्
क्लिद्	कृशीभू	क्षुभ्	लागय्
क्लिश्	कृष्णीभू	क्षुद्	लज्ज्
क्नोपय्	कृत्	क्षुध्	लज्जय्
कोपय्	कृतार्थीकृ	क्ष्वेडय्	लक्ष्
कोष्टकीकृ	क्रुध्	क्ष्विड्	लक्षय्
कोष्ठकीकृ	क्रुश्	कुड्मलीकृ	लक्षीकृ
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क्रम्	क्षमय्	कुञ्च्	लालसीभू
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क्रीडय्	क्षारय्	कुट्टय्	लापय्
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नद्	निबुध्	निग्राहय्	निकल्
नादय्	निचयीकृ	निगुह्	निकालय्
नह्	निच्छादय्	निगूहय्	निकर्तय्
नाहय्	निचि	निगुप्	निकष्
नम्	नीचीकृ	निहा	निखन्
नमस्कृ	निदर्शय्	निहन्	निखानय्
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नामय्	निधापय्	निह्नु	निकृ
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नष्टपिष्टीकृ	निदिश्	निःस्रावय्	निकुञ्च्
नट्	निगा	निःसृज्	निकुञ्चय्
नाटय्	निगद्	निःसृप्	निली
नवीकृ	निगालय्	निःस्नु	निमा
नायय्	निगम्	निःष्ठा	निमज्ज्
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निवध्	नू	पराहृ	परिबाध्
निवह्	नुद्	पराजि	परिबन्ध्
निवप्	न्यक्कृ	पराक्रम्	परिभा
निवापय्	न्यञ्च्	पराकृष्	परिभक्षय्
निवारय्	न्यस्	परमेश्वरीभू	परिभञ्ज्
निवर्तय्	न्यासय्	परमेश्वरीकृ	परिभर्जय्
निवासय्	न्यासीकृ	परामृज्	परिभर्त्स्
निवेदय्	न्युब्जीकृ	परामृश्	परिभर्त्सय्
निवेशय्	पच्	परामृष्	परिभाष्
निवेष्टय्	पाचय्	पराङ्मुखीभू	परिभावय्
निविद्	पद्	पराङ्मुखीकृ	परिभिद्
निविश्	पादय्	पराणुद्	परिभ्राज्
निवृ	पक्षीभू	परापत्	परिभ्रम्
निवृत्	पक्षीकृ	परास्	परिभ्रमय्
निया	पक्वीकृ	परासिच्	परिभ्रंश्
नियम्	पालय्	पराश्वस्	परिभृज्ज्
नियमय्	पल्लवीकृ	परतन्त्रीकृ	परिभू
नियामय्	पण्	परावर्तय्	परिभूष्
नियोधय्	पणय्	परावस्	परिबृंहय्
नियोजय्	पराभावय्	परावृत्	परिचक्ष्
नियुध्	पराभू	पारय्	परिचालय्
नियुज्	पराद्रु	परायत्	परिचर्

परिचारय्	परिदीप्	परिहापय्	परिखिद्
परिचर्व्	परिदीपय्	परिहारय्	परिख्या
परिच्छद्	परिदीव्	परिहर्षय्	परिकीर्तय्
परिच्छिद्	परिद्रावय्	परिहस्	परिक्लम्
परिचिन्तय्	परिदृभ्	परिहासय्	परिक्लेदय्
परिचोदय्	परिदृश्	परिहृ	परिक्लिद्
परिचुम्ब्	परिदु	परिह्रासय्	परिक्लिश्
परिच्यु	परिद्विष्	परिहृष्	परिकोपय्
परिदा	परिगद्	परिजल्प्	परिक्रम्
परिदह्	परिगल्	परिजन्	परिक्री
परिदाहय्	परिगालय्	परिजप्	परिक्रीड्
परिदंश्	परिगम्	परिजारय्	परिकृष्
परिदेवय्	परिगमय्	परिजि	परिकृत्
परिधा	परिगणय्	परिज्ञा	परिक्रुश्
परिढक्कय्	परिगर्ह्	परिजृ	परीक्ष्
परिधम्	परिगर्हय्	परिज्वल्	परिक्षन्
परिधामय्	परिघट्	परिकलय्	परिक्षर्
परिधापय्	परिघट्टय्	परिकालय्	परीक्षय्
परिधर्षय्	परिघृष्	परिकल्पय्	परिक्षेपय्
परिधाव्	परिघूर्ण्	परिकर्षय्	परिक्षि
परिधिष्ठा	परिग्ला	परिकर्तय्	परिक्षिप्
परिधृ	परिग्रह्	परिकथय्	परिक्षु
परिधू	परिहा	परिखन्	परिकुप्
परिध्वंस्	परिहन्	परिखेदय्	परिकुट्

परिलम्ब्	परिमृज्	परिनिष्ठा	परिपू
परिलेखय्	परिमृश्	परिनियम्	परिपूजय्
परिलेपय्	परिमुच्	परिनृत्	परिपूरय्
परिली	परिमुह्	परिणू	परिरभ्
परिलिह्	परिमूर्छय्	परिणुद्	परिरक्ष्
परिलिख्	परिमुष्	परिपच्	परिरुध्
परिलिप्	परिणह्	परिपाचय्	परीष्
परिलोडय्	परिणम्	परिपालय्	परिषद्
परिलुल्	परिणमय्	परिपश्	परिसाधय्
परिलुण्ठ्	परिणामय्	परिपत्	परिसमादा
परिलुप्	परिनन्द्	परिपातय्	परिसमाप्
परिमा	परिणायय्	परिपाटय्	परिशमय्
परिमारय्	परिणी	परिपठ्	परिसंहृष्
परिमर्दय्	परिणिहन्	परिपाठय्	परिसंख्या
परिमार्जय्	परिनिपीडय्	परिपेषय्	परिसंलिह्
परिमर्शय्	परिनिर्मा	परिपीडय्	परिसंपत्
परिमेलय्	परिनिर्णिज्	परिपिष्	परिसंस्पृश्
परिम्ला	परिनिर्वा	परिप्लावय्	परिसंस्था
परिमोचय्	परिनिर्वृ	परिप्लु	परिसंस्थापय्
परिमोदय्	परिनिश्चि	परिपोषय्	परिसंस्तृ
परिमोहय्	परिनिश्चिन्तय्	परिपृ	परिसंस्तु
परिमोक्षय्	परिनिषेचय्	परिप्रच्छ्	परिसंशुध्
परिमोषय्	परिनिषेव्	परिप्राप्	परिसंतप्
परिमृद्	परिनिष्पद्	परिप्रवच्	परिसंवह्

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प्रचालय्	प्रधा	प्रदु	प्रग्रन्थ्
प्रचर्	प्रधम्	प्रदुह्	प्रग्रस्
प्रचारय्	प्रधारय्	प्रादुरस्	प्रगुह्
प्रच्छ्	प्रधर्षय्	प्रादुर्भावय्	प्रगुणीभू
प्रच्छा	प्रधाव्	प्रादुर्भू	प्रगुप्
प्रच्छद्	प्रधावय्	प्रदुष्	प्राह्
प्रच्छादय्	प्राधी	प्रदूषय्	प्रहा
प्रच्छर्दय्	प्रध्मापय्	प्रादुष्कृ	प्रहन्
प्रच्छेदय्	प्रधृ	प्रद्विष्	प्रहर्षय्
प्रच्छिद्	प्रधृष्	प्रद्योतय्	प्रहस्
प्रच्च्यावय्	प्रध्वंस्	प्रगाह्	प्रहासय्
प्रचि	प्रध्वंसय्	प्रगल्	प्रहि
प्रचिन्तय्	प्रध्वन्	प्रगालय्	प्राहि
प्रचोदय्	प्रध्या	प्रगल्भ्	प्रह्लादय्
प्रचुद्	प्रडी	प्रगम्	प्रह्व
प्रचुरीभू	प्रदिह्	प्रगणय्	प्रह्वष्
प्रच्यु	प्रदीप्	प्रगर्ज्	प्रहु
प्रदा	प्रदीपय्	प्रघर्षय्	प्रह्वीभू
प्रदह्	प्रदिश्	प्रघातय्	प्रज्ट
प्रदक्षिणीकृ	प्रदृ	प्रघोषय्	प्रजागृ
प्रदापय्	प्रद्रावय्	प्रघृष्	प्रजल्प्
प्रदारय्	प्रदृश्	प्रघुष्	प्रजन्
प्रदर्शय्	प्रद्रु	प्रगृ	प्रजनय्
प्रदेहय्	प्राद्रु	प्रग्रह्	प्रजप्

