

A Preliminary Work on Causative Verbs in Hindi

Rafiya Begum, Dipti Misra Sharma

Language Technologies Research Centre, IIIT.

rafiya@research.iiit.ac.in,

dipti@iiit.ac.in

Abstract

This paper introduces a preliminary work on Hindi causative verbs: their classification, a linguistic model for their classification and their verb frames. The main objective of this work is to come up with a classification of the Hindi causative verbs. In the classification we show how different types of Hindi verbs have different types of causative forms. It will be a linguistic resource for Hindi causative verbs which can be used in various NLP applications. This resource enriches the already available linguistic resource on Hindi verb frames (Begum et al., 2008b). This resource will be helpful in getting proper insight into Hindi verbs. In this paper, we present the morphology, semantics and syntax of the causative verbs. The morphology is captured by the word generation process; semantics is captured by the linguistic model followed for classifying the verbs and the syntax has been captured by the verb frames using relations given by Panini.

1 Introduction

Verbs play a major role in expressing the meaning of a sentence and its syntactic behavior. They decide the number of participants that will participate in the action. Semantically verbs are classified into action verbs, state verbs and process verbs. Syntactically they are classified into intransitives, transitives and ditransitives. The morphological, semantic and syntactic properties of verbs play an important role in deeper level analysis such as parsing.

Causative verbs are differently realized in different languages. These verbs have been an interesting area of study. The study of causative constructions is important as it involves the interaction of various components such as semantics, syntax and morphology (Comrie, 1981). This paper presents the preliminary work on Hindi causative verbs.

2 Causative Verbs

Causative verbs mean that *some actor makes somebody else do something or causes him to be in a certain state* (Agnihotri, 2007). The causal verb indicates the *causing of another to do something, instead of doing it oneself* (Greaves, 1983). Semantically causative verbs refer to a *causative situation* which has two components: (a) the causing situation or the antecedent; (b) the caused situation or the consequent. These two combine to make a *causative situation* (Nedyalkov and Silnitsky, 1973). There are different ways in which causation is indicated in different languages. There are three types of causatives: Morphological causatives, Periphrastic causatives and Lexical causatives (Comrie, 1981).

Morphological Causatives indicate causation with the help of verbal affixes. Sanskrit, Hindi/Urdu, Persian, Arabic, Hebrew, Japanese, Khmer and Finnish languages have morphological causatives. **Periphrastic causatives** indicate causation with the help of a verb which occurs along with the main verb. For example, in English in a sentence such as:

(1) *John made the child drink milk.*

In the above example the verb *make* is expressing causation which is occurring along with the verb *drink* which in turn is expressing

the main action. English, German and French are some of the languages which have periphrastic causatives. **Lexical causatives** are those in which there is no morphological similarity between the base verb root and the causative verb form. A different lexical item is used to indicate causation. For example, the causative of English *eat* is *feed*. English and Japanese have lexical causatives. English has both **periphrastic** and **lexical causatives**.

3 Causative verbs in Hindi

Causatives in Hindi are realized through a morphological process. In Hindi, a base verb root changes to a causative verb when affixed by either an *-aa* or a *-vaa* suffix.

<u>Base verb</u>	<u>First causal</u>	<u>Second causal</u>
<i>so</i> 'sleep'	<i>sul-aa</i> 'put to sleep'	<i>sul-vaa</i> 'cause to put to sleep'

In each step of causative derivation there is an increase in the valency of the verb (Kachru, 2006; Comrie, 1981)

(2) *baccaa soyaa*
child sleep.Pst
'The child slept.'

(3) *aayaa ne bacce ko sulaayaa*
maid Erg. child Acc. sleep.Caus.Pst
'The maid put the child to sleep.'

(4) *maa.N ne aayaa se bacce ko sulvaayaa*
mother Erg. maid by child Acc.
sleep.Caus.Pst
'Mother caused the maid to put the child to sleep.'

