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#### WORD TRANSLATION DISAMBIGUATION

#### SHWETA VIKRAM STUDENT DEPARTMENT OF COMPUTER SCIENCE BANASTHALI VIDYAPITH JAIPUR

#### ABSTRACT

This paper have how Anusaaraka machine translation translate English language to Hindi language. Here we use the word sense translation for word-sense disambiguation (WSD) because one language translated into another language. WSD is an open problem of natural language processing, which governs the process of identifying which sense of a word (i.e. meaning) is used in a sentence, when the word has multiple meanings. The solution to this problem impacts other computer related writing, such a discourse, improving relevance of search engines anaphora resolution, coherence, inference etcetera.

#### **KEYWORDS**

Anusaaraka, word sense disambiguation, rule based approach, machine translation.

#### INTRODUCTION

esearch has progressed steadily to the point where WSD systems achieve sufficiently high levels of accuracy on a variety of word types and ambiguities. A rich variety of techniques have been researched, from dictionary-based methods that use the knowledge encoded in lexical resources, to supervised machine learning methods in which a classifier is trained for each distinct word on a corpus of manually sense-annotated examples, to completely unsupervised methods that cluster occurrences of words, thereby inducing word senses. Among these, supervised learning approaches have been the most successful algorithm to date.

The system promises to give faithful representation of the translated text, no loss of information while translation and graceful degradation (robustness) in case of failure. The layered output provides an access to all the stages of translation making the whole process transparepent.

#### ANUSAARAKA

Anusaaraka is open source free software. Anusaarakas among Indian languages were developed in the last decade of the 20th century and later on the developers concentrated their efforts on building English-Hindi Anusaaraka. The English-Hindi Anusaaraka, like other Anusaarakas, is a Machine Translation and Language Accessing software that takes ingenious concepts for language analysis from Panini's Astadhyayi (Eight chapters on Sanskrit grammar) to build a robust and reliable tool. The Anusaaraka concept of layered output has proved useful in giving 100% access to information in the source language text. With a little training, a serious user can trace back to the information in the Source text by looking at the various layers of Anusaaraka output, word level coding, word group level encoding, phrasal level coding, and sentence level coding, etc. Anusaaraka derives its name from the Sanskrit word 'Anusaran' which means 'to follow'. One question will arise in your mind why we are not using word sense disambiguation in this paper. The answer is word translation Disambiguation terminology

translate source language to target language. Many problems arose translation such as

#### Ordering problem

Example: English sentence "Shana reading a book." Parallel translation: SanA pada rahl hai ek kitAba. Hindi translation: SanA ek kitAba pada rahl hai. In hindi verb comes at end but in English verb always comes in middle. Anusaaraka resolve this problem with the help of relation table which based on Paninian Grammar.

#### Gender number problem

Shana is reading a book. SanA ek kitAba pada rahl hai. Gautum is reading a book.

Gautama ek kitAba pada rahA hai

Above sentences are same only name is different one is girl and another is boy. So verb is same for both English sentences but in Hindi verb is change.

#### METHOD FOR TRANSLATION

Translation is very difficult task because source language and target languages have different syntax and different grammar rules. So Anusaaraka follows some algorithm for translation English language to Hindi language.

#### Algorithm

Input file English translation (should be in text format.) Call aperatium platform (English Language)

Do the initial analysis of the source text which includes morphological analysis, POS tagging and chunking.

Call CLIP Expert system shell

{

Make WTD Rule for English word

Call aperatium platform (Target Language)

{

Final formatting and displacing the surface form of the target language.

Output (Target language)

}

We can understand its working with the help of example and for Hindi Anusaaraka use "wx" notation so in this paper wx notation use for Hindi translation or meaning.

#### 1) Input file English translation

To prepare lunch.

Dopahara kA KAnA banAnA.

#### 2) Call aperatium platform (English Language)

Step 1. Divide into one word

English sentences have three words

To, prepare, and lunch.

Note: If there is any apostrophe s then it counts as one word such as He is Shana's father. Similarly for comma and full stop.

Step 2. POS tagging

To- preposition, prepare- verb, lunch- noun.

#### 3) CLIP Expert system

Word translation disambiguation module determines the final Hindi meaning of a ambiguous English word. This module uses the information from morph Analyser, POS tagger and Paninian relations , position and semantic property of the word to disambiguate to a final Hindi meanings. This module consists of thousands of manually written rules in CLIPS environment. The rule data-base is made up of two types of rules. One is the generalised rule comes with the Anusaaraka software package and the other one is provisional (user given) rules. Higher priority is given to the provisional rules, than the system rules. If no rule is present for a word, the default Hindi meaning is chosen from the bilingual dictionary. Multi words are also translated with the help of a multi word dictionary. The rules are in CLIPS language, which can be written directly in CLIPS or through a web-interface available over Internet for the users to contribute towards enriching the WSD rule database. User has to fill up the forms using different facts available for the given word. These forms when saved, automatically converts the facts into CLIPS format rules.