प्रजारय्	प्रकटीकृ	प्रक्षोभय्	प्रलुप्
प्रजि	प्रखलीकृ	प्रक्षुभ्	प्रमा
प्रजीव्	प्रख्या	प्रक्ष्वेडय्	प्रमद्
प्रज्ञा	प्रख्यापय्	प्रकूज्	प्रमादय्
प्रज्ञपय्	प्रकीर्तय्	प्रकुप्	प्रमज्ज्
प्रज्ञापय्	प्रक्लेदय्	प्रकुट्	प्रमाणय्
प्रजृम्भ्	प्रक्लिद्	प्रकुट्टय्	प्रमाणीकृ
प्रजुष्	प्रकोपय्	प्रक्वथ्	प्रमन्थय्
प्रज्वल्	प्रक्टप्	प्रक्वाथय्	प्रमापय्
प्रज्वलय्	प्रकृ	प्रलभ्	प्रमर्दय्
प्रज्वालय्	प्राकृ	प्रलालय्	प्रमार्जय्
प्रक्ट	प्रक्रम्	प्रलम्ब्	प्रमथ्
प्रकालय्	प्रक्रीड्	प्रलम्बय्	प्रमाथय्
प्रकल्पय्	प्रकृष्	प्रलम्बीकृ	प्रमिह्
प्रकामय्	प्रकृत्	प्रलप्	प्रमिल्
प्रकम्प्	प्रक्रुध्	प्रलेपय्	प्रमील्
प्रकम्पय्	प्रक्रुश्	प्रली	प्रम्ला
प्रकाङ्क्ष्	प्राक्रुश्	प्रलिह्	प्रमोचय्
प्रकारय्	प्रक्षालय्	प्रलिख्	प्रमोदय्
प्रकाश्	प्रक्षपय्	प्रलिप्	प्रमोहय्
प्रकाशय्	प्रक्षारय्	प्रलोभय्	प्रमृ
प्रकाशीकृ	प्रक्षेपय्	प्रलू	प्रमृद्
प्रकथय्	प्रक्षि	प्रलुभ्	प्रमृज्
प्रकटीभू	प्रक्षिप्	प्रलुञ्च्	प्रमृश्

प्रमुच्	प्रप्ट	प्ररक्ष्	प्रसञ्जय्
प्रमुद्	प्राप्	प्रार्च्	प्रशङ्क्
प्रमुह्	प्रपा	प्ररोधय्	प्रसन्नीभू
प्राण्	प्रपच्	प्रार्पय्	प्रसन्नीकृ
प्रणद्	प्रपाचय्	प्ररुद्	प्रसारय्
प्रणम्	प्रपद्	प्ररुध्	प्रसर्पय्
प्रणमय्	प्रपालय्	प्ररुह्	प्रशास्
प्रणामय्	प्रपरीक्ष्	प्ररुज्	प्रशासय्
प्रनर्तय्	प्रपश्	प्रास्	प्रशातय्
प्रणश्	प्रपत्	प्राश्	प्राशय्
प्रणाशय्	प्रपातय्	प्रसद्	प्रसेचय्
प्रणयीभू	प्रपाटय्	प्रसादय्	प्रसेव्
प्रणी	प्रपठ्	प्रसाधय्	प्रसिच्
प्राणी	प्रापय्	प्रसादीकृ	प्रसिध्
प्रणिदा	प्रपेषय्	प्रसह्	प्रस्कन्द्
प्रणिधा	प्रपीडय्	प्रशम्	प्रस्कन्दय्
प्रणिध्या	प्रपिधा	प्रशमय्	प्रस्खल्
प्रणिगद्	प्रपिष्	प्रशामय्	प्रस्मृ
प्रणिपत्	प्रपू	प्रसंधा	प्रस्नु
प्राञ्जलीभू	प्रपूजय्	प्रसमीक्ष्	प्रशोभय्
प्रणोदय्	प्रपूरय्	प्रसंख्या	प्रशोधय्
प्रनृत्	प्रपुष्	प्रशंस्	प्रशोषय्
प्रणु	प्रपुट्	प्रशंसय्	प्रस्पन्द्
प्रणुद्	प्रारभ्	प्रसञ्ज्	प्रस्फुर्

प्रसृ	प्रस्वेदय्	प्रतिभोजय्	प्रतिदृश्
प्रशृ	प्रश्वि	प्रतिभू	प्रतिदुष्
प्रस्रंस्	प्रस्विद्	प्रतिभुज्	प्रतिदूषय्
प्रस्रावय्	प्रस्यन्द्	प्रतिबिम्बीकृ	प्रतिगा
प्रश्रि	प्रस्यन्दय्	प्रतिबोधय्	प्रतिगालय्
प्रसृज्	प्रतम्	प्रतिब्रू	प्रतिगम्
प्रसृप्	प्रतन्	प्रतिबुध्	प्रतिगर्ज्
प्रसृतीकृ	प्रतनूकृ	प्रतिचक्ष्	प्रतिग्रह्
प्रस्रु	प्रतप्	प्रतिचल्	प्रतिग्राहय्
प्रस्तम्भ्	प्रतापय्	प्रतिच्छद्	प्रतिगृध्
प्रस्तारय्	प्रतारय्	प्रतिच्छादय्	प्रतिहन्
प्रस्तावय्	प्रतर्पय्	प्रतिच्छिद्	प्रतिहारय्
प्रस्था	प्रतर्षय्	प्रतिचोदय्	प्रतिहेष्
प्रस्थापय्	प्रथ्	प्रतिचुम्ब्	प्रतिह्व
प्रस्तृ	प्रथय्	प्रतिदा	प्रतिजल्प्
प्रस्तु	प्रती	प्रतिदह्	प्रतिज्ञा
प्रसु	प्रतिबाध्	प्रतिदापय्	प्रतिज्ञापय्
प्रसू	प्रतिबन्ध्	प्रतिदर्शय्	प्रतिज्वल्
प्रशुच्	प्रतिभा	प्रतिदेशय्	प्रतिकाङ्क्ष्
प्रसूदय्	प्रतिभज्	प्रतिधा	प्रतिकारय्
प्रशुष्	प्रतिभास्	प्रतिधाव्	प्रतिक्टप्
प्रस्वप्	प्रतिभाष्	प्रतिध्वंस्	प्रतिक्रम्
प्रस्वापय्	प्रतिभावय्	प्रतिदिश्	प्रतिकृष्
प्रश्वस्	प्रतिभिद्	प्रतिदीव्	प्रतिक्रुध्