Hindi verbs are divided into two groups based on their behaviour in causative sentences: **affective verbs** and **effective verbs** (Kachru, 2006). The action of affective verbs benefits or affects the agent. **Affective verbs** will have both first and second causal forms. Verbs such as *ronaa* 'to cry' and *dau.Dnaa* 'to run' are affective intransitive verbs. Only verbs belonging to *khaanaa* 'to eat' class come under affective transitive verbs. The agent of the affective in-

transitive verb becomes the patient and the agent of the affective transitive verbs becomes the recipient in the first causal and they both will take a *ko* postposition (Hindi case marker). **Effective verbs** and ditransitive verbs have only one causal form. The agent of the effective verb and ditransitive verb becomes the causative agent in the first causal. So this causative agent in the first causal takes a *se* 'with' postposition (Hindi case marker). Verbs belonging to *karnaa* 'to do' class come under the effective verbs.

The major studies in Hindi causatives: Kachru (1966), Kachru (1980), Kachru (2006), McGregor (1995), Greaves (1983), Kellogg (1972), Agnihotri (2007), Sahaay (2004), Sahaay (2007), Singh (1997) and Tripathi (1986). Kachru (1966) has given the classification of Hindi verbs based on their causativization behavior. The others have mostly talked about the derivation process of the causative verbs.

However the classification of causative verbs in Hindi remains an issue of discussion. Since they are morphologically related, the decision of what is the base verb form of these verbs remains a point of discussion. There are two approaches which are followed in deciding the base verb: (1) causative formation based only on morphology, (2) causative formation based on morphology and semantics.

I. Based on Morphology

<u>Base verb</u>	→ <u>First causal</u>	→ <u>Second causal</u>
(Intransitive) <i>khul</i> 'open'	(Transitive) <i>khol</i> 'open'	(Causative) <i>khulvaa</i> 'cause to open'

II. Based on Morphology and Semantics

<u>Intransitive</u>	← <u>Base verb</u>	→ <u>Second causal</u>
(Intransitive) <i>khul</i> 'open'	(Transitive) <i>khol</i> 'open'	(Causative) <i>khulvaa</i> 'cause to open'

In I, *khul* 'open' is taken as the base verb and *khol* 'open' and *khulvaa* 'cause to open' are derived from it by adding suffix *-aa* and *-vaa* respectively to the base verb (Kachru, 1966; Kachru, 1980). The arrow denotes the direction of derivation from base verb. Here, the forward arrow denotes the increment of the argument from base to the causal forms. On the other

hand, in II, *khol* ‘open’ is taken as the base verb. Here, other than morphology, the semantics of the verbs is also taken into consideration. Here *khul* ‘open’ and *khulvaa* ‘cause to open’ are derived from the base verb *khol* ‘open’. *khulvaa* ‘cause to open’ is a causative verb which is derived from the base verb by adding suffix ‘-vaa’ to it. *khul* ‘open’ is a derived intransitive form. The agent of the base verb *khol* ‘open’ is not realized on the surface level of the derived intransitive verb *khul* ‘open’ though it is implied semantically. Here there is both forward and backward derivation. From base verb to the derived intransitive it is a backward derivation which means there is a reduction of one argument from base verb to the derived intransitive verb (Tripathi, 1986; Reinhart, 2005).

In this paper, we motivate our work by presenting our approach for classifying the causative verbs in Hindi.

4 Our Approach

4.1 Linguistic Model for Classifying Causative verbs

We have followed Paninian Grammatical framework in this model as the theoretical basis for our approach. The meaning of every *verbal root* (*dhaatu*) consists of: (a) *activity* (*vyaapaara*) and; (b) *result* (*phala*). *Activity* denotes the actions carried out by the various participants (*karakas*) involved in the action. *Result* denotes the state that is reached, when the action is completed (Bharati et al., 1995). The participants of the action expressed by the verb root are called *karakas*. There are six basic *karakas*, namely; *adhiakarana* ‘location’, *apaadaan* ‘source’, *sampradaan* ‘recipient’, *karana* ‘instrument’, *karma* ‘theme’ and *karta* ‘agent’ (Begum et al., 2008a). Here the mapping between *karakas* and *theta roles* is a rough mapping.

The *karta karaka* is the locus of the *activity*. Similarly *karma karaka* is the locus of the *result*. The locus of the *activity* implied by the verbal root can be animate or inanimate. Sentence (2) given above, is the example where the locus of the activity is animate. Sentence (5) given below, is the example where the locus of the activity is inanimate.

(5) *darvaazaa khulaa*

door open.Pst
‘Door opened.’

(6) *raam ne darvaazaa kholaa*
ram Erg. door open.Pst
‘Ram opened the door.’

