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CONTENTS

INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT   ii

A Monthly Double-Blind Peer Reviewed (Refereed/Juried) Open Access International e-Journal - Included in the International Serial Directories

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http://ijrcm.org.in/

iii

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iv

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INTRODUCTION

REVIEW OF LITERATURE

NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

ACKNOWLEDGMENTS

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APPENDIX/ANNEXURE

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CONTRIBUTIONS TO BOOKS

●   Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

JOURNAL AND OTHER ARTICLES

●   Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

CONFERENCE PAPERS

●   Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

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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
Research 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 rahI hai ek kitAba.
Hindi translation: SanA ek kitAba pada rahI 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 rahI 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.

Meaning

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))
```

INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT 83

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```
(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

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

FIGURE 2: ANUSAARAKA PROCESS STEP FIGURE

INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT   84

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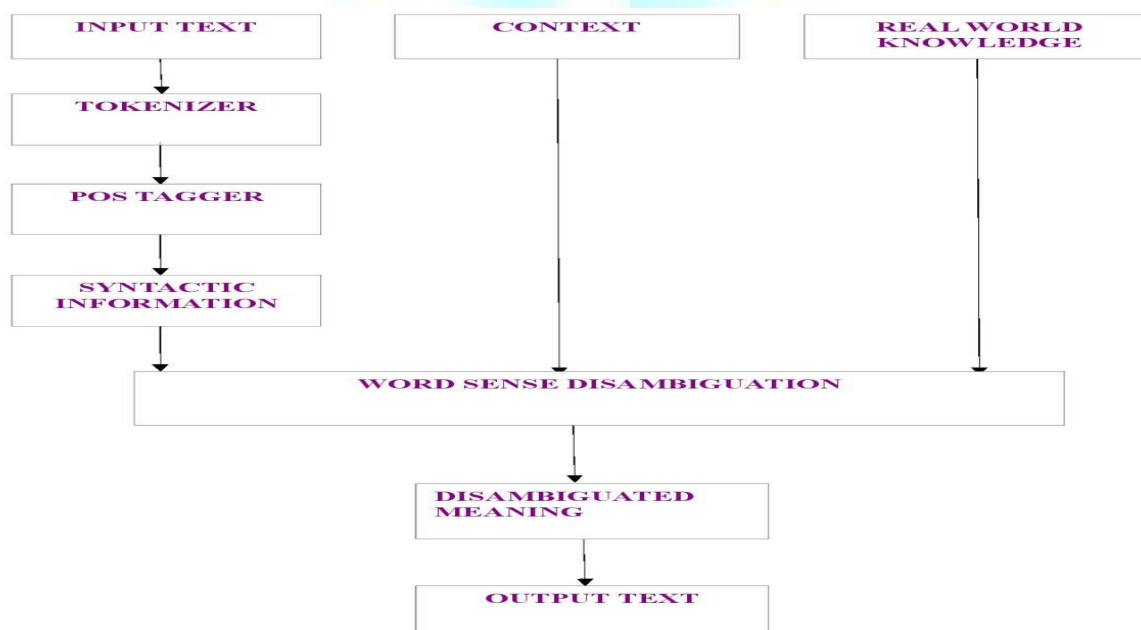
6) **RESULT**

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

GRAPH 1: ANUSAARAKA TRANSLATION GRAPH ON IBLEU.

TABLE 1: GRAM COUNT FOR ANUSAARAKA TRANSLATOR

Type	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