प्रतीक्ष्	प्रतिनिहन्	प्रतिपृ	प्रतिसंछद्
प्रतिक्षिप्	प्रतिनिक्षिप्	प्रतिप्रदा	प्रतिसंछादय्
प्रतिकूज्	प्रतिनिर्दिश्	प्रतिप्रकाश्	प्रतिसंधा
प्रतिकूलय्	प्रतिनिर्जि	प्रतिप्रविश्	प्रतिसंदिश्
प्रतिलभ्	प्रतिनिर्वप्	प्रतिप्रया	प्रतिसंग्रह्
प्रतिलम्बय्	प्रतिनिर्या	प्रतिप्रयम्	प्रतिसंहन्
प्रतिलङ्घ्	प्रतिनिवारय्	प्रतिपूजय्	प्रतिसंहारय्
प्रतिलिख्	प्रतिनिवर्तय्	प्रतिपूरय्	प्रतिसंह्व
प्रतिलोभय्	प्रतिनिविश्	प्रतिराध्	प्रतिसंह्वष्
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प्रतिमुद्	प्रतिपालय्	प्रतिशम्	प्रतिसंरुध्
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प्रतिनी	प्रतिपीडय्	प्रतिसमास्	प्रतिसंवारय्
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समासञ्ज्	समावह्	समवतृ	सम्भा
समासेव्	समवहा	समवे	सम्भज्
समासिच्	समवज्ञा	समावेदय्	सम्भक्ष्
समाश्लिष्	समवकृ	समवेक्ष्	संभक्षय्
समास्फालय्	समवक्षिप्	समावेशय्	सम्भञ्ज्
समाश्रावय्	समवाक्षिप्	समावेष्टय्	संभारय्
समाश्रि	समवलम्ब्	समाविश्	संभर्त्स्
समासृज्	समवलोकय्	समावृ	सम्भाष्
समाश्रु	समवाप्	समाव्रज्	संभाषय्
समास्था	समावप्	समावृत्	सम्भावय्
समास्थापय्	समावाप्	समाव्यध्	सम्भिद्
समास्तृ	समावापय्	समय्	संभोजय्
समासुप्	समवपीडय्	शमय्	सम्भृ
समाश्वस्	समावर्जय्	शामय्	सम्भ्रम्
समाश्वासय्	समावर्तय्	समाया	संभ्रामय्
समती	समावस्	समायम्	सम्भ्रंश्
समतिक्रम्	समावासय्	समायस्	सम्भू
समतिसृज्	समवस्कन्दय्	समायत्	सम्भुज्
समतिवृत्	समवसृज्	समयीकृ	संभुज्
समतिया	समवष्टम्भ्	समायोजय्	संभूषय्
समवबुध्	समवस्था	समायुज्	सम्बोधय्
समवच्छद्	समवस्थापय्	सम्बाध्	संबृंहय्

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संजि	संक्लेदय्	संकुञ्च्	संमार्जय्
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संजीवय्	संक्लिद्	संकूर्द्	संमेलय्
संज्ञा	संक्लिश्	संकुट्	सम्मील्
संज्ञापय्	संकोचय्	संक्वाथय्	संमिल्
संजृ	संक्टप्	संलभ्	सम्मीलय्
संजुष्	संक्रम्	संलग्	संमोदय्
संज्वल्	संक्रमय्	संलज्ज्	संमोहय्
संज्वालय्	संक्रामय्	संलक्षय्	संमृ
संज्वर्	संक्रमीकृ	संलालय्	सम्मृद्
संकलय्	संक्री	संलप्	सम्मृज्
संकालय्	संक्रीड्	संलापय्	सम्मुच्
संकलीकृ	संकृष्	संलेपय्	सम्मुह्
संकल्पय्	संकृत्	संली	संमुखीभू
संकम्प्	संक्रुध्	संलिह्	संमुखीकृ
संकम्पय्	संक्रुश्	संलिख्	संमुख्यस्
संकारय्	संक्षालय्	संलिप्	सम्मूर्छ्
संकासय्	संक्षपय्	संलोडय्	संमूर्छय्
संकथय्	संक्षि	संमा	संनादय्
संकेतीकृ	संक्षिप्	सम्मद्	संनह्
संखन्	संक्षोभय्	संमज्ज्	संनम्
संखिद्	संक्षोदय्	सम्मन्	संनमय्
संख्या	संक्षुभ्	संमानय्	संनामय्
संकीर्तय्	संक्षुद्	संमर्दय्	संनर्द्

संनी	संनिशामय्	संपरिभावय्	सम्पठ्
संनिबुध्	संनिषेव्	सम्परिग्रह्	संपेषय्
संनिचि	संनिषिच्	सम्परिहर्षय्	सम्पीडय्
संनिधा	संनिसृज्	सम्परिकीर्तय्	सम्पिष्
संनिधापय्	संनिषूदय्	सम्परिक्रम्	संप्लावय्
संनिधारय्	संनिवारय्	संपरिक्षिप्	सम्प्लु
संनिग्रह्	संनिवर्तय्	संपरिमर्दय्	संप्लुष्
संनिहन्	संनिवस्	सम्परिप्लु	सम्पोथय्
संनिकाशय्	संनिवेदय्	संपरिपृ	सम्पृ
संनिकृष्	संनिवेशय्	संपरिप्रच्छ्	सम्प्रबाध्
संनिकृत्	संनिविश्	सम्परिपूजय्	सम्प्रभा
संनिक्षिप्	संनिवृत्	सम्परिरभ्	संप्रभञ्ज्
संनिली	संनियम्	सम्परिष्वज्	सम्प्रभाष्
संनिमज्ज्	संनियोजय्	संपरितप्	सम्प्रबुध्
संनिमील्	संनियुज्	संपरितोषय्	सम्प्रचक्ष्
संनिपत्	संन्यस्	सम्परित्यज्	संप्रचल्
संनिपातय्	संन्यासय्	संपरिवारय्	संप्रचालय्
संनिरस्	सम्पा	सम्परिवर्जय्	सम्प्रचर्
संनिरीक्ष्	संपच्	संपरिवेष्ट्	सम्प्रच्छ्
संनिरोधय्	संपाचय्	संपरिवीजय्	संप्रच्छा
संनिरुध्	सम्पद्	सम्परिवृत्	संप्रच्छादय्
संनिर्वा	सम्पादय्	संपश्	सम्प्रचि
संनिर्वच्	सम्पालय्	सम्पत्	सम्प्रचोदय्
संनिषद्	सम्परी	संपातय्	सम्प्रदा

सम्प्रदह्	सम्प्रह्व	संप्रमर्दय्	सम्प्ररुच्
संप्रदापय्	सम्प्रहृष्	संप्रमार्जय्	संप्ररुष्
संप्रदर्शय्	सम्प्रजन्	सम्प्रमथ्	सम्प्राश्
सम्प्रधारय्	सम्प्रज्ञा	संप्रमृद्	सम्प्रसद्
सम्प्रधर्षय्	सम्प्रज्वल्	सम्प्रमृज्	संप्रसादय्
संप्रधाव्	संप्रज्वालय्	सम्प्रमुच्	सम्प्रसाधय्
संप्रधृष्	सम्प्रकल्पय्	सम्प्रमुह्	सम्प्रसह्
संप्रधुक्षय्	सम्प्रकम्प्	सम्प्रणद्	संप्रशम्
संप्रध्या	सम्प्रकास्	संप्रणादय्	संप्रशंस्
संप्रदीप्	संप्रकाशय्	सम्प्रणम्	सम्प्रसञ्ज्
सम्प्रदीपय्	संप्रकीर्तय्	संप्रणश्	सम्प्रसारय्
सम्प्रदिश्	सम्प्रकृ	सम्प्रणी	सम्प्रशास्
सम्प्रदृश्	संप्रकृ	सम्प्रणिधा	संप्राशय्
सम्प्रद्रु	सम्प्रक्रम्	संप्रनृत्	सम्प्रसिच्
सम्प्रदुष्	सम्प्रकृष्	सम्प्रणुद्	संप्रसिध्
सम्प्रगा	संप्रकृत्	सम्प्राप्	संप्रसृज्
सम्प्रगाह्	संप्राक्रुश्	सम्प्रपच्	सम्प्रस्रु
संप्रगल्भ्	सम्प्रक्षिप्	सम्प्रपद्	सम्प्रस्था
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संप्राह्	संप्रलेपय्	संप्रपेषय्	संप्रस्वप्
सम्प्रहा	सम्प्रली	सम्प्रपीडय्	संप्रतप्
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समुत्क्लेशय्	समुत्तारय्	संवेष्टय्	संवृत्
समुत्क्लिश्	समुत्तेजय्	संविभज्	संव्यध्
समुत्कृ	समुत्था	संविभावय्	संव्याप्
समुत्क्रम्	समुत्थापय्	संविचर्	संव्यवह्न
समुत्कृष्	समुत्तृ	संविचारय्	संव्यवस्था
समुत्कृत्	समुत्त्रस्	संविचेष्ट्	संव्ये
समुत्क्रुश्	संवा	संविधा	संया
समुत्क्षिप्	संवच्	संविद्रु	संयाच्
समुत्कूलय्	संवद्	संविगाह्	संयाचय्
समुत्क्वाथय्	संवादय्	संविहा	संयज्
समुत्पद्	संवह्	संविह्न	संयाजय्
समुत्पादय्	संवाहय्	संविज्	संयम्
समुत्पत्	संवल्	संवीजय्	संयमय्
समुत्पातय्	संवन्द्	संविज्ञा	संयत्
समुत्पाटय्	संवारय्	संविज्ञापय्	संयोधय्
समुत्पीडय्	संवर्धय्	संविकृ	संयोजय्
समुत्पिष्	संवर्जय्	संविप्	संयु
समुत्सद्	संवर्तय्	संविश्	संयुध्
समुत्सादय्	संवस्	संविवद्	संयुज्
समुत्सह्	संवेदय्	संविवह्	सनाथीकृ
समुत्साहय्	संवेजय्	संव्रज्	सान्द्रीभू
समुत्सारय्	संवेल्ल्	संवृध्	सञ्ज्
समुत्सृज्	संवेशय्	संवृज्	शङ्क्