(7) *maiM ne raam se darvaazaa*
I Erg. ram by door
khulvaayaa
open.Caus.Pst
‘I made Ram open the door.’

When we come to the causatives, the notion of *prayojak karta* ‘causer’, *prayojya karta* ‘causee’ and *madhyastha karta* ‘mediator causer’ are introduced. *prayojak karta* ‘causer’ is the initiator of the action. *prayojya karta* ‘causee’ is the one who is made to do the action by the *prayojak karta* ‘causer’. *madhyastha karta* ‘mediator causer’ is the causative agent of the action. The *karta* of the base verb becomes the *prayojya karta* of the causative verb and the *prayojak karta* of the first causative becomes the *madhyastha karta* of the second causative.

This model takes both semantics and morphology into consideration.

4.1.1 Semantics

(8) *caabii ne taalaa kholaa*
key Erg lock open.Pst
‘The key opened the lock.’

(9)* *raam ne caabii se taalaa khulvaayaa*
ram Erg. key by lock open.Caus.Pst
‘Ram caused the key to open the lock.’

(10) *raam ne mohan dvaaraa caabii se taalaa*
ram Erg. mohan by key with lock
khulvaayaa
open.Caus.Pst.
‘Ram made Mohan open the lock with the key.’

In (8), *caabii* ‘key’ is the *karta* of the transitive verb *khol* ‘open’. *caabii* ‘key’ is an inanimate *karta* so this sentence can’t be causativized. (8) has been tried to causativize in (9) which is unacceptable. (9) is actually interpreted as (10) where an inanimate noun with a *se* ‘with’ postposition acts as an instrument and not as a *prayojya karta* ‘causee’. So in (10), *caabii*

'key' is an inanimate noun and takes *se* 'with' postposition so *caabii se* 'with the key' acts as instrument and *mohan* 'Mohan' acts as the *prayojya karta* 'causee' (Kachru, 1966). It seems that only those verbs can be causativized which take an animate *karta*.

Out of the above two given approaches, we are following approach II where both morphology and semantics are considered. In our approach we are saying that only those base verbs can be causativized which take an animate *karta* and it should also have volitionality (Tripathi, 1986; Reinhart, 2005). Those base verbs which take an inanimate *karta* can't be causativized. So in our approach the *prayojya karta* 'causee' in the causative sentence is always animate as the *karta* of the base verb becomes the *prayojya karta* 'causee' in the causative sentences. In our approach we have the notion of *karmakartri* which says an intransitive can be derived out of a basic transitive verb and the *karma* of the basic transitive verb becomes the *karta* of the derived intransitive verb. So the *karta* of the derived intransitive verb is called *karmakartri*. The derived intransitive verbs are like unaccusative verbs of English.

Whereas in approach I, the intransitive base verbs that take both animate and inanimate *karta* can be causativized. But in case of transitives, base verbs which take only animate *karta* can be causativized. Ditransitives can also be causativized. (Kachru 1966; Kachru 1980)

We follow the dependency tagging scheme proposed by Begum et al. (2008a) for the development of a dependency annotation for Indian Languages. In this scheme *prayojak karta* 'causer', *prayojya karta* 'causee' and *madhyas-tha karta* 'mediator causer' are represented as *pk1*, *jk1* and *mk1* respectively.

Some of the base verb forms and their causative sentences are given below with dependency relations marked in the brackets for the appropriate arguments:

(11) *raam ne(k1) seb(k2) khaayaa*
ram Erg. apple eat.Pst
'Ram ate an apple.'

(12) *siitaa ne(pk1) raam ko(jk1) seb(k2)*
sita Erg. ram Acc. apple

khilaayaa
eat.Caus.Pst
'Sita fed Ram an apple.'

(13) *maa.N ne(pk1) siitaa se(mk1) raam ko(jk1)*
mother Erg. sita by ram Acc.
seb(k2) khilvaayaa
apple eat.Caus.Pst.
'Mother caused Sita to feed Ram an apple.'

(14) *naukar ne(k1) kaam(k2) kiyaa*
servant Erg. work do.Pst
'The servant did the work.'

(15) *maalik ne(pk1) naukar se(mk1) kaam(k2)*
master Erg. servant by work
karvaayaa
do.Caus.Pst
'The master caused Ram to do the job.'

(16) *raam ne(k1) siitaa ko(k4) kitaab (k2) dii*
ram Erg. sita Dat. book give.Pst
'Ram gave a book to Sita.'