For make wtd rule first collect all parallel corpus to word prepare then collect all possible hindi meaning of that word then trying to minimize these meaning as possible. Then construct the rule for reaming meaning of word prepare.

Find out all the relation of prepare word and other word of the sentences with the help of relation table which is based on paninian grammar. This relation table mapped the English relation and Hindi relation. Parser defines the English relation then relation table according to this parser relation define the Hindi relation. Our rule based on this Hindi (Paninian grammar) relation. For example: kriyA-Subject relation, KriyA-Object relation, Subject-Subject relation etc. Sometime parser also mistake then we analyse that mistake and with the help of English grammar remove that mistake. For example not identify the category of the word or wrong relationship show between any relations and so on.

When we make rule then we also use our mind and that relationship because these relationship gave the idea to construct the rule and our mind analyse that relation is correct or not, if correct the make rule otherwise first of all correct that relation then construct rule or that word according to the relation.

Whenever disambiguate the meaning of word then write the manual rule in CLIP language and cover all the senses. Word "prepare" have many meaning in different context but category of that word always verb. When we are writing rule then we are always trying to minimize the senses of that word. But here all meaning is necessary so we have eight senses of word prepare. So here we construct eight rules and one rule of these rules becomes default rule which is most frequent meaning. Here "wEyAra\_kara" is the default meaning.

Here take example for word "prepare" it have many meaning in Hindi. So we disambiguate its meaning with the help of manual rules and also try to minimize the senses of word.

Meanina 1. wEyAra\_kara 2. banA 3. racanA\_kara 4. savaXAna kara 5. pakA 6. sajA 7. praswuwa kara 8. TIka kara For example here we gave three rule for word prepare where two normal and one is default (If any rule nor fire then at least this default rule will be fire, so every clip file have default rule. Default rule has no salience). Rule for word prepare: To prepare lunch. Hindi meaning: banana. Whenever make rule then this rule have root meaning such as banA is the root word of banana. Dopahara kA KAnA banAnA (defrule prepare1 (declare (salience 1700)) (id-root ?id prepare) ?mng <-(meaning\_to\_be\_decided ?id) (or(to-infinitive ??id)(kriyA-in\_saMbanXI ?id ?)) (id-cat\_coarse ?id verb) (retract ?mng) (assert (id-wsd\_root\_mng ?id banA)) (if ?\*debug\_flag\* then (printout wsd\_fp "(dir\_name-file\_name-rule\_name-id-wsd\_root\_mng "?\*prov\_dir\*" prepare.clp prepare2 "?id "banA)" crlf)) Rule for prepare: The first task was to prepare an, election manifesto. Meaning: wEyAra\_kara (defrule prepare2 (declare (salience 1600)) (id-root ?id prepare) ?mng <-(meaning\_to\_be\_decided ?id) (id-cat\_coarse ?id verb) (id-cat\_coarse ?id1 verb) (id-cat\_coarse ?id2 adjective) (or(and(kriyA-kriyArWa\_kriyA ?id ?id1)(viSeRya-viSeRaNa ?id2 ?id))(and(kriyA-object ?id ?)(viSeRya-viSeRaNa ? ?id))) (retract ?mng) (assert (id-wsd\_root\_mng ?id wEyAra\_kara))

(if ?\*debug\_flag\* then

(printout wsd\_fp "(dir\_name-file\_name-rule\_name-id-wsd\_root\_mng "?\*prov\_dir\*" prepare.clp prepare3 "?id " wEyAra\_kara )" crlf))

Default rule also have same meaning as rule2 because meaning of this word is most frequent wEyAra\_kara. It has not any condition. Default rule for meaning wEyAra\_kara (defrule prepare0 (id-root ?id prepare) ?mng <-(meaning\_to\_be\_decided ?id) (id-cat\_coarse ?id verb) => (retract ?mng) (assert (id-wsd\_root\_mng ?id wEyAra\_kara))

(if ?\*debug\_flag\* then

(printout wsd\_fp "(dir\_name-file\_name-rule\_name-id-wsd\_root\_mng "?\*prov\_dir\*" prepare.clp prepare0 "?id " wEyAra\_kara )" crlf)) )

4) Call aperatium platform (Target Language)

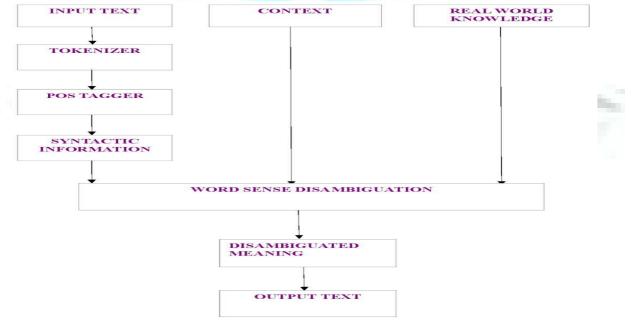
- After constructing clip file aperatium platform perform many TAM (Tense, Aspect and Modality) related work.
- 5) Output: Anusaaraka gives the layed output it gives 100% access to information in the source language text.