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उपचिन्तय्	उपगमय्	उपजापय्	उपलक्षय्
उपदा	उपगणय्	उपजीव्	उपलालय्
उपादा	उपघातय्	उपजीवय्	उपलेपय्
उपदह्	उपघ्रा	उपकल्पय्	उपलिप्
उपदर्शय्	उपाघ्रा	उपकरणीकृ	उपमा
उपदेशय्	उपघुष्	उपकारय्	उपमर्षय्
उपधा	उपग्रह्	उपक्लेशय्	उपमथ्
उपाधा	उपगुह्	उपक्लिद्	उपमृद्
उपधम्	उपगूहय्	उपक्लिश्	उपनादय्
उपाधम्	उपहन्	उपक्टप्	उपनह्
उपधानीकृ	उपाहन्	उपाकृ	उपनाहय्
उपधारय्	उपहारय्	उपक्रम्	उपनम्
उपढौकय्	उपहस्	उपाक्रम्	उपनामय्
उपधाव्	उपहासय्	उपक्री	उपनायय्
उपाधाव्	उपहिंस्	उपक्रीड्	उपनी
उपध्वंस्	उपह्व	उपकृत्	उपानी
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उपगम्	उपजनय्	उपालभ्	उपनिर्वर्तय्
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उपशुभ्	उपव्रज्	उत्कम्प्	उत्पादय्
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उपवेष्टय्	उररीकृ	उत्कुप्	उत्सृज्
उपवीज्	ऊर्ध्वीभू	उत्क्वथ्	उत्सृप्
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Appendix-II

Published Research Papers

LREC 2014, Ninth International Conference on Language Resources and Evaluation

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Issues in Mapping of Sanskrit-Hindi Verb forms

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Abstract

Verb handling is the most important task for Machine Translation. A thorough syntacto-semantic study has been done in the Indian Grammatical Tradition which is highly appreciated by all the modern linguists worldwide. This paper deals with the syntactic patterns between Sanskrit-Hindi Verbs to formulate the possible algorithm to map the verbs for Sanskrit-Hindi Translator (SaHiT). This effort will help in producing linguistic rules for the required tool which can handle the verb forms in SaHiT.

Keywords: Sanskrit, Hindi , Verb, SaHiT, Machine Translation, rule

1. Introduction

Famous NASA Scientist Rick briggs[1] (1985) in his research article "Sanskrit & Artificial Intelligence" drew grate attention towards Sanskrit because of its grammatical technicalities for Natural language processing. Since 1991, NLP stated in India, and many researchers explored the possibilities of developing "intelligent machines" to process the Natural Language. Panini, who had already processed the spoken language of his time, presents a model for computational algorithm. Nicholas Ostler's[2], (a British scholar and author, who first studied Greek, Latin, philosophy, and economics and later studied under Noam Chomsky at the Massachusetts Institute of Technology, where he earned his Ph.D. in linguistics and Sanskrit) work "Empires of the Word: A Language History of the World" (2005) documents the spread of language throughout recorded human history. Nicholas Ostler (2001) in his research article *Sanskrit Studies as a Foundation for Computational Linguistics*, said "There is also evident competition in India both from Hindi and from English, as de facto and de jure languages of pan-Indian communication in the modern world. Nevertheless, Hindi has not had the benefit of 2,500 years of linguistic analysis on which to found its computer development. And English, despite its feverish development over the past 250 years, can never offer the well-established cultural links with languages all over India that are inalienable from Sanskrit"….

"we can consider the potential role of Sanskrit in the future electronic notation, analysis and transmission of languages world-wide".

At present, varies efforts are being made towards the development of Indian Language to Indian Language Machine Translation systems. Sanskrit-Hindi Machine Translation System is one of them. In this perticular task, verb handling has always been the challenging topic because of divergence and linguistic contrast between both language pairs. Some efforts have been made to deal with the verbs but much is needed.

Sanskrit Verb Argument Valence: A Computational Analysis by Subhash Chandra says that the verb argument valence analysis system and Knowledge database are the outcome of their research and development[3]. Sanskrit Wordnet discussed the divergence of verbs in Sanskrit and Hindi and its implication for constructing verbal synsets in SWN[4]. *Automatic Identification and Analysis of verb groups in Hindi* is the latest research work related to Hindi Verbs[5]. *Knowledge base for Karma karak* by Manji Bhadra, JNU and *Ontological Knowledge Base for selected verbs of Sanskrit and Bangla* by Subhash Chandra are dealing with the Sanskrit Verbs to

[1] http://www.vedicsciences.net/articles/sanskrit-nasa.html
[2] http://www.emille.lancs.ac.uk/lesal/ostler.pdf
[3] http://www.researchgate.net/publication/233341515_Sanskrit_Verb_Argument_Valence_A_Computational_Analysis
[4] http://www.cse.iitb.ac.in/~pb/papers/gwc12-swn-verb.pdf.
[5] Narayan Kumar Chaudhary, Centre for Linguistics, JNU.

represent the semantic processing. But the mapping of verb for Sanskrit-Hindi Translator and the possible rules for acceptable output has not been discussed. This paper is going to discuss some differences and present the issues and challenges in verb mapping for SaHiT. As the Sanskrit verbs are of two types: tingant and kridanta, this paper will be restricted only to the tingant part because kridant may also be used as noun (ram+ghany=raam), adverb (pachamaanah), adjective (pachantam), indeclinable (paayam paayam), gerund (gatvaa) etc which needs to be discussed separately.

2. Sanskrit-Hindi Verbs

According to Paninian Grammar, generally sentence has two main parts – *subanta* and *tinganta*. He says – '*sup-tingantam padam*'[6]. Here *subanta* is noun and the *tinganta* is verbs in a given Sanskrit syntax. tinganta forms are made of two kinds of roots, first (the original) one which are listed in the ten ganas of Paninian dhatupath, and the second one which are obtained by adding suffixes to the primary root to express some special meaning. These roots have different morphological forms in the ten lakaras and their forms further differ in their atmane-pada and Parasmai-pada divisions. The ten lakaras express the tense and mood. Present Tense takes lat-lakaara form, Future takes lut & lrut forms and Past tense takes lit, lang and lung lakaaras. Mode takes lot, vidhi-ling, aasirling and lrung lakaars. The Sanskrit forms are inflectional while Hindi forms are periphrastic, the mapping of verb forms between two needs close observation.

2.1 Present Tense

In Sanskrit sentence, lat-lakara is used to convey the present. The lakaras are divided into three persons and three numbers so the verb has nine forms in parasmai-pada and nine forms in atmane-pada. The atmanepada type of morpho-syntactic difference has not been discussed in Hindi forms. In Sanskrit, the meaning of a ubhayapadi verb (having both the forms: atmanepada and parasmaipada respectively) does not change in active voice, thus we can take only parasmai-pada forms (for analysis) which are widely used in classical Sanskrit writings. The pattern of Lat-lakaara forms have roots followed by suffix tip, tas jhi…. and so on[7]. For clear understanding, we can take root paTh (to read): paThati, paThatah, paThanti … so on. Depending on the gender of agent, the form paThati can be translated as – paDhataa hai, paDhatI hai, PaDhate hain, paDha rahaa hai, PaDha rahI hai, PaDha rahe hain etc. A single Sanskrit verb form represents multiple Hindi verb forms. In this regard, it is important to note that Hindi forms are governed by the gender of agent as well as the honorific use. What is happening here is basically the root is giving the meaning and suffixes ' tip, tas & jhi are giving the forms {taa hai, tI hai, te hain, rahaa hai, rahi hai, rahe hain} which is being added to the root form of Hindi. Here we should clearly understand that honorifics (bhavaan/bhavati and any respected person) have third person forms (tip, tas, jhi) in Sanskrit and it takes root form +{te hain/tI hain/rahe hain/rahi hain} in Hindi.