(17) *mohan ne(pk1) raam se(jk1) siitaa ko(k4)*
mohan Erg. ram by sita Dat.
kitaab(k2) dilaaii
book give.Caus.Pst
'Mohan made Ram give a book to Sita.'

(18) *mujhko(k4a) chaa.Nd(k1) dikhaa*
I.Dat. moon appear.Pst
'The moon became visible to me.'

(19) *maiM ne(k1) chaa.Nd(k2) dekhaa*
I Erg. moon see.Pst
'I saw the moon.'

(20) *maiM ne(pk1) raam ko(jk1) chaa.Nd(k2)*
mother Erg. ram Dat. moon
dikhaayaa
see.Caus.Pst
'Mother showed moon to Ram.'

(21) *maiM ne(pk1) mohan se(mk1)*
I Erg. mohan by
raam ko(jk1) chaa.Nd(k2) dikhlaayaa
ram Dat. moon see.Caus.Pst
'Mother made Mohan show moon to Ram.'

4.1.2 Morphology

In this section we have given the derivation process of the Hindi causative verbs. We have studied 160 Hindi verbs and have come up with certain number of rules for the derivation process of causative verbs.

When causative affixes are added to the base verb roots then some of the base verb roots change in form and some don't. Various causal affixes are added to each verb type to form causatives. An example of affix addition for each verb type is discussed below. The affixes that are added are given in bold. The changes in the base verb root are underlined and made bold in both root form and the causal form.

4.1.2.1 Type-1 and its causative forms:

Suffix '-aa' is added to the verb root to form the first causal and '-vaa' to form the second causal.

No Change in the Root:

Chip → *Chip-aa* → *Chip-vaa*
'hide' 'hide' 'cause to hide'

Change in the Root:

➤ aa → a

naach → *naach-aa* → *naach-vaa*
'dance' 'make someone dance' 'cause to make someone dance'

4.1.2.2 Type-2 and its causative forms:

Suffix '-aa' is added to the verb root to form the first causal and '-vaa' to form the second causal.

No Change in the Root:

likh → *likh-aa* → *likh-vaa*
'write' 'dictate' 'cause to dictate'

Change in the root:

➤ aa, ii → i; In addition, 'l' is inserted here between the root and the causative suffix.

khaa → *khi-l-aa* → *khi-l-vaa*
'eat' 'feed' 'cause to feed'

pi → *pi-l-aa* → *pi-l-vaa*
'drink' 'make someone drink' 'cause to make someone drink'

4.1.2.3 Type-3 and its causative forms:

Suffix '-vaa' is added to the verb root to form the first causal.

No Change in the Root:

khariid → *khariid-vaa*
'buy' 'cause to buy'

Change in the Root:

➤ aa → a

gaa → *ga-vaa*
'sing' 'cause to sing'

4.1.2.4 Type-4 and its causative forms:

Suffix '-aa/-vaa' is added to the verb root to form the first causal.

No Change in the Root:

paros → *paros-vaa*
'serve' 'cause to serve'

Change in the root:

➤ e → i; In addition, 'l' is inserted here between the root and the causative suffix.

de → *di-l-aa / di-l-vaa*
'give' 'cause to give'

In case type-5 and type-6 verbs, we can derive intransitive verbs out of transitive verbs. Here we have two types of word formations:

- causative formation,
- Derived intransitive verb formation

Causative derivation is the forward derivation and intransitive derivation is backward derivation.

4.1.2.5 Type-5 and its causative forms:

Suffix '-aa' is added to the verb root to form the first causal and '-vaa' to form the second causal. In this verb type there is no example where the

verb root form doesn't change.

Causative Formation: Change in the root

➤ e → i

dekh → *dikh-aa* → *dikh-vaa*
 'see' 'show' 'cause to show'

Derived intransitive formation: Change in the above root:

➤ i ← e

dikh ← *dekh*
 'appear' 'see'

4.1.2.6 Type-6 and its causative forms:

Suffix '-aa/-vaa' is added to the transitive verb root to form the first causal.