#### FIGURE 1: ANUSAARAKA LAYERED OUTPUT

| prepare. | .txt - Mozilla Firefox  |   |  | 📼 en 🖂 👣 🖣  | )) 1:27 PM 👤 Shweta 🔱            |
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|          | Image: | e.txt_frame.html  |  | 🗇 🕶 🕲 🛛 Google                                    | 🔍 🖖 🏠                            |
|          | The first task was to prepare an,   | 1.1.A Prepare.  |  |   |                                  |
|          | election manifesto. LSD is very easy to<br>prepare in the laboratory. The artistes  | 1.1.C तैयार~करना2{0}.   |  |   | 8                                |
| -        | themselves prepare the puppets<br>required for the plays they produce.  | <ol> <li>1.1.1 तैयार_कर{इम्पेर}.</li> <li>1.1.K तैयार कीजिए.</li> </ol> |  |   |                                  |
|          | Thus, the larvae prepare their own<br>abode of safety and plenty. It is   | 2.1.A The first task was to   | prepare an, electi                                   |   | is                               |
|          | necessary to prepare and plan for the distant future too. She helped DrBose   | 2.1.B<br>2.1.C - प्रथम नियत~कार्य{0} था @to{-                           | <br>>को[की~ओर]/ना} तैयार~करना2{0} -, चनाव{           | - 2.2.B -<br>मत~द्वारा}{0} घोषणा~पत्र{0}. 2.2.C - | -<br>होना~ {@s}                  |
|          | to prepare his new book. Stop a little,I  | 2.1.C - प्रथम मियत~काय{0}था @co{-<br>2.1.I - प्रथम काम था{या}-          | >का[का~आर]/ग] तथार~करग2{0}-, युगवर<br>बनाना -, युनाव | धोषणा_पत्र. 2.2.1 एल_प                            |                                  |
| 10-01    | said to the two of them,let me prepare<br>Lola. They help one another in this   | 2.1.K - प्रथम काम था -  | बनाने वाला -, चुनाव                                  | घोषणा पत्र. 2.2.K एल_ए                            | रस डी है                         |
| -        | search for new words and prepare the  | very easy to  | prepare in   | the laboratory. 2.3.A The artistes                | themselves                       |
|          | notes. The Constituent Assembly set to<br>work to prepare a new constitution for  | <br>बहत[उत्तमासूबक] े उसी सरल ^ आरामदायक @to {                          | -<br>  | 2.3.B<br>} प्रयोगशाला{0}. 2.3.C गायक/गायि         | -<br>ोका/नर्तकी {@5} स्वयं {ये } |
| 1        | India. The court empowered Sir  | अत्यन्त आसान -  | तैयार_रहना> में                                      | - प्रयोगशाला. <b>2.3.</b> । - गायक                | खुद                              |
|          | Asutosh to prepare a scheme for<br>utilizing the gift. Hipparchus of Nicaea,  | अत्यन्त आसान -  | तैयार रहना ~   | - प्रयोगशाला में. 2.3.K - गायक                    | खुद                              |
| 1        | a Greek mathematician (150 B.C.), was   | prepare the puppets required  | for  | the plays they proc                               | luce.                            |
|          | possibly the first to prepare these<br>Tables. Then I would arrive in the   | <br>तैयार~करना2{0}- पतली{@s} मॉगना^आदेश~                                | -<br>देना~ { @ed/@en } क्योंकि/के~लिये^की~ओर~सं      |   | म[>प्रस्तुत]~करना{0}.            |
| >_       | second car and prepare for the<br>meeting, when the first car would move  | तैयार_कर{ता_है} - पुतली जरूरी हो  | > के_लिये  |   | ता_है}.                          |
|          | ahead to the next meeting place.  | तैयार करते हैं - पुतलियाँ जरूरी हुई हुई                                 | -  | - खेलों के लिये वे बनाते                          | 8.                               |
|          |   | Goto Show/Hide Roy  | vs 🗹 Numbers 🗹 Borders                               | Help Translation Lay                              | ered Output [Hindi-order]        |
|          |   | (4)   | ····   |   |                                  |
|          | 1.1 तैयार कीजिए .   |   |  |   | 4                                |
|          | 2.1 प्रथम काम , चुनाव घोषणा पत्र बनाने वाला था .  |   |  |   |                                  |
|          | 2.2 एल एस डी प्रयोगशाला में तैयार रहना अत्यन्त आसान   |   |  |   |                                  |
| THE      | 2.3 गायक खुद खेलों के लिये जरूरी हुई हुई पुतलियाँ तैयार<br>2.4 इस प्रकार, डिम्मक सुरक्षा और पर्याप्त का उनका अपन  |   |  |   |                                  |
| 7        | 2.4 रता अपगर, 10-147 पुरवा आर पयात यग उनयग अपन  | SIGN UNIVERSITY OF  |  |   | B                                |

