

Verbs in Sanskrit Wordnet

Abstract

How far the language divergence affects the development of a Wordnet following the expansion approach, especially if languages are historically related and the Wordnet of the older language is created on the basis of the modern language, is the topic of discussion in this paper. The verbs in Hindi and Sanskrit differ from each other in nature which affects the process of developing the Sanskrit Wordnet (SWN) from Hindi Wordnet (HWN). We present here those differences and strategies to create SWN. We seek to examine if the expansion approach forces to bring up issues rarely paid serious attention so far.

1 Introduction

The Sanskrit Wordnet (SWN) is being developed at IIT Bombay following the expansion approach. Hindi Wordnet (HWN¹) is the source for it. Hindi is New Indo Aryan (NIA) whereas Sanskrit has three different stages namely Old Indo Aryan (OIA), Middle Indo Aryan (MIA) and Modern Sanskrit². It would generally be unacceptable that the lexical database for a historically older language is developed on the basis of the database of the historically younger language. We show in this paper how in this scenario creation of SWN could prove useful linguistically.

1.1 Current status of the work

In all, 10244 synsets are completed in SWN till 31st August 2011. Category-wise break-up is as follows-

Noun	7033
Adjective	2306
Adverb	170
Verb	735

Table.1

Unique Word count- 28930

¹ <http://cfilt.iitb.ac.in>

² Burrow (2001: 2)

Ratio per synset- 3.5

Developing SWN with the expansion approach gives us an opportunity to study the linguistic peculiarities of Sanskrit from a fresh perspective. In this paper our focus will be on the divergence of verbs in Sanskrit and Hindi and its implication for constructing verbal synsets in SWN.

1.2 The roadmap of the paper is as follows:-

Second section discusses verbs in Hindi. The nature of Verbs in Sanskrit is discussed in third section. Section four discusses the strategies adopted while creating the synsets of verbs in SWN. Fifth section focuses on the emerging issues in SWN. Sixth section draws the conclusion from the material presented and also poses interesting relevant issues for future discussion.

2 Verbs in Hindi

Hindi has two kinds of verbs, namely, Simple and Complex. Verbs like चलना (calanā – to walk), चढ़ना (caḍhanā- to climb) *etc.* are simple verbs and आरम्भ करना (ārambha karanā- to start), लिख डालना (likha ḍālanā- to finish the writing) *etc.* are examples of complex verbs³. The complex verbs are again divided into two groups i.e. Conjunct verbs and Compound verbs. A conjunct verb is the combination of Nominal/Adverbial + a simple verb, e.g. आरम्भ करना (ārambha karanā), सर्वनाश करना (sarvanāśa karanā-to destroy) *etc.* A compound verb is the combination of Verb + Verb, e.g. लिख डालना (likha ḍālanā), खा लेना (khā lenā) *etc.* Sometimes the second verb is aspectual or modal when it functions as an auxiliary.

2.1 Compound Verbs

The second verb in a compound verb construction (as in लिख डालना) (likha Ḍālanā) is called as the vector (Chakrabarti 2008). Chakrabarti *et. al.*

³ Bhattacharya *et. al.* (2007: 3)

(2008) discuss the issue of compound verbs in Hindi. ‘Light verb’ is also a term used for the second verb in V+V construction⁴.

2.2 Conjunct Verbs

The conjunct verbs are the combination of a noun/adjective/adverb and a simple verb. In the conjunct verb it is obvious that the tense, mood and aspect are expressed by the main verb. Not every occurrence of Noun/adjective/adverb and Verb is considered as ‘conjunct verb’ in HWN. Various tests such as adding the accusative case marker, constituency tests, adding modifiers to the noun phrase etc. are used to determine the conjunct verb. Then the ‘true conjunct verbs’ are revealed and those only are added in the synset⁵.

3 The nature of verbs in Sanskrit

Sanskrit is an inflectional language. The traditional Sanskrit grammarians have shown the main division of a word; i.e. a stem and a suffix. The stem expresses the lexical meaning and suffixes bear various meanings such as tense, mood, aspect etc.