Morpho-syntactically, something different happens with the verbs used with second person 'You (tvam)' & first person 'I/we'. Here we can see that the verb form with tvam, yuvaam, yooyam is the root + si, thah & tha. i.e. pathasi, pathathah & pathatha. Here we get the translation in Hindi: [tum/tum_dono/tum_sab {padha_te ho, padha_rahe ho}] So, '_te ho' & '_rahe ho' of Hindi form is representing masculine forms. When the agent is feminine, we will see '_tI ho' & '_rahI ho' with the verb root of Hindi.

First person, I & we (aham, aavaam, vayam) take [root+{_mi/vas/mas}] in Sanskrit, and in Hindi, it takes [root+ {_taa hoon/ tI hoon}/ {_rahaa hoon/rahI hoon}(singular form)] and dual as well as plural takes [root+ {_te hain/ rahe hain}].

In this way we find that the nine forms of Sanskrit verbs (in Lat lakaara) are presenting so many forms in Hindi. The Hindi forms are depending on the gender while Sanskrit (tinganta) does not. Hindi takes different forms to represent simple present and present continuous tense while Sanskrit shows both from one verb form.

2.2Past Tense

In Sanskrit, Past Tense takes three lakaras, lit lakara (past perfect), lan lakara (past imperfect) and lun lakara (Aorist). Lit or perfect is used in the sense that the past period was not seen by the speaker which refers to the historical past. While analyzing the past we find that the aorist would refer only to eventualities that have happened earlier during the present day, the imperfect

[6] P-1.4.14
[7] P-3.4.78

only to witnessed eventualities that have happened before the present day, and the perfect to non-witnessed eventualities that have happened long time ago. Paul Kiparsky explained this while referring that the perfect should block the imperfect and the imperfect in turn should block the aorist and noticed that the aorist is optionally used for remote past[8]. Dealing with past, V S Apte[9] says that earlier the past forms were used in their exact senses but when Sanskrit became a less spoken language, the writers began to use these three tenses promiscuously. He differentiates the past tense by noticing the fact that the imperfect and the perfect are used in narrating events of remote past occurrence, and the aorist is used in dialogues and conversations which refer in recent past action but it is not used to denote past specified time, or to narrate events. Apte gives the examples of imperfect and perfect past from purusha-sukta for the events narrated referring to the non-witnessed past and presents the example of Aitareya Brahman for the recent past which is shown by the aorist. In post-Paninian Sanskrit, the aorist can refer to any past event, whereas the imperfect and perfect are restricted to the described events only.

If we compare the past forms of Sanskrit with the Hindi forms, we can find the differences of gender same as present (hota tha, hoti thi etc). But the time reference of the non-witnessed past is being shown as hua karte the, hue the, huyi thi (babhoova) etc with reference to the historical narratives. ho rahaa tha, huaa/hota tha, and ho chukaa etc are representing the past usage in Hindi for which abhavat/abhoot both are used. Here we can see that the use of imperfect and aorist is not clear in Hindi while perfect (past-perfect) is very clear in both the languages. We can find both the term 'ho chukaa' and 'ho chukaa tha' where we need to identify the remote past and recent past. For example, we can take root han to see the different form in both the languages:

Perfect: jaghaana = maara dala thaa, maaraa thaa, maarataa thaa, [(Raja choro ko) maaraa karataa thaa] etc may be the possible translation of the form given in the (past) perfect tense.

Imperfect: avadheet= maaraa thaa or maarataa thaa or maara rahaa thaa…

Aorist: ahan= maaraa…

Eventually the difference of these three Sanskrit forms is lost in Hindi. So we are finding these past forms – maaraa, maarataa thaa, maara rahaa thaa- frequently in Modern Hindi usage. This particular tense needs a thorough comparative research between both the languages so that the framework can be developed for Machine Translation.

2.3 Future Tense

Future takes two lakaaras lut & lrit respectively. Apte[10] says that the lut denotes the remote future time not of today and the lrit denotes indefinite future time, today's future time, and recent and future continuous time. The periphrastic future (lut) is far less frequently used; and where it is used, it generally denotes a remote future action while the simple future is used to denote any indefinite future action. As –ramaH pathishyati= raama paDhegaa; raamaH paThitaa= raama paDhegaa. But both the tense has basic difference that the first verb-pathishyati denotes the indefinite future action while the next- paThitaa shows the remote future. If time is not mentioned in Sanskrit, the sense of the sentence will not be clearly shown in Machine Translation. When the close proximity of a future action is intended, the present or the future may be used. As- kada gamishyasi-esha gachchaami/gamiShyaami. When hope is expressed in a conditional form, the Aorist, the present, or simple future may be used in both the clause to denote a future time. As- devashchedavarShId varShati varshishyati vaa dhaanyamavaapsma vapaamo vapsyaamo vaa[11]. Therefore we can come across these challenges in Sanskrit-Hindi Machine Translation mainly in the verb mapping.

3. Analysis and rules

On the basis of above discussed facts, we find that Sanskrit is inflectional while Hindi is periphrastic. Sanskrit verbs (tingant) are not agreeing with gender but Hindi verbs agree with the gender. Sanskrit verbs have dual number while the Hindi has dropped the dual, thus the Sanskrit dual becomes plural in Hindi. The regular and the progressive verbs are clearly expressed in Hindi but Sanskrit verbs have no such differentiation. Sanskrit has three different forms for past and two different forms for future, but Hindi doesn't show such morphological differences.

[8] On the architecture of Panini's Grammar, p-38.
[9] A students' guide to Sanskrit Composition, p-142.
[10] The Students guide to Sanskrit Composition, p-148.
[11] The Students guide to Sanskrit Composition, p-147.

To handle the progressive forms in Hindi, we can add the scope of optional outputs. The gender agreement can be handled with the help of Anaphora resolution system so that machine can identify the gender of agent to give correct output for SaHiT system.

3.1 Rules for verb mapping

3.1.1 Present

1(a). root+ti=> root+ taa/ti +hai.
1(b) root+ti= root+ rahaa/rahi+hai.
2(a) root+ tah./anti=>root+te/ ti +hain,
2(b) root + rahe/rahi +hain.
3(a) root+si/thah./tha=>root+te/ti+ho
3(b) root+si/thah./tha=>root+rahe/rahi+ho
4(a) root+mi => root+ta/ti+hoon,
4(b) root+mi root+raha/rahi hoon
4(c) root+ vah./mah. => root+te/rahe+hain
Rules for past forms can be divided into remote and recent past so that the tentative rules can be written.

3.1.2 Remote past

1(a) root+a=> root+aa tha, root+i thi, root+e the [i.e. path+a (lit) - papaatha=> padh+aa tha, padh+i thi, path+e the]
1(b) root+atuh./uh. => root+e_the /i_thiAs remote past is generally used for third person, these rules may be sufficient to handle remote past.

3.1.3 Simple past

Third person simple past will take the rules of remote past as it is. Further the rule 1(b) will be repeated to handle the verb forms of simple past for second person. For 1st person (singular), the rule may be:

2(a) root+a => root+aa thaa, root+i thi
2(b) root+a => root+rahaa thaa, /rahi thi
2(c) root+iva/ima => root+e the/rahe the

3.1.4 Rules for Future

Hindi forms for both the lakaara are same so the rules can be written as:
Root+ future suffix=>root+gaa/gi, root+ge/ gi, root+oge, root+ungaa, root+enge (depending on the agent of the verb).