All process we easily understand with the help of Anusaaraka process step figure.

#### FIGURE 2: ANUSAARAKA PROCESS STEP FIGURE



#### 6) **RESULT**

Select randomly twelve sentences of word prepare, and then we run these sentences at bleu software. The graph and table show the result.

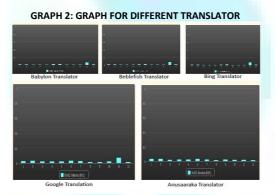


#### TABLE 1: GRAM COUNT FOR ANUSAARAKA TRANSLATOR

| Туре       | 1-gram | 2-gram | 3-gram | 4-gram |
|------------|--------|--------|--------|--------|
| Individual | 0.0960 | 0.0027 | 0.0014 | 0.0008 |
| Cumulative | 0.0917 | 0.0153 | 0.0069 | 0.0039 |

Table show the result and 1-gram is good result for this translator *Comparison* 

Method: I take randomly twelve English sentences from online parallel corpus. These sentences run on different translators which are available online and compare with our Anusaaraka translator. Then we show the result with the help of graph.



This graph shows the result of different translation. The graph shows all the translators are same but anusaaraka translation different from that. The Anusaaraka concept of layered output has proved useful in giving 100% access to information in the source language text. Sentence no eleven has more score from others in four translators but anusaaraka has not. Every Translator has only one meaning of word prepare but Annusaaraka has different meaning of same word "prepare" regarding to context.

| Translator              | Туре       | 1-gram | 2-gram | 3-gram | 4-gran |
|-------------------------|------------|--------|--------|--------|--------|
| Anusaaraka              | Individual | 0.0960 | 0.0027 | 0.0014 | 0.0008 |
|                         | Cumulative | 0.0917 | 0.0153 | 0.0069 | 0.0039 |
| Babylon                 | Individual | 0.0455 | 0.0161 | 0.0057 | 0.0031 |
|                         | Cumulative | 0.0455 | 0.0271 | 0.0162 | 0.0107 |
| Bable <mark>fish</mark> | Individual | 0.0505 | 0.0161 | 0.0057 | 0.0031 |
|                         | Cumulative | 0.0505 | 0.0285 | 0.0167 | 0.0110 |
| Bing                    | Individual | 0.0505 | 0.0161 | 0.0057 | 0.0031 |
|                         | Cumulative | 0.0505 | 0.0285 | 0.0167 | 0.0110 |
| Google                  | Individual | 0.1061 | 0.0161 | 0.0057 | 0.0031 |
|                         | Cumulative | 0.0983 | 0.0383 | 0.0199 | 0.0122 |

Built all possible rules of prepare word, if this word have give the different meaning to compound word those word also add on that CLIP file. For example:

To prepare lunch.

Dopahara kA KAnA banAnA.

She was busy preparing lunch.

Vaha dopahara kA KanA banane me vayasaWa WI.

#### **GRAPH 1: ANUSAARAKA TRANSLATION GRAPH ON IBLEU.**

#### **FUTURE SCOPE**

Anusaaraka translator is very useful for those peoples who have not user friendly with English. More population of India have mother tong is Hindi so they are not understand English properly. This is also very useful of those students whose background is Hindi medium.

It is open source free software so everyone use it without pay money. Any organization it can be use for translation purpose, so with the help of this software organization save the valuable time and money. Everything will be available in Hindi language in wikipedia or other websites. Its future is too bright.

#### CONCLUSIONS

Word translation disambiguation gives the correct meaning of the every word but full meaning of sentences has sometime ordering problem. But this problem is not a big issue for translation because it gives the correct sense related to the context. Anusaaraka English-Hindi machine translation is open source free software so everyone use it. Its demo session is online and after sometime it will launch then every people use it with online or off line.

#### ACKNOWLEDGMENT

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