

Translations of Ambiguous Hindi Pronouns to Possible Bengali Pronouns

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ABSTRACT

In a Hindi to Bengali transfer based machine translation system the baseline lexical transfer module replaces a Hindi word by its most frequent Bengali translation. Some pronouns in Hindi can have multiple translations in Bengali. The choices of actual translations have big impact on the accessibility of the translated sentence. The list of Hindi pronouns is small and their corresponding Bengali translations may be judged using a set of rules. In this paper, we are working on the translations of ambiguous Hindi pronouns to possible Bengali pronouns. We observed the uses of Hindi pronouns in a Hindi corpus and formulated the translation rules based on their translations in parallel Bengali corpus.

1 Introduction

Hindi and Bengali both originated from Old Indo-Aryan family of languages and are similar in structure. They have lot of similarities even though there are differences in the form of uses and positions of the words in corresponding sentences. According to Koul (2008), Hindi pronouns can be broadly categorized into seven types namely, Personal, Demonstrative, Indefinite, Relative-Correlative, Possessive, Interrogative and Reflexive. Among these Hindi pronouns some are used both as Personal, Demonstrative, and Relative-Correlative pronouns. In Bengali, there are different pronouns for each of these uses. As the list of Hindi such pronouns is small and their uses are limited, it is possible to differentiate each use and find their Bengali translations using a set of linguistic rules.

In a transfer based machine translation system source language words and phrases are transferred to suitable target language words and phrases. A baseline lexical transfer module transfers words and phrases to their most frequent translations. If a word is ambiguous then the module which finds its sense in the current context is referred to as Word Sense Disambiguator (WSD). Word sense disambiguation can be done using statistical and rule based approaches. Identifying uses of pronouns is one of the WSD tasks.

In this paper, we propose rules for disambiguating ambiguous Hindi pronouns which will be translated to different Bengali pronouns in different constructs. We have developed these rules by analysing the sentences in a large Hindi corpus taken from Hindi story books, newspapers, web etc. and their translations in the parallel Bengali corpus. The rules are discussed with example Hindi sentences and their corresponding Bengali translations. The effects of the rules applied in the Hindi to Bengali transfer based Machine Translation (MT) system are evaluated and analysed.

2 Related Work

The correlative clauses in Hindi correlative constructions are discussed and analysed by Bhatt (2003), Kachru (1973), Srivastav (1991), Dayal (1996), etc. They have given extensive study on the use of Dem-XP adjunction structures (a noun phrase headed by a demonstrative pronoun) in the correlative constructions. Similar correlative clauses are also available in Bengali as discussed by Dasgupta (1980), Bagchi (1994), etc.

Dash (2000) has developed a system to identify and analyse Bengali pronouns in corpus data. They have explored the morphological structure of Bengali pronouns in the corpus. The morphological structures of Bengali words (including pronouns) are also analysed by Bhattacharya et al. (2005). Prasad (2000) have investigated the uses of Hindi pronouns in corpus data.

A few attempts have been made in formatting rules for translating pronouns for some language pairs. For example, Patel and Pareek (2010) have analysed the influence of grammatical properties in the translation of Hindi words (including pronouns) to Gujarati.

Some work has been done on the analysis of the pronouns which are used as anaphora in Hindi and Bengali languages. A shared task has been carried out on anaphora resolution on these languages in ICON 2011 and the results of the participants are discussed in Sobha et al. (2011).

3 Translation Rules for Ambiguous Hindi Pronouns

Most of the Hindi pronouns have single translation in Bengali. Some of such pronouns which occur frequently in the corpus are listed in Table 1 with the corresponding Bengali translations. The transliteration into Roman using Itrans and English translations of these examples are also included.

Hindi Pronoun	Bengali Translation	English Translation	Hindi Pronoun	Bengali Translation	English Translation
मैं (mai.N)	আমি (Ami)	I	कौन(kauna)	কে (ke)	who
तू (tu)	তুই (tui)	you-familiar	क्या (kyA)	কি (ki)	what
तुम(tuma)	তুমি (tumi)	you-normal	कब (kaba)	কখন(kakhana)	when
आप (Apa)	আপনি(Apani)	you-formal	तब (taba)	তখন(takhana)	then

TABLE 1 – List of some Hindi pronouns that have single translations in Bengali.