3.1 The Verbs in Sanskrit

By verbs⁶ we mean roots which stand for an action lexically. Verbs in Sanskrit are said to be of four types namely, simple roots, derived roots, denominatives, inchoatives⁷. By simple roots we mean the part of a verb that remains after suffix stripping. A traditional list of Sanskrit verbal roots is available in the form of ‘*dhātupāṭha*⁸’. In SWN we have followed the entries as given in this treatise. But certain entries of roots, different than the surface level root, which have some technical aspect, are not incorporated in the synsets of the verbs in SWN e.g. षह् (to tolerate) is सह् at surface level. The *dhātupāṭha* gives the entry of सह् as षह् for phonological operations. We have avoided such complex entries in SWN. SWN synset has the root सह्, not षह्.

The derived roots are the forms of the simple root which are formed by adding certain suffixes to the simple roots. These are causatives⁹, desideratives¹⁰ and intensives¹¹. All these formations are optional except causatives. The denominative verbal roots are formed by adding certain suffixes to the nouns¹². The inchoatives¹³ are special formation in Sanskrit as a suffix is added to a noun or an adjective and then it is compounded with verbs such as कृ (kr), भू (bhū), अस् (as).

3.2 Historical survey of verbs in Sanskrit

There are in all seven¹⁴ *dhātupāṭhas* available traditionally.

All of these give around 2000 verbal roots. These all are studied by Palsule (1961). He has studied all these *dhātupāṭhas* critically; including the grouping of the verbal roots, other technical devices that form a part of each entry in *dhātupāṭha* etc. He has also discussed the issue of meanings given in the *dhātupāṭha* in detail. There is one more article which is important in this regard. Whitney (1885) reduces the number of verbal roots in Sanskrit as given in *dhātupāṭha* (around 2000) to just 845 and gives a detailed account of the usage of the verbs and records these roots as available in vast literature of Sanskrit, ranging from Vedic period upto 18th Century A.D. This article is important as it contains a historical record of the usages of the verbal roots. Edgern (1885) tries to reduce the number of the roots in Sanskrit applying the diachronic approach. He analyzes all the 10 classes of verbal roots in Sanskrit as given in the tradition. He reduces the number of the verbal roots on the basis of Proto Indo-European etymology. All the studies mentioned above and those of Rocher (1967), Nooten (1969) have focused on the one hand the historical development of the verbal roots and on the other hand the theory of meaning as discussed in Pāṇinian tradition. But we find hardly any study which speaks about the

⁴ Butt (2003)

⁵ Ibid.

⁶ The primary information about the synsets of verbs in SWN is given in Kulkarni et.al. (2010 a) It discusses the peculiarity of the gloss of the verb and other features. The importance of the gloss of the verbs using navya-nyāya theory is also discussed in Kulkarni et. al. (2009).

⁷ This division is based on Speijer (1980 reprint).

⁸ This is the collection of verbal roots.

⁹ गम्(to go)-गमयति (gamayati) (makes somebody go)

¹⁰ गम्(to go)-जिगमिषति(jigamiṣati) (wishes to go)

¹¹ गम्(to go)-जङ्गम्यते(jamgamyate) (goes again and again)

¹² Aṣṭādhyāyī 3.1.8-27

¹³ शुक्लीकृ- to make white which is not white before

¹⁴ Pāṇinian, Cāndra, Kātantra, Jainendra, one *dhātupāṭha* by Hemacandra, one *dhātupāṭha* ascribed to Śarvavarman, *dhātupāṭha* by Vopadeva titled as Kavikalpadruma.

lexical semantics of verbs and how to lexicalize their combinations with pre-verbs *etc.*

3.3 Survey of Syntactic study of Sanskrit

In contrast to Hindi, Sanskrit uses simple verbs and the kinds of verbs that are briefly explained in the former passage. The concept of ‘complex verb’ is mainly discussed while studying the syntactic nature of a language in modern linguistics. The syntactic studies of Sanskrit are older than ‘modern linguistics’. Speijer (1886) was the first to publish a book on this topic. The term ‘compound verb’ is found in this book, but its connotation is completely different from the present one. He terms the pre-verb and verb combination as ‘compound verb’. Dr. Sukumar Sen¹⁵ (reprint 1995) has written articles on the syntax of Indo-Aryan languages. But he uses this particular term for N+V combination. These articles are older so the term is used in non-standard sense. The modern Sanskrit grammarians like Whitney (reprint 1962) do not discuss the topic. The work has mainly focused on the conjugation and other peculiarities of Sanskrit. Burrow (2001 first Indian edition) has also adopted diachronic approach while studying Sanskrit. Ivanov (1968) has tried to study the syntax of Sanskrit. But he also does not even use the term ‘compound verb’. Our attempt in this paper is to see if expansion approach can throw some light on these issues.