Causative formation: No change in the root

bhar → *bhar-vaa / bhar-aa*
 'fill' 'cause someone to fill'

Derived intransitive formation: No change in the root

bhar ← *bhar*
 'to fill' 'to fill'

Causative formation: Change in the root

➤ o → u; In addition, 'l' is inserted here between the root and the causative suffix

dhō → *dhu-l-aa / dhu-l-vaa*
 'wash' 'cause to wash'

Derived intransitive formation: Change in the above root:

➤ u ← o; In addition, 'l' is inserted at the end of the root

dhu-l ← *dhō*
 'be washed' 'cause to wash'

In the implementation of the causative verbs, the causative feature of a verb is reflected in the morph analysis. There are two possible ways to implement causative information: (i) All the causative verb roots are included in the root dictionary of the morph analyzer with an additional feature marking it a causative verb type. (ii) For

all causative verbs the following information is marked; causative root, base root, verb type and causative suffix. In (i), the information of base verb root from which the causative root is derived is missing which is captured in (ii). In the above mentioned two ways the latter gives more detailed information than the former.

4.2 Methodology of the Work

For this work, 160 base verbs were taken, their causative forms were given and were classified. Rules for deriving causative verb forms from their base forms were made. Verb frames for base verbs and their causative forms were developed. Based on the analysis of the base verbs certain problem cases were logged and generalizations regarding causativization were made. In this paper, we briefly discuss about all the points mentioned above.

4.3 Classification of Hindi Causative Verbs

Here Hindi verbs have been classified into 6 types based on their causativization behavior:

➤ **Type-1:** Basic Intransitive verb

Basic intransitive verb has two causal forms i.e., first causal and second causal form. First causal of the basic intransitive verb functions as a transitive verb. The subject of the basic intransitive verb becomes the object of the transitive verb or the first causal form. The subject of the first causal form becomes the causative agent of the second causal form. Sentence (2) is the example of basic intransitive and sentences (3) and (4) are its causative forms.

➤ **Type-2:** Basic Transitive verb type-I (which is similar to *khaanaa* 'to eat' verb type given by Kachru (1966))

➤ **Type-3:** Basic Transitive verb type-II (which is similar to *karna* 'to eat' verb type given by Kachru (1966))

Type-2 and type-3 are transitive verbs which are divided into two types based on their causativization behavior. Basic transitive verbs of type-I, like *khaanaa* 'to eat' have two causal forms. First causal of *khaanaa* 'to eat' type verb

also functions as ditransitive. Whereas transitive verbs of type-II, like *karnaa* 'to do' have one causal form. First causal of *karnaa* 'to eat' type verb functions as causative. Sentences (11-13) are examples for type-2 verb. Sentences (14-15) are examples for type-3 verb.

➤ **Type-4:** Basic Ditransitive verb

Ditransitive verbs also have one causal form. Sentences (16-17) are examples for type-4 verb.

➤ **Type-5:** Basic Transitive verb type-I, out of which intransitive verbs can be derived which takes a dative subject,

➤ **Type-6:** Basic Transitive verb type-II, out of which intransitive verbs can be derived.

Type-5 and type-6 are transitive verbs which have causal forms depending on whether it is type-I (*khaanaa* 'to eat') transitive or type-II (*karnaa* 'to do') transitive and in addition both have a derived intransitive form. Type-5 takes a dative subject in the base form. Sentences (18-21) are examples for type-5 verb. Sentences (5-7) are examples for type-6 verb. Other than the 4 classes classified by Kachru (1966), we have two more extra classes, i.e., type-5 and type-6.

An example for each verb type that goes into the classification is given below:

➤ **Type-1**

Base verb → **First causal** → **Second Causal**
so *sulaa* *sulvaa*
 'sleep' 'put to sleep' 'cause to put to sleep'

➤ **Type-2**

Base verb → **First causal** → **Second Causal**
khaa *khilaa* *khilvaa*
 'eat' 'feed' 'cause to feed'

➤ **Type-3**

Base verb → **First causal**
kar *karaa/karvaa*
 'do' 'cause to do'

➤ **Type-4**

Base verb → **First causal**
de *dilaa/dilvaa*

'give' 'cause to give'

➤ **Type-5**

Intransitive ← **Base verb**
dikh *dekh*
 'appear' 'see'

Base verb → **First causal** → **Second Causal**
dekh *dikhaa* *dikhvaa*
 'see' 'show' 'cause to show'

➤ **Type-6**

Intransitive ← **Base verb**
khul *khol*
 'open' 'open'

Base verb → **First causal**
khol *khulvaa*
 'open' 'cause to open'

5 Verb Frames

In this section we list out the syntactic frames for all the causative types discussed in the previous sections. Verb frame (Begum et al., 2008b) is given for the base form and for its first and second causal form. For ease of exposition, below we show only the relevant information of a verb frame. Components not necessary for the present discussion have been left out. Here the structure of a verb frame is given in terms of dependency relation, postposition (Hindi case marker) and TAM. We have taken past tense (*yaa* is the past tense marker) in the TAM. Refer the examples given above for each type of causatives for a better understanding of the frames.