Some Hindi pronouns are used to demonstrate both animate and inanimate nouns and as third person personal pronouns. For these three uses a single Hindi pronoun is used where in Bengali there are dedicated pronouns for each use. Given such a Hindi pronoun, we have to find its use in the corresponding sentence and translate it to corresponding Bengali pronoun. In this paper, we consider three such pronouns namely यह (yaha), वह (baha), and जो (jo) and identify their translation rules.

Unlike Hindi, in certain cases classifiers are added to Bengali nouns and pronouns. We discuss the rules of adding the classifiers and case markers (suffixes) with the Bengali translations of the Hindi pronouns.

3.1 Handling यह (yaha)

Three different constructions of the Hindi pronoun यह (yaha) are shown below.

1. The noun being demonstrated is present in the surface.
2. The noun being demonstrated is absent and the absent noun is inanimate.
3. The noun being demonstrated is absent and the absent noun is animate. In this case, the pronoun is usually a third person personal pronoun.

In the first two cases the corresponding Bengali pronoun is এই (ei). The singular classifiers টা (TA) or টি (Ti), the plural classifiers গুলা (gulo) or গুলি (guli), and the case markers র (ra), কে (ke), তে (te), etc) are added with the Bengali nouns being demonstrated in the first case and with the Bengali pronouns in the second case where the noun is not present in the surface.

In the third case the corresponding Bengali pronoun is এ (e). In this case, as the noun indicated by the pronoun does not follow it in the surface, the pronoun can be considered as personal pronoun. However, the features of the noun to which the pronoun is indicating is used when translated in Bengali. The singular classifier ০ (Zero) and the plural classifier রা (rA) is added with this pronoun when the indicated noun is animate. The Bengali pronoun এই (ei) is used when the indicated noun is inanimate and the singular classifiers টা (TA) or টি (Ti) and the plural classifiers গুলা (gulo) or গুলি (guli) are added with it.

Example sentences for each construction of this Hindi pronoun and their translations in Bengali and English are shown in Table 2.

Hindi Pronoun	Us-es	Hindi Example	Bengali Translation	English Translation
यह (yaha)	1	यह लड़का मेरा भाइ है। (yaha la.DakA merA bhAi hai.)	এই ছেলেটা আমার ভাই। (ei chheleTA AmAra bhAi.)	This boy is my brother.
	2	यह मेरा है। (yaha merA hai.)	এইটা আমার। (eiTA AmAra.)	This is mine.
	3	यह कौन है? (yaha kauna hai.)	এ কে? (e ke?)	Who is he?

TABLE 2 – Examples of different constructions of Hindi pronoun यह (yaha).

3.2 Handling वह (baha) in simple construction

The Hindi pronoun वह (baha) has the similar constructions as mentioned in Section 3.1. The rules of adding the classifiers and case markers are also similar. In the first two cases the corresponding Bengali pronoun is ওই (oi) and in the third case the

corresponding Bengali pronoun is ও (o). Example sentences for each construction of this Hindi pronoun and their translations in Bengali and English are shown in Table 3.

Hindi Pronoun	Uses	Hindi Example	Bengali Translation	English Translation
बह (baha)	1	बह घर मेरा है। (baha ghara merA hai.)	ওই বাড়িটা আমার। (oi bA.DiTA AmAra.)	That home is mine.
	2	बह मेरा है। (baha merA hai.)	ওইটা আমার। (oiTA AmAra.)	That is mine.
	3	बह या रहा है। (baha yA rahA hai.)	ও যাচ্ছে। (o yAchhhe.)	He is going.

TABLE 3 – Examples of different constructions of Hindi pronoun बह (baha).

3.3 Handling जो (jo) - बह (baha) in relative-correlative construction

The Hindi relative pronoun जो (jo) and the Hindi correlative pronoun बह (baha) have the similar constructions as mentioned in Section 3.1. The rules of adding the classifiers and case markers are also similar. In the first two cases the Bengali translations of these pronouns are ये (yei) and से (sei) and in the third case these are ये (ye) and से (se), respectively. In the third case when the Bengali plural classifier রা (rA) is added with the pronouns then the orthographic changes are ये+রা = যারা (ye+rA=yArA) and সে+রা = তারা (se+rA=tArA). Example sentences for each of these constructions for Hindi pronouns जो (jo) and बह (baha) and their translations in Bengali and English are shown in Table 4.