4. Conclusion

In this paper we tried to reflect the multiple possibilities of verbal translation in SaHiT which needs to be handled carefully to produce acceptable output into Hindi. This will be more challenging when the passive forms and the Kridant forms will be present in the input text. The compound and complex verbs also needs to be discussed in details to formulate the possible rules for verb mapping. Present work is ongoing research which will be providing the rules for the rule based SaHiT system. This can be used to understand the issues between all IL- Hindi MT system.

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Verb Mapping: A Dilemma in Sanskrit-Hindi Machine Translation

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Abstract

Creating a Fully Automated Machine Translation is a challenge. MT system developers have to take care of all minute aspects of both the language pairs (i.e. the Source Language and the Target Language). Issue of verb mapping between language pairs needs a careful study of verb pattern of those languages. A close look towards verb pattern indicates the importance of the conditional use of verb forms in a language. The conditional use of the verbs is a challenge for MT systems. As Sanskrit-Hindi Machine Translation (SHMT) is an ongoing task and the Sanskrit Consortium, funded by the DIT, Govt. of India, has already finished its first Phase, this study becomes more relevant. The proposed SHMT– Sampark System is not functional yet. An Interface of SHMT- Anusaaraka is available on the website of Sanskrit Department, HCU, Hyderabad. In this study, some challenging aspects of verb mapping have been noticed as the dilemma in SHMT.

Keywords: SHMT, Verb Mapping, lakāra, Sanskrit, Hindi

1. Introduction:

The Sanskrit language is inflectional and the Hindi is post positional in nature. Therefore there is a difference in the verb pattern of both the languages.

These are the following differences:

1. Sanskrit Verbs are inflected with the suffix markers but the Hindi verbs are periphrastic.
2. Sanskrit verb forms are classified into ten *lakāra*s in which the six *lakāra*s (*laṭ, liṭ, laṅ, luṅ, luṭ, lṛṭ*) denote the tense and rest four (*loṭ, vidhi-liṅ, āśīrliṅ* and *lṛṅ*) denote the mood. Hindi verbs are not classified like Sanskrit and the verbs which denote the mood in Hindi, are discussed as modal verbs which comes with the main verbs in a sentence.
3. Sanskrit has *ātmanepada* and *parasmaipada* forms but Hindi has no such divisions.
4. The main difference between both the languages is that the Hindi is aspectual language and Sanskrit is not.
5. Sanskrit verbs (*tiṅanta*) don't agree with the gender but the Hindi verbs agree with the gender.

The Sanskrit roots take the following suffixes (in *ātmanepada* and *parasmaipada*) in the ten *lakāra*s:

Parasmaipada

	singular	Dual	Plural
Third Person	*tip*	*tas*	*jhi*
Second Person	*sip*	*thas*	*tha*
First Person	*mip*	*vas*	*mas*

ātmanepada

	Singular	Dual	Plural
Third Person	*ta*	*ātāṃ*	*jha*
Second Person	*thās*	*āthāṃ*	*dhvaṃ*
First Person	*iḍ*	*vahi*	*mahiṅ*

2. Sanskrit-Hindi Verb Mapping:

Sanskrit has approx 2000 roots listed in the Paṇinian *dhātupāṭh*. But Hindi does not have such *dhātupāṭh*. The list of Hindi roots can be created by translating the Sanskrit roots into Hindi. For example- Sanskrit root *kṛ* becomes *kara*, *paṭh* becomes *paḍha*, *bhū* becomes *ho*, *khād* becomes *khā*. So Hindi has roots *kara*, *paḍha*, *ho*, *khā* etc. To map the Sanskrit verbs into Hindi, we can first replace the Sanskrit roots with the Hindi forms of those roots and we can add the meaning of the Sanskrit suffixes to the Hindi roots. Sanskrit verbs have two forms- *ātmanepada* and *parasmaipada*, but Hindi verb forms are unchanged for both the forms of Sanskrit verbs.

Here the general verb mapping rules are written:

2.1 laṭ lakāra (Present tense)

Sanskrit root + *ti* = Hindi root +*tā hai/tī hai/ te hain/rahā hai/ rahī hai/ rahe hain/rahī hain*

Sanskrit root + *taḥ* = Hindi root + *te hain/ tī hain/ rahe hain/ rahi hain*

Sanskrit root + *anti* = Hindi root + *te hain/ tī hain/ rahe hain/ rahi hain*

Sanskrit root + *si* = Hindi root + *te ho/ tī ho/ rahe ho/ rahī ho*

Sanskrit root + *thaḥ* = Hindi root + *te ho/ tī ho/ rahe ho/ rahī ho*

Sanskrit root + *tha* = Hindi root + *te ho/ tī ho/ rahe ho/ rahī ho*

Sanskrit root + *mi* = Hindi root + *tā hoon/ tī hoon/ rahā hoon/ rahī hoon*

Sanskrit root + *vaḥ* = Hindi root + *te hain/ rare hain*

Sanskrit root + *maḥ* = Hindi root + *te hain/ rare hain*

2.2 loṭ lakāra (Imperetive)

Sanskrit root + *tu* = Hindi root + *e/en*

Sanskrit root + *tām* = Hindi root + *en*

Sanskrit root + *antu* = Hindi root + *en*

Sanskrit root + *hi* (:) = Hindi root + *o*

Sanskrit root + *tam* = Hindi root + *o*

Sanskrit root + *ta* = Hindi root + *o*

Sanskrit root + *āni* = Hindi root + *ūn*

Sanskrit root + *āva* = Hindi root +*en*

Sanskrit root + *āma* = Hindi root + *en*

2.3 laṅ lakāra (Imperfect tense)

Sanskrit root + *ta* = Hindi root +*ā/ī/e*

Sanskrit root + *tāṃ* = Hindi root +*ā/ī/e*

Sanskrit root + *an* = Hindi root +*ā/ī/e*

Sanskrit root + *s (ḥ)* = Hindi root +*ā/ī/e*

Sanskrit root + *tam* = Hindi root +*ā/ī/e*

Sanskrit root + *ta* = Hindi root +*ā/ī/e*

Sanskrit root + *am* = Hindi root +*ā/ī/e*

Sanskrit root + *va* = Hindi root +*ā/ī/e*

Sanskrit root +*ma* = Hindi root +*ā/ī/e*

2.4 **vidhiliṅ lakāra (Potential)**

Sanskrit root + *it* = Hindi root + *nā* + *chāhiye* (or Hindi root+*e*)

Sanskrit root + *itāṃ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*e*)

Sanskrit root + *iyuḥ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*e*)

Sanskrit root + *iḥ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*o*)

Sanskrit root + *itaṃ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*o*)

Sanskrit root + *ita* = Hindi root + *nā* + *chāhiye* (or Hindi root+*o*)

Sanskrit root + *iyaṃ* = Hindi root + *nā* + *chāhiye* (or Hindi root+*ūn*)

Sanskrit root + *iva* = Hindi root + *nā* + *chāhiye* (or Hindi root+*en*)

Sanskrit root + *ima* = Hindi root + *nā* + *chāhiye* (or Hindi root+*en*)

2.5 **liṭ lakāra (Perfect tense)**

Sanskrit root + *a* = Hindi root + *ā* + *thā*

Sanskrit root + *atuḥ* = Hindi root + *e* + *the*

Sanskrit root + *uḥ* = Hindi root + *e* + *the*

Sanskrit root + *(i)tha* = Hindi root + *e* + *the*

Sanskrit root + *athuḥ* = Hindi root + *e the*

Sanskrit root + *a* = Hindi root + *e* +*the*

Sanskrit root + *a* = Hindi root + *ā thā*

Sanskrit root + *(i)va* = Hindi root + *e* +*the*

Sanskrit root + *(i)ma* = Hindi root + *e* + *the*

2.6 luṭ lakāra (Future tense)

Sanskrit root + *tā* = Hindi root + *egā /egī/enge*

Sanskrit root + *tārau* = Hindi root + *enge/ engī*

Sanskrit root + *tāraḥ* = Hindi root + *enge/engī*

Sanskrit root + *tāsi* = Hindi root + *oge/ogī*

Sanskrit root + *tāsthaḥ* = Hindi root + *oge/ogī*

Sanskrit root + *tāstha* = Hindi root + *oge/ogī*

Sanskrit root + *tāsmi* = Hindi root + *ūngā/ūngī*

Sanskrit root + *tāsvaḥ* = Hindi root + *enge*

Sanskrit root + *tāsmaḥ* = Hindi root + *enge*

2.7 lṛṭ lakāra (future tense)