4 Strategies of creating verbal synsets in SWN

Below we discuss the strategies with regards various issues.

4.1 Lexicalization vs. Suffixation

Hindi uses lexicalized units to denote tense, mood, aspect and such other syntactic information. This kind of information is fused into one unit in Sanskrit and it is expressed by a suffix. The unit of a verb that bears syntactic information is called as an ‘auxiliary’. Sanskrit has very few ‘auxiliaries’. Hence the synset which expresses such syntactic meaning cannot be mapped in SWN as the conveyor of such meaning i.e. suffix is not a part of lexicon. The example is given below-

1. (synset id. 10809) चुकना¹⁶ (chukanā)- किसी कार्य का बाकी न रहना (kisi kārya kā bākī na

rahanā) "क्या आप खाना खा चुके" (kyā āpa khānā khā chuke)

चुकना (chukanā) is a modal auxiliary in Hindi.

This particular sense is expressed through a suffix (लुङ् or तवत्) in Sanskrit. Hence we cannot link this synset.

2. (synset id.10149) संभावना होना¹⁷, सकना (sambhāvanā honā, sakanā) कोई कार्य हो सकना (koī kārya ho sakanā) आज बारिश होने की संभावना है। (āja bārisha hone kī sambhāvanā hai)

सकना is also a modal auxiliary in Hindi which is expressed through a suffix (लिङ्) in Sanskrit. Hence we cannot lexicalize above mentioned concepts in Sanskrit and link the synset of Hindi in HWN.

4.2 Light Verbs

Hindi has light verbs but they are absent in Sanskrit. Butt (2003:18) says that the decrease in the use of the pre-verbs has given rise to the use of the light verbs. Every language that uses the light verb has a closed set of such verbs. Hindi has 11¹⁸ such verbs. The light verbs express the meanings like completion, suddenness, benefaction etc.

4.2.1 Light verbs and pre-verbs

Sometimes the meanings like completion as in चला जाना (calā jānā) would be conveyed through a pre-verb in Sanskrit like निर् (nir) as in निर्गतः (nirgatah) (he went).

4.2.2 Reverse Example

¹⁶ complete, finish - come or bring to a finish or an end "He finished the dishes" "She completed the requirements for her Master's Degree" "The fastest runner finished the race in just over 2 hours others finished in over 4" hours"<http://www.cfilt.iitb.ac.in/wordnet/webhwn/wn.php>

¹⁷ expect, anticipate - regard something as probable or likely "The meteorologists are expecting rain for tomorrow" <http://www.cfilt.iitb.ac.in/wordnet/webhwn/wn.php>

¹⁸ Poornima (2008:7) There are 11 light verbs listed in the paper. बैठना (baiṭhanā), डालना (ḍālanā), देना (denā), लेना (lenā), मारना (māranā), निकालना (nikālanā), आना (ānā), जाना (jānā), पडना (paḍnā), निकलना (nikālanā), उठना (uṭhanā). One verb is repeated as they are grouped according to transitive and intransitive nature.

¹⁵ Sen has written these articles in late 19th century A.D.

Here is the reverse example where Sanskrit does not express the meaning of the light verb by any of the pre-verbs¹⁹.