Hindi Pronoun	Uses	Hindi Example	Bengali Translation	English Translation
जो (jo) and बह (baha)	1	जो घर मेरा है बह घर तेरा भी है। (jo ghara merA hai baha ghara terA bhI hai.)	যেই বাড়িটা আমার সেই বাড়িটা তোরাও। (yei bA.DiTA AmAra sei bA.DiTA torao.)	My home is your home too.
	2	जो बोल रहा हूँ बह करो। (jo bola rahA hu.N baha karo.)	যেইটা বলছি সেইটা করো। (yeiTA balochhi seiTA karo.)	Do what I am telling.
	3	जो खड़ा है बह मेरा भाई है। (jo kha.DA hai baha merA bhAi hai.)	যে দাঁড়িয়ে আছে সে আমার ভাই। (ye d.NA.DiYe Achhe se AmAra bhAi.)	Who is standing is my brother.

TABLE 4 – Examples of different constructions of Hindi pronouns जो (jo) and बह (baha)

The Hindi relative pronoun जो (jo) is sometimes followed by कुछ (kUchha), सब (saba), etc. to indicate an abstract amount of things. In these cases the pronoun is translated to Bengali pronoun যা (yA). An example of such construction is given below.

जो कुछ मैंने माँगा है बह सब मिला है। (jo kUchha mai.Nne mA.ngA hai baha saba miLA hai.)
 যা কিছু আমি চেয়েছি সেই সব পেয়েছি। (yA kichhu Ami cheYechhi sei saba peYechhi.)

Those which I wanted I got.

According to Section 3.2 and the current section, different translations of Hindi pronoun बह (baha) and its inflected forms are shown in Table 5. Each empty cell indicates that the corresponding inflected form does not have the corresponding construction.

	बह (baha)	उस (usa)	उसका (usakA)	बो (bo)
Simple 1	ওই (oi)	ওই (oi)		ওই (oi)
Simple 2	ওইটা (oiTA)		ওইটার(oiTAra)	
Simple 3	ও (o)		ওর (ora)	উনি (uni)
Correlative 1	সেই (sei)	সেই (sei)		সেই (sei)
Correlative 2	সেইটা(seiTA)		সেইটার(seiTAra)	
Correlative 3	সে (se)		তার (tAra)	তিনি (tini)

TABLE 5 – Translations of different forms of बह (baha)

3.4 Handling Hindi pronominal suffixes

Hindi nominal suffixes को (ko), का (kA), से (se), पे (pe), etc. are also used with Hindi pronouns. Different uses of these Hindi pronominal suffixes have different Bengali translations. The most frequent corresponding Bengali pronominal suffixes are কে (ke), র (ra), থেকে (theke), এ (e), etc. The suffixes which have different translations can be disambiguated with the help of rules.

We have identified the rules of translating the pronominal Hindi suffix को (ko) as discussed below. Then, the rules for translating the Hindi suffix से (se) are discussed.

The Hindi pronouns इसे (ise) and इसको (isako) as well as the Hindi pronouns उसे (use) and उसको (usako) are used interchangeably. Now, इसे (ise) and उसे (use) Hindi pronouns have different Bengali translations for the following two different cases.

1. If these pronouns indicate the things or persons to whom something is told, given, etc. then their corresponding translations are একে (eke) and ওকে (oke). In this case the Hindi word इसे (ise) is यह+को (yaha+ko) and उसे (use) is वह+को (baha+ko). The corresponding Bengali translations are এ+কে (e+ke) and ও+কে (o+ke), respectively.
2. If these pronouns indicate the things (inanimate) which are being kept, given, etc. then their corresponding translations are এইটা (eiTA) (alternatively এইটাকে (eiTAke)) and ওইটা (oiTA) (alternatively ওইটাকে (oiTAke)). In this case the Hindi word इसे (ise) is यह+ও (yaha+o) and उसे (use) is वह+ও (baha+o). The corresponding Bengali translations are এই+টা (ei+TA) and ওই+টা (oi+TA).

The noun being indicated by these two pronouns can be animate or inanimate in the first case and are inanimate in the second case. Examples for each of these two uses of

Hindi pronouns and their translations in Bengali and English are shown in Table 6.