Sanskrit root + *ṣyati* = Hindi root + *egā /egī/enge*

Sanskrit root + *ṣyataḥ* = Hindi root + *enge/ engī*

Sanskrit root + *ṣyanti* = Hindi root + *enge/engī*

Sanskrit root + *ṣyasi* = Hindi root + *oge/ogī*

Sanskrit root + *ṣyathaḥ* = Hindi root + *oge/ogī*

Sanskrit root + *ṣyatha* = Hindi root + *oge/ogī*

Sanskrit root + *ṣyāmi* = Hindi root + *ūngā/ūngī*

Sanskrit root + *ṣyāvaḥ* = Hindi root + *enge*

Sanskrit root + *ṣyāmaḥ* = Hindi root + *enge*

2.8 āśirliṅ lakāra (Benedictive)

Sanskrit root + *yāt* = Hindi root + *e*

Sanskrit root + *yāstāṃ* = Hindi root + *en*

Sanskrit root + *yāsuḥ* = Hindi root +*en*

Sanskrit root + *yāḥ* = Hindi root + *o*

Sanskrit root + *yāstaṃ* = Hindi root + *o*

Sanskrit root + *yāsta* = Hindi root + *o*

Sanskrit root + *yāsaṃ* = Hindi root + *ūn*

Sanskrit root + *yāsva* = Hindi root + *en*

Sanskrit root + *yāsma* = Hindi root + *en*

2.9 luṅ lakāra (Aorist)

Sanskrit root + *t* = Hindi root + *ā/ī/e*

Sanskrit root + *tāṃ* = Hindi root + *ā/ī/e*

Sanskrit root + *an* = Hindi root + *e/īn*

Sanskrit root + *aḥ* = Hindi root + *e/ī*

Sanskrit root + *taṃ* = Hindi root + *e/ī*
Sanskrit root + *ta* = Hindi root + *e/ī*
Sanskrit root + *am* = Hindi root + *ā/ī*
Sanskrit root + *va* = Hindi root + *e/īn*
Sanskrit root + *ma* = Hindi root + *e/īn*

2.10 lṛṅ lakāra (Conditional)

Sanskrit root + *ṣyat* = Hindi root + *tā/te/tī/egā/egī/enge*
Sanskrit root + *ṣyatām* = Hindi root + *te/tīn/ egā/engī/enge*
Sanskrit root + *ṣyan* = Hindi root + *te/tīn/ engī/enge*
Sanskrit root + *ṣyaḥ* = Hindi root + *te/tī/oge/ogī*
Sanskrit root + *ṣyataṃ*= Hindi root + *te/tī/oge/ogī*
Sanskrit root + *ṣyata* = Hindi root + *te/tī/oge/ogī*
Sanskrit roọt + *ṣyaṃ* = Hindi root + *tā/tī/ūngā/ūngī*
Sanskrit root + *ṣyāva* = Hindi root + *te/enge*
Sanskrit root + *ṣyāma* = Hindi root + *te/enge*
But when we look at the conditional use of the *lakāra*s, we see that the *lakāras* are being used to denote the meaning of other tense as well.

3. Conditional usage of *lakāra*s:

In this context, the specific words (it may be *nipāta* or certain words used to denote the similar meaning of the verbs expressed in the Paninian *sūtra*) used in a sentence decide the meaning of the verb. Sometime the original tense (of the verb) is changed.

3.1 **Use of *laṭ lakāra* (Present tense) :** The *laṭ lakāra* is used to denote present tense. But the following sentences show the variation in the meaning denoted by the *laṭ lakāra*:

a. *saḥ paṭhati = vaha paḍhatā hai.*
b. *kadā āgato'si = kaba āe?or kaba āe ho?*
c. *ayam āgacchāmi = abhī āyā.*
d. *upādhyāyaśced āgacchati, vyakaraṇaṃ adhīmahe*
e. *vasan dadarśa = rahate hue dekhā.*
f. *yo annaṃ dadāti sa svargaṃ yāti = jo anna degā vaha svarga jāegā.*
g. *kṛṣṇaśced bhuñkte tvaṃ gāścāraya = kṛṣṇa abhī khāegā, tuma gāya carāo.*
h. *upādhyāyaśced āgacchati, atha tvaṃ vyākaraṇaṃ adhīṣva.*
i. *Or muhūrtād upari upādhyāyaśced āgacchati, atha tvaṃ paṭha = kucha kṣaṇa meṃ upādhyāya āeṃge, aba tuma paḍho.*
j. *yajati sma yudhiṣṭhiraḥ = yudhiṣṭhira yajña karate the.*
k. *akārṣīḥ kim?= kyā tumane kārya kara liyā?*
l. *nanu karomi= hān, kara liyā.*
m. *paṭhanti iha purā= pahale yahān paḍhegā.*
n. *vasantīha purā chātrāḥ = pahale yahān chātra rahegā.*
o. *krīṇanti sma prāṇamūlyaiḥ yashāṃsi = prāṇamūlya se yasha kharīdate the.*
p. *pāṭham apāṭhīstvam? nanu paṭhāmi bhoḥ= tumane pāṭha paḍhā?, hān, paḍha liyā.*
q. *ahaṃ nu paṭhāmi = hān, maine paḍhā.*
r. *yāvat bhuñkte = jaba taka khāegā.*
s. *yāvat dāsyati tāvad bhuñkte = jabataka degā tabataka khāegā.*
t. *kadā bhuñkte = kaba khāenge?*
u. *kaṃ bhavān bhojayati = āpa kise khilāenge?*

This is happening because of the conditional use of *laṭ lakāra* and the context of the sentence such as *vartamāna sāmīpya* etc. Here we can see that the example (a) is a simple present tense sentence. Example (b) is a question and (c) is a reply to that question. In example (b), *asi* can drop its literal meaning. In example (c), *āgacchāmi* is in *laṭ* form but it is used in the sense of past tense. In (d), *varṣati* (laṭ) is used in the sense of future tense. The verb forms {*dadāti*, *bhuñkte*, *āgacchati* (*laṭ*)} in the examples (f) to (h) are used to express future tense. In (i), *yajati* is being translated as past form in Hindi because of '*sma' nipāta*. Example (j) is a question and (k) is the answer where both the words have given up their actual meaning. Thus *na karomi* is being translated as *hān, kara liyā.* When *purā* (*nipāta*) is used, the *laṭ* form is denoting the past tense in the examples (l) to (m). In the examples (o) - (p), *nanu* and *nu* (*nipāta*) are used and therefore *laṭ* form is denoting past tense. When *yāvat* is used as *nipāta*, *laṭ lakāra* denotes future tense. In this way, we notice that the Sanskrit verb forms may denote other tense in a given condition (i.e. depending on the use of *nipāta* with the verb). So the words (nipātas) sma, nanu, nu, na, yāvat, purā, kadā, karhi, kam, kataram, katamam, yo-so, cet, muhūrta yāvat etc are changing the meaning of the laṭ lakāra. While translating these forms, we cannot ignore

the tense denoted by the *laṭ-lakāra* in the given context. Similarly we can look into other *lakāra*s discussed in the *lakārārtha* section of *siddhānta kaumudi* and find if those *lakāra*s are also giving the different meaning depending on the conditional usage.