I. Frame of Type-1 and its Causative Forms:

	<u>Relation-Postposition</u>	<u>TAM</u>
(a)	k1-0	yaa
(b)	pk1-ne jk1-ko	yaa
(c)	pk1-ne mk1-se jk1-ko	yaa

II. Frame of Type-2 and its Causative Forms:

	<u>Relation-Postposition</u>	<u>TAM</u>
(a)	k1-ne	k2-0 yaa
(b)	pk1-ne jk1-ko	k2-0 yaa

(c)pk1-ne mk1-se jk1-ko k2-0 yaa

III. Frame of Type-3 and its Causative Forms:

<u>Relation-Postposition</u>		<u>TAM</u>
(a)k1-ne	k2-0	yaa
(b)pk1-ne jk1-se	k2-0	yaa

IV. Frame of Type-4 and its Causative Forms:

<u>Relation-Postposition</u>		<u>TAM</u>
(a) k1-ne	k4-ko k2-0	yaa
(b) pk1-ne jk1-se	k4-ko k2-0	yaa

V. Frame of Type-5 and its Causative Forms:

<u>Relation-Postposition</u>		<u>TAM</u>
(a)k4a-ko	k1	aa
(b)k1-ne	k2-0	aa
(c)pk1-ne	jk1-ko k2-0	yaa
(d)pk1-ne mk1-se	jk1-ko k2-0	yaa

VI. Frame of Type-6 and its Causative Forms:

<u>Relation-Postposition</u>		<u>TAM</u>
(a)k1-0		aa
(b)k1-ne	k2-0	aa
(c)pk1-ne jk1-se	k2-0	yaa

6 Issues and Observations

There are some verbs which can't be causativized. Motion verbs like aa 'come' and jaa 'go' can't be causativized. After analysing certain amount of corpus we have observed that not all motion verbs behave like the above verbs. aa-naa 'to come' and jaanaa 'to go' verbs can't be causativized because these verbs always occur as main verbs and take the following verbs as manner adverbs: chalnaa, bhaagna, daudnaa. For instance, chalkar aayaa 'came running' and daudkar gayaa 'went running'. Those motion verbs which occur as manner adverbs and modify another motion verb can be causativized and those verbs which occur as main verbs and nev-

er occur as manner adverbs of another motion verb can't be causativized. Natural process verbs like khil 'blossom', garajnaa 'thunder' and ug 'rise' also can't be causativized.

There are three types of the verb *nikal* 'leave'. All the three are used as intransitives.

➤ *derived intransitive*: sense → drain out

(22) *paanii kamre se nikal gayaa*
water room from leave go.Pst.
'Water drained out of the room.'

➤ *Baisc Intransitive*: sense → walked out

(23) *raam kamre se baahar nikal gayaa*
ram room from out leave go.Pst.
'Ram walked out of the room.'

➤ *Baisc Intransitive which involves natural process*.

(24) *gangaa gangotrii se nikaltii*
ganga gangotri from emerge.Impf.
hai
be.Pres.
'Ganga emerges from Gangotri.'

The first type is a derived intransitive which is derived from the base transitive verb *nikaal* 'remove'. This base transitive verb root can be causativized. The second type is basic intransitive which can also be causativized. The third type which is natural process can't be causativized. This shows how important the property of animacy for making causatives is.

7 Conclusion and Future Work

In this work we flesh out the linguistic devices that work for causativization. In this paper we have introduced a preliminary work on Hindi causative verbs. We have given the classification of causative verbs and the linguistic model followed for their classification. We have also given the verb frames of the causative verbs. These insights have been incorporated in the Hindi dependency treebank (Bhatt et al., 2009). We also plan to use the verb frames in a Hindi dependency parser (Bharati et al., 2009) to improve its performance.

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