Case	Hindi Example	Bengali Translation	English Translation
1	इसलिए इसे ब्रह्मकुंड कहा जाता है (isalie ise brahmaku.nDa kahA yAtA hai.) इसलिए उसे डांटता हूँ (isalie use DA.nTatA hu.N.)	এইজন্য একে ব্রহ্মকুন্ড বলা হয় (eijanya eke brahmakuNDa baLA haYa.) এইজন্য ওকে বকি (eijanya oke baki.)	That's why it is called Brahmakund. That's why I scold him.
2	इसे तुम रख लो (ise tuma rakha lo.) उसे ठीक से रखो (use Thika se rakho.)	এইটা তুমি রেখে দাও (eiTA tumi rekhe dAo.) ওইটা ঠিক করে রাখো (oiTA Thika kare rAkho.)	Keep it with you. Keep that carefully.

TABLE 6 – Examples of different uses of Hindi pronouns इसे (ise) and उसे (use).

The Hindi pronoun उसे (use) is also used as correlative pronoun and then its Bengali translations are তাকে (tAke) and সেইটা (seiTA) (alternatively সেইটাকে (seiTAke)) for these two cases, respectively.

The Hindi pronominal suffix or postposition से (se) can be translated to different Bengali suffixes and postpositions similar to the case on noun as discussed in Mukhopadhyay et al. (2008). Following are some examples of Hindi pronoun उससे (usase) (बह+से (baha+se)) and its translations in Bengali and English, respectively.

उससे कुछ मत कहो | (usase kuchha mata kaho.)

ওকে কিছু বোলো না | (oke kichhu bolo nA.)

Don't tell him anything.

उससे कुछ ही दुरी पर मेरा घर है | (usase kuchha hI durI para merA ghara hai.)

ওখান থেকে কিছু দূরেই আমার ঘর | (okhAna theke kichhu durei AmAra ghara.)

My home is near to that place.

यह घर उससे बना हुआ है | (yaha ghara usase banA huA hai.)

এই ঘরটা ওইটা দিয়ে বানানো | (ei gharaTA oiTA diYe bAnAno.)

This home is made of that.

3.5 Handling इस (isa), उस (usa), यहाँ (yahA.N) and उहाँ (uhA.N)

There are some pronouns which are translated differently when they occur as inflected form in the surface. The Hindi pronouns इस (isa) and उस (usa) are used as demonstrative pronouns when they are not inflected and then their Bengali translations are এই (ei) and ওই (oi), respectively. When they are inflected, then the roots are translated as ए (e) and ओ (o), respectively.

Similarly, the Hindi pronouns यहाँ (yahA.N) and उहाँ (uhA.N) are translated to Bengali pronouns এখানে (ekhAne) and ওখানে (okhAne) when they are not inflected and to Bengali pronouns এখান (ekhAna) and ওখান (okhAna) when they are inflected.

The examples of uses of such pronouns are shown below with Bengali and English translations. In the first example, first उस (usa) is not inflected and second उस (usa) is inflected and the corresponding translations are ওই (oi) and ও (o), respectively. In the second example, first उहाँ (uhA.N) is inflected and second उहाँ (uhA.N) is not inflected and the corresponding translations are ওখান (okhAna) and ওখানে (okhAne), respectively.

उस लड़के को उसके बारे में मत बोलो | (usa la.Dake ko usake bAre me.n mata bolo.)

ওই ছেলেটাকে ওর সম্বন্ধে বোলো না । (oi chheleTAke ora sambandhe bolo nA.)

Don't tell that boy about him.

(उहाँ से) उहाँ याओ | (uhA.N se uhA.N yAo.)

ওখান থেকে ওখানে যাও । (okhAna theke okhAne yAo.)

Go from there to there.

4 Implementation

To apply the rules for translating Hindi pronouns to Bengali it is important to decide whether the noun being demonstrated is present in the surface and to identify the animacy (whether animate or inanimate) of the demonstrated nouns. Based on these observations and the suffix value given by the Hindi morphological analyzer we translate them using the proposed rules.