3.2 **liṭ lakāra (perfect tense)**

The *liṭ lakāra* is used for perfect tense. With the words *ha* and *śaśvad* are used in the sentence, the *lit lakāra* takes place. But the meaning of perfect is not changed. For Example-

a. *iti ha cakāra- usane aisā niścaya hī kiyā;*
b. *iti ha akarot – usane aisā niścaya hī kiyā*
c. *'śaśvad akarot'- usane sadā aisā kiyā*
d. *śaśvat cakāra' – usane sadā aisā kiyā.*

3.3 luṭ lakāra (Future tense)

With *kadā* and *anadyatana bhaviṣya*, the *luṭ lakāra* takes place with the root. But the sense of future is intact there as well. For Example-

a. *kadā bhoktā.*
b. *śvo bhoktā.*

3.4 lṛṭ lakāra (Future tense)

The *sūtra kālavibhāge-cānahorātrāṇāṃ* (P-3.3.137) says that the *ahorātra* (reference of day and night) will take *lṛṭ* (for *adyatana bhaviṣya*) instead of *luṭ* (for *adyatana bhaviṣya*). Ex- *yo'yaṃ vatsara āgāmī tasya yad avara-āgrahāyaṅyāḥ tatra yuktā adhyeṣyāmahe- ye jo āgāmi varṣa hai, usake pahale jo agahana māsa kī pūrṇimā hai, usame pūrṇatayā tallīna hokara pārāyaṇa karenge.* (*adhyeṣyāmahe instead of adhyetāsmahe*). Here also the tense is unchanged.

The *sutra anavakṛptyamarṣayor-akiṃvṛtte'pi* (P-3.3.145) – says that the suffixes *liṅ* and *lṛṭ* occurs in *asambhāvanā* (incredibility) and *amarṣa* (intolerance).

For example-

a. *na sambhāvayāmi bhavān hariṃ nindet- main nahi samajhatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*
b. *na sambhāvayāmi bhavān hariṃ nindiṣyati- main nahi samajhatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*
c. *na marṣaye bhavān hariṃ nindiṣyati- main nahi saha sakatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*
d. *na marṣaye bhavān hariṃ nindet- main nahi saha sakatā ki āpa hari kī nindā kiyā karate the/ karate hain / karenge.*

The *sūtra kiṃ-kilāstyartheṣu lṛṭaḥ* (P-3.3.146) says that the *lṛṭ* is used with the word *kiṃkila* and *asti* in the sense of *asambhāvanā* (incredibility) and *amarṣa* (intolerance). Here *asti* denotes *asti, bhavati* and *vidyate*. This *sutra* blocks the use of *liṅ* which was assigned by the previous *sūtra* (P.3-3.45). For example-

a. *na śraddadhe kiṃkila tvaṃ sudrānnaṃ bhokṣyase – main visvāsa nahi karatā kit um sudra kā anna khāte ho.*
b. *na marṣaye kiṃkila tvaṃ sudrānnaṃ bhokṣyase – main sahana nahi karatā kit um sudra kā anna khāte ho.*
c. *tvam sūdrīṃ gamiṣyasi iti asti/bhavati/vidyate – tuma sūdrī kā gamana karate ho, aisā hai kyā?*

The *sutra vibhāṣā sākāṅkṣe* (P-3.2.114) says that in the *anadyatana bhūtakāla* (Past perfect), if the *smṛti-bodhaka pada* is used in the sentence with *ākāṅkṣya-bhāva*, optionally it takes *lṛṭ*. For example- *smarasi kṛṣṇa! vane vatsyāmastatra gāścārayāmaḥ. -yāda hai kṛṣṇa, vana me rahate the aura gāya charāte the. (vatsyāmaḥ= rahate the; cārayiṣyāmaḥ = carāte the).*

These *sūtra* clearly indicates that the *lṛṭ lakāra* forms - *nindiṣyati, bhokṣyase* etc are being translated into the forms of present tense in Hindi.

3.5 **loṭ lakāra (Imperative)**

The *nipāta -sma* is also used with *loṭ* by the *sūtra - sme loṭ* (P-3.2.165) when the word *muhurta* is there. Ex- *muhūrtasya paścād śiṣyaḥ pāṭhaṃ paṭhatu sma- muhūrta bhara ke bāda śiṣya pāṭha paḍhe*. In this example, *paṭhatu sma* is being translated as *paḍhe*. The word *sma* is also being used with the *laṭ* (present) and there the meaning of present tense verb is getting changed into the past tense. Here machine can get confused between these two *sma* where the first is changing the tense and the second is not giving any meaning.

3.6 laṅ lakāra (Imperfect)

In the *lakārārtha* section, *laṅ* has been discussed in the context of *ha, śaśvad, praśne, purā.* But nowhere laṅ has shown the meaning of other tense. For example-

a. *iti ha cakāra- usane aisā niścaya hī kiyā thā.*
b. *iti ha akarot – usane aisā niścaya hī kiyā thā.*
c. *śaśvad akarot- usane sadā aisā kiyā thā.*
d. *śaśvat cakāra – usane sadā aisā kiyā thā.*
e. *agacchat kiṃ (laṅ)- gayā kyā.*
f. *jagāma kiṃ? (liṭ)- gayā thā kyā.*

g. iha purā chātrāḥ avasan (laṅ) - yahān pahale chātra rahate the.

3.7 *liṅ lakāra - vidhiliṅ and āśīrliṅ* (Potential and benedictive)

It is used with the indeclinable – *cet, yadi, kathaṃ, muhūrta, api, ut,* with *yacca* and *yatra* when the sense of *asambhāvanā* is denoted, and in the sense of *kimvṛtta*, desire (in the absence of kaścid), in the sense of *sāmarthya* (capability) (without using the word alaṃ in the sentence).

According to the *sūtra liṇ-cordhva-mauhūrtike* (P-3.3.9), *liṅ* is used with the word denoting the sense of the time period of more than *muhūrta*. In the example –

a. *muhūrtasya paścād upādhyāyaścet āgacchet, atha tvaṃ adhīṣva- thoḍī dera me upādhyāya āenge, aba tuma paḍho*.

Here the verb *āgacchet* is translated as *āenge*.

The *sūtra āśaṃsā-vacane-liṅ* (P-3.3.134) says that if the word denoting the sense of *āśaṃsā* is in the sentence, the *liṅ lakāra* is used to denote the future tense. For example-

b. upādhyāyaścet āgacchet āśaṃse yukto'adhīyīya – yadi upādhyāya āenge to āśā hai ki ṭhīka se paḍhenge.

Here also the verb *āgacchet* is translated as *āenge*.

According to the *sūtra kiṃvṛtte liṅlṛitau* (P-3.3.144)- when the sense of *'nindā'* is denoted by *kaḥ, kataraḥ* and *katamaḥ*, the *liṅ lakāra* as well as *lṛṭ lakāra* is used with the root. For example-

c. ko hariṃ nindet (nindiṣyati vā)- hari kī nindā kaun karatā hai?

The *sūtra jātu-yadorliṅ* (P-3.3.147) says that when the sense of *asambhāvanā* and *akṣamā* is denoted and the words *jātu* and *yad* are used in the *upapada*, the root takes *liṅ lakāra*. For example-

d. *na sambhavāmi yat nāma bhavān vedaṃ nindet- main socha bhī nahīn sakatā ki āpa veda kī nindā karate hain.*

Therefore we see that the liṅ lakāra is giving the meaning of present and future in Hindi.

3.8 luṅ lakāra (Aorist)

According to *māṅī luṅ, luṅ lakāra* is used with *māṅ (*in *upapada*). For example- *mā bhavān akārṣī- āpane nahīn kiyā / āpa nahīn karenge*. Here *luṅ* has been used to indicate future as well.

3.9 lṛṅ lakāra (Conditional)

liṅ nimitte lṛṅ-kriyātipattau says that the *lṛṅ* is used in place of *liṅ* when the action is fruitless. *śramaśced akariṣyat uttīrno abhaviṣyat (śrama karoge to uttīrṇa ho jāoge).* The *sūtra bhūte ca* says that the lṛṅ can be used to denote past tense as well. The Same example can be translated as *'śrama karate to uttīrṇa ho jāte'.* So we see that the *lṛṅ* can be translated into past as well as future tense.

4. Conclusion:

The general rules for mapping the Sanskrit-Hindi verb forms can be conflicted because of so many exceptional usages of *lakāra*s in different conditions. For example- when some words (*sma, nanu, nu, na, yāvat, purā, kadā, karhi, kam, kataram, katamam, yo-so, cet, muhūrta yāvat* etc) are used with laṭ *lakāra*, The translation shows the past and future tense as well. This is a dilemma in verb mapping. Therefore all the conditions of all the *lakārārtha* usage need to be examined linguistically so that mapping rules can be formulated. The study of *lakāra* usage can improve the output of rule based SHMT.

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