7122 ²⁰ एक चीज़ आदि के बदले में दूसरी चीज़ आदि लेना या देना (ek cīja ādi ke badale mein dūsarī cīja ādi lenā yā denā) रमा ने अपनी पुरानी फ्रीज़ बदल दी (ramā ne apañī purānī freez badala dī) बदलना, बदल देना (badalanā badala denā)	एकं वस्तु दत्त्वा अन्यस्य वस्तुनः ग्रहणानुकूलः व्यापारः। (ekam vastu datvā anyasya grahaṇānukūlah vyāpārah) "रमा स्वस्य शीतकपाटिकां प्रत्ययच्छत् । (ramā svasya śītakakapāṭikām pratyayacchat) /तिलेभ्यः प्रतियच्छति माषान् । (tilibhyaḥ pratiyacchati māṣān) प्रतिदा (pratidā), विमे (vime), निमे (nime), मे(me), प्रतिपण् (prati-pan), व्यतिह (vyatih), व्यवह (vyavah), परिवृत् (parivṛt)
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Table.2

The concept in 7122, 'to exchange', can be expressed in Hindi with the help of two verbs. One of these verbs in Hindi is simple verb and other one is V+V *i.e.* compound verb. The second member देना is a light verb. In Sanskrit the concept [(एक चीज़ आदि के बदले में दूसरी चीज़ आदि लेना या देना) (ek cīja ādi ke badale mein dūsarī cīja ādi lenā yā denā)] is expressed by adding a pre-verb to the verb which means exactly opposite by adding a pre-verb *e.g.* प्रतिदा. The root दा means 'to give' but when प्रति (prati) is added to the verb

¹⁹ These are as follows- प्र (pra), परा (parā), अप (apa), सम् (sam), अनु (anu), अव (ava), निस् (nis), निर् (nir), दुस् (dus), दुर् (dur), वि (vi), आइ (ān), नि (ni), अधि (adhi), अपि (api), अति (ati), सु (su), उद् (ud), अभि (abhi), प्रति (prati), परि (pa-ri), उप¹⁹ (upa) (Total 22).

²⁰ change, exchange, commute, convert - exchange or replace with another, usually of the same kind or category "Could you convert my dollars into pounds?" "He changed his name" "convert centimeters into inches" "convert holdings into shares"
<http://www.cfilt.iitb.ac.in/wordnet/webhwn/wn.php>

then its meaning changes to 'to exchange'. Same can be said about पण् (paṇ) which means 'to buy' and when प्रति (prati) is added to the verb then its meaning changes to 'to exchange'. व्यतिह (vyatih), व्यवह (vyavah) also mean 'to exchange' but the verb occurs here with pre-verbs like वि+अति (vi+ati) and वि+अव (vi+ava). The meaning of the root ह is 'to take' but it changes when these particular pre-verbs are added to the root. Sometimes the root expresses the same meaning with the pre-verbs too, as मे itself means 'to exchange' but विमे (vime), निमे (nime) also mean the same.

All the members of the synset express the meaning of the root बदलना (badalanā) only. But no member of the synset in Sanskrit expresses the sense of देना (denā).

4.3 Conjunct verbs

The noun or adjective or adverb and a simple verb together form a conjunct verb.

4.3.1 Conjunct Verb with a तत्सम word in Hindi and Simple Verb in Sanskrit

The conjunct verbs with the combination of- a तत्सम²¹ word + simple verb, in HWN will be expressed by a single verb unit in Sanskrit, *e.g.*

इच्छा करना (icchā karanā), कामना करना (kāmanā karanā), इच्छा रखना (icchā rakhanā) (to desire)	इष् (iṣa), कम् (kam) (to desire)
सर्वनाश करना (sarvanāśa karanā) (to destroy)	नश् (naś), ध्वंस् (dhvam-sa) (to destroy)
शान्त करना (śānta karanā) (to stop)	शम् (śam) (to stop)

Table.3

The verbs in Hindi are conjunct verbs and the verbs in Sanskrit are the roots of the words in Hindi conjunct verbs, *e.g.*; इच्छा (icchā) is derived from the verbal root इष् (iṣa), कामना (kāmanā) is derived from कम् (kam) and so on.

²¹ तत्सम word is a Sanskrit word used in modern languages.

4.3.2 Conjunct Verb in Hindi and Pre-verb+Verb in Sanskrit

7861 ²² किसी का अनुसरण करना (kisī kā anusaraṇa karanā) "पुलिस ने बहुत देर तक चोर का पीछा किया" (pulisā ne bahuta dera taka chora kā pīchā kiyā) पीछा करना,पछियाना,पीछे लगना (pīchā karanā pachiyānā pīche laganā)	पश्चात् धावनानुकूलः व्यापारः। (paścāt dhāvnānukūḷḥ vyāpārah) आरक्षकाः दीर्घकालं यावत् चौरम् अन्वसार्षुः। (ārakṣakāḥ cauram anvasārṣuh) अनुसृ (anusṛ), अनुगम (anugam), अनुधाव (anudhāv), अनुव्रज (anuvraj), अनुया (anuyā), अनुवृत् (anuvṛt), अनुक्रम (anukram), अनुद्रु (anudru), समनुगम (samānugam), समनुद्रु (samānudru)
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Table.4

This example (id 7861) is in the sense of 'to pursue or to follow'. In Hindi it is expressed through conjunct verb (पीछा करना 'pīchā karanā', पीछे लगना 'pīche laganā') and a simple verb (पछियाना 'pachiyānā'). In Sanskrit, it is expressed through a pre-verb अनु (anu) and समनु (samānu) along with verbs which mean 'to go' and 'to run'. Here two pre-verbs combine together. This is the unique feature of Sanskrit absolutely absent in Hindi.

4.4 Simple Verb in Hindi and Conjunct Verb (?) in Sanskrit

Here is the example where Hindi expresses a particular concept through a simple verb. But Sanskrit, against its natural tendency, expresses a particular concept through a noun and simple verb combination.

5351 सूर्य, चंद्र आदि का अस्त होना (sūrya Chandra ādi kā asta honā)	सूर्यस्य चन्द्रस्य वा अस्तं प्रति गमनानुकूलः व्यापारः। (Sūryasya chandrasya vā astam prati)
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²² pursue, follow - follow in or as if in pursuit "The police car pursued the suspected attacker" "Her bad deed followed her and haunted her dreams all her life
<http://www.cfilr.iitb.ac.in/wordnet/webhwn/wn.php>

"सूर्य पश्चिम में डूबता है " (Sūrya paścima me ḍūbatā hai) डूबना (ḍūbanā), ढलना (dhalanā), अस्त होना (asta honā), अस्तगत होना (astagata honā)	gamanānukūḷḥ vyāpārah) "सूर्यः पश्चिमदिशि अस्तं गच्छति।" (Sūryaḥ paścimadiśi astam gacchati) अस्तं_गम (astam_gam), अस्तं_व्रज (astam_vraj), अस्तं_या (astam_yā), अस्ताचलम्_अवलंब (astācalam_avalamb), अस्तशिखरम्_अवलंब (astāśikharam_avalamb), अस्ताचलम्_प्राप् (astācalam_pṛāp), अस्तशिखरम्_प्राप् (astāśikharam_pṛāp), सागरे_मस्ज (sāgare_masj)
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Table.5

This is an example of such concept which is not expressed through a single verb in Sanskrit. The synset in Hindi is 'डूबना' (ḍūbanā) means 'to set'. This concept is expressed through a single verb, ढलना (dhalanā) as well as डूबना (ḍūbanā), in Hindi. Other members of the synset are 'conjunct verbs'. The first member is 'तत्सम' (tatsama) word in it. There should be a strategy to map this synset in SWN. The possible solution is, a phrase which means 'to set' in Sanskrit should be entered in the synset like HWN does in other synsets of verbs.

Should we call all the members (अस्तं_गम) (astam_gam) etc. of this synset in SWN 'conjunct verb'? The first word in 'astam gam' means 'setting' and second word means 'to go'. Both of these words together mean 'to set'. 'Asta' is an independent lexeme in Sanskrit and 'gam' too. In this way one concept is expressed through 'noun+simple verb' combination. Hence it can be labeled as a 'conjunct verb'.

5 Emerging Issues

In the previous (fourth) section we have shown the strategies of creating the synsets of verbs in SWN. Following are certain emerging issues which are an outcome of the activity of developing SWN with an expansion approach.

5.1 Role of pre-verbs

In the section 4.3.2 we have shown that Sanskrit expresses meanings (expressed by conjunct verbs in Hindi) through pre-verb and verb combination. Hence pre-verbs will play an important role as far as the lexicalization in Sanskrit is concerned. The pre-verbs are also important to study the relational semantics.