4.1 Identifying Animacy

If the demonstrated noun is absent, then the animacy is not implicit. In this case, generally, the verb and the dependency relations provide the clue. The subjects (karta) of some activities like खाना (khAnA), खेलना (khelanA), etc. are animate and their objects (karma) are inanimate. The indirect objects (gauna karma) of some activities like बोलना (bolanA), देना (denA), etc. are animate and their direct objects (mukhya karma) are inanimate. We have listed 2 such types of verbs to identify the animacy.

Sometimes we get the animacy information from other nouns or pronouns. The animacy of the noun of proposition (samanadhikaran) is same as the animacy of the corresponding subject (karta). Hindi question words also contain the animacy information which is same as the animacy of the corresponding subjects (karta). For example, कौन (kauna) is animate and क्या (kyA) is inanimate Hindi question words. We have copied the animacy features based on these agreements.

4.2 Deciding whether the demonstrated noun is present in the surface

Generally, if the demonstrated noun is present then it will immediately follow the pronoun. Sometimes, the demonstrative pronoun and the demonstrated noun are intervened by some adjectives. However, the nouns followed by these pronouns are not always the ones being demonstrated. In the following examples, the noun घर(ghara) is not being demonstrated. We hypothesize that if the immediately followed noun is not inflected (except pluralized) and no verb or conjunct immediately follow that noun then that noun is being demonstrated. We have implemented the decision module based on

this hypothesis.

यह घर नहीं है। (yaha ghara nahI.N hai.) यह घर का दरवाजा है। (yaha ghara kA darabAjA hai.)
এইটা বাড়ি নয়। (eiTA bA.Di naYa.) এইটা বাড়ির দরজা। (eiTA bA.Dira darajA.)
This is not a home. This is the door of the home.

5 Evaluation

We have used 100 Hindi sentences for testing the proposed rules. We are considering personal and demonstrative pronouns. There are 129 such pronouns in these test sentences. Out of them 19 are unique roots and remaining are the inflections of these 19 roots. The detailed analyses of translations of pronouns are discussed below.

5.1 Analysis

The baseline transfer based MT system replaces these pronouns by their most frequent translations. Among 129 pronouns 103 pronouns are translated correctly by this baseline system. Then, the rules proposed in this paper are used as the transfer grammar rules in this baseline system. The 103 correct translations of the baseline system are also translated correctly by the modified system. Among other 26 other translations 21 are modified correctly (total 124 correct translations) using the rules and 5 are either not modified or the modification is also incorrect.

Examples of input Hindi sentences from the 100 test sentences and their Bengali translations using the baseline and modified systems are shown and discussed below. Correct modifications are made boldface and others are underlined.

- Hindi Input:** जो पुण्य ब्रह्मकुंड में स्नान से मिलता है, वह कहीं नहीं मिलता है। (jo puNya brahmaku.nDa me.n snAna se milatA hai, baha kahI.n nahI.n milatA hai.)
English Translation: The favour you will get by bathing in Brahmakunda, that is not available anywhere.
Baseline Output: যা পুণ্য ব্রহ্মকুণ্ডে স্নান থেকে মেলে, সে কোথাও মেলে না। (yA puNya brahmakunDe snAna theke mele, se kothAo mele nA.)
Modified Output: যেই পুণ্য ব্রহ্মকুণ্ডে স্নান থেকে মেলে, সেইটা কোথাও মেলে না। (yei puNya brahmakunDe snAna theke mele, seiTA kothAo mele nA.)
- Hindi Input:** जो भी भक्त इन मंदिरों में दर्शन हेतु आते हैं, वे इनसे पूजा जरूर करवाते हैं। (jo bhI bhakta ina ma.ndiro.n me.n darshana hetu Ate hai.n, be inase pUjA jarUra karabAte hai.n.)
English Translation: Whoever followers come in this temple for holy witness, those definitely worship by him.
Baseline Output: যারা ভক্ত এ মন্দিরে দর্শনের জন্য আসে, তারা এর_থেকে পূজা নিঃসন্দেহে করায়। (yAo bhakta e mandire darshanera janya Ase, tArA era_theke pUjA niHsandehe karAYa.)
Modified Output: যেইও ভক্ত এই মন্দিরে দর্শনের জন্য আসে, তারা একে_দিয়ে পূজা নিঃসন্দেহে করায়। (yeio bhakta ei mandire darshanera janya Ase, tArA eke_diYe pUjA niHsandehe karAYa.)

5.2 Evaluation of Effect of Rules in Machine Translation

The translations of the 100 sentences by the baseline and the modified MT systems are used for automatic evaluation. Three reference translations are used to calculate the BLEU and NIST scores. The averages of three scores with respect to three different reference translations are shown in Table 7.

	BLEU	NIST
Baseline MT system	0.1660	4.2142
Modified MT system	0.1669	4.2514

TABLE 7 – BLEU and NIST scores of the Baseline and Modified MT systems.

6 Conclusion

The problems in machine translation can be handled by capturing comprehensive and unified rules for different categories of words. This process is lengthy for some class of words like noun, verb, etc. where there are a large number of ambiguities. But the class of words in which the number of ambiguity is limited, there the rules may be helpful. For example, the proposed rules for translating ambiguous Hindi pronouns to Bengali may be implemented easily to solve the pronominal ambiguities.

The statistical way of learning the rules for each category is a quick solution for the overall translation problems. The automatically learned rules for translation of Hindi pronouns to Bengali can be compared with these manually created rules in future. The effect of these rules in other applications like, anaphora resolution, question answering, etc. should also be tested in future.

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References

- Bagchi, T. (1994). *Bangla Correlative Pronouns, Relative Clause Order and D-Linking*, in M. Butt, T. H. King, and G. Ramchand (eds.), *Theoretical Perspectives on Word Order in South Asian Languages*, CSLI Lecture Notes, No. 50, CSLI, Stanford, California, pp. 13–30.
- Bhatt, R. (2003). *Locality in Correlatives*. In *Natural Language & Linguistic Theory*, Vol. 21, No. 3, pp. 485–541.
- Bhattacharya, S., Choudhury, M., Sarkar, S., and Basu, A. (2005). *Inflectional morphology synthesis for Bengali noun, pronoun and verb systems*, in *Proceedings of the national conference on computer processing of Bangla (NCCPB)*, pp. 34–43.

- Dash, N. S. (2000). *Bangla Pronouns - a Corpus Based Study*. In *Literary and Linguistic Computing*, Vol. 15, No. 4, pp. 433-443.
- Dasgupta, P. (1980). *Questions and Relative and Complement Clauses in a Bangla Grammar*. unpublished Ph.D. dissertation, New York University.
- Dayal, V. (1996). *Locality in Wh-Quantification: Questions and Relative Clauses in Hindi*. *Studies in Linguistics and Philosophy*, No. 62, Kluwer, Dordrecht.
- Kachru, Y. (1973). *Some Aspects of Pronominalization and Relative Clause Construction in Hindi-Urdu*, in B. B. Kachru (ed.), *Papers on South Asian Linguistics*, Vol. 3.2, *Studies in the Linguistic Sciences*, Department of Linguistics, University of Illinois, Urbana, pp. 87-103.
- Koul, O. N. (2008). *Book Title: Modern Hindi Grammar*. Dunwoody Press, Springfield, VA 22150, USA.
- Mukhopadhyay, S., Barik, B., and Sarkar, S. (2008). *Problems of Transfer Grammar: The Hindi Postpositional Correlatives in Bangla*. In *Proceedings of 6th International Conference on Natural Language Processing (ICON 2008)*, Pune, India.
- Patel, K. A., and Pareek, J. S. (2010). *Rule base to resolve translation problems due to differences in gender properties in sibling language pair Gujarati-Hindi*. In *Proceedings of Computer and Communication Technology (ICCT)*, pp.776-781.
- Prasad, R. (2000). *A Corpus Study of Zero Pronouns in Hindi: An Account Based on Centering Transition Preferences*. In *Proceedings of DAARC 2000, Discourse Anaphora and Reference Resolution Conference*. Lancaster University, 66-71.
- Sobha, L., Bandyopadhyay, S., Ram, V. S., and A., Akiladeswari. (2011). *NLP Tool Contest @ICON2011 on Anaphora Resolution in Indian Languages*. In *Proceedings of ICON2011 NLP Tools Contest: Anaphora Resolution in Indian Languages*, Chennai, India.
- Srivastav, V. (1991). *The Syntax and Semantics of Correlatives*. *Natural Language and Linguistic Theory* 9, pp. 637-686.