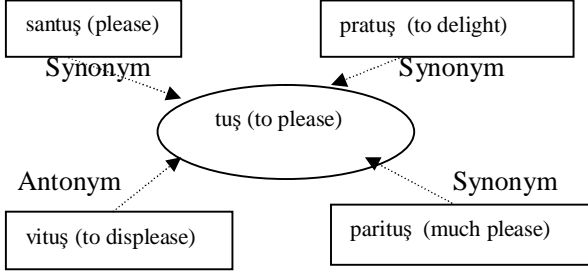


Fig.1

The verb तुष् (tuṣ) means ‘to satisfy’ or ‘to please’. When various pre-verbs like सम् (sam), प्र (pra), परि (pari) etc. are attached to it then meaning of the verb gets changed slightly, hence we may say that these newly formed words are synonyms of the original verbs²³. But the other pre-verb *i.e.* वि expresses opposite meaning *i.e.* ‘to be unhappy’.

The figure no.1 gives an over-view that such kind of study of the relations among the verbs and their combinations with the pre-verbs would reveal some interesting issues in the field of ‘relational’ semantics which forms a foundation to the Wordnet activity.

5.2 More discussion on conjunct verbs in Sanskrit

Sen (reprint 1995) is an important contribution in this discussion. It provides (presented below) a list²⁴ of verses in Mahābhārata²⁵ and goes to show the usage of conjunct verbs.

The list is given below.

1. राज्यं कारयितुम् Mahābhārata I.80.27
(rājyam kārayitum)
State to make somebody to do
(to rule a state)

²³ This feature drastically increases the size of the synset.

²⁴ Sen 1995:382

²⁵ Mahābhārata is an epic composed by Vyāsa.

2. पाण्डुर्भावं चक्रे | Mahābhārata 1.90.73
(Pāṇḍurbhāvam cakre)
Pāṇḍu **opinion do**
(Pāṇḍu **decided**)|
3. गमनाय मतिं चक्रे | Mahābhārata 2.2.2
(gamanāya matim cakre)
To go **intellect to do**
((He) **decided** to go)|
4. प्रवेशनं चक्रे | Mahābhārata 2.4.1
(praveśanam cakre)
Act of entering do
((He) entered)|
5. राजसूये मनः कुरु | Mahābhārata 2.13.26
(rājasūye manaḥ kuru)
rājasūya **mind do**
(**Concentrate** on rājasūya)
6. पूजां चक्रे महात्मने | Mahābhārata 3.81.3
(pūjām cakre mahātmane)
worship do ‘honorable person’
((He) **worshiped** the ‘honorable person’.)
7. यज्ञायैव मनो दधे | Mahābhārata 2.13.4
(yajñāyaiva mano dadhe)
sacrifice only **mind keep**
(**Concentrate** only on sacrifice.)
8. वाचं ददानि | Mahābhārata 3.265.3
(vācam dadāni)
word give
((Let me) promise)

The members of each verb (in these cases) are a noun and the verb. The verbs like कृ (kr), दा (dā), धा (dhā) are used here. So we may say that there are ‘conjunct verbs’ found in the Sanskrit literature also. On the basis of this discussion we can say that we use conjunct verbs in SWN to map concepts in HWN.

We are also aware of the distinction between the conjunct verbs and the peri-phrases.

5.2.1 Peri-phrases- Most of the verbs in Sanskrit can be converted into ‘derived form of the verb + kr’ format (peri-phrase) *e.g.* गच्छति (gacchati)-

गमनं करोति²⁶ (gamanam karoti) (he goes), पठति (paṭhati)- पठनं करोति (pathanam karoti) (he studies), शेते (śete)- शयनं करोति (śayanam karoti) (he sleeps) etc. Because of their distinct nature from the conjunct verbs we do not make peri-phrases the part of SWN

6. Conclusion and Future Work

1. The preverbs play an important role in Sanskrit and will be used effectively in SWN to express various Hindi language phenomenon like 'light verbs'.
2. It could be shown that Sanskrit has conjunct verbs.
3. The conjunct verbs will be a part of synset of verbs in SWN and not the periphrases.
4. The study of the inchoative constructions in Sanskrit and conjunct verbs in Hindi is an interesting issue which we reserve for future discussion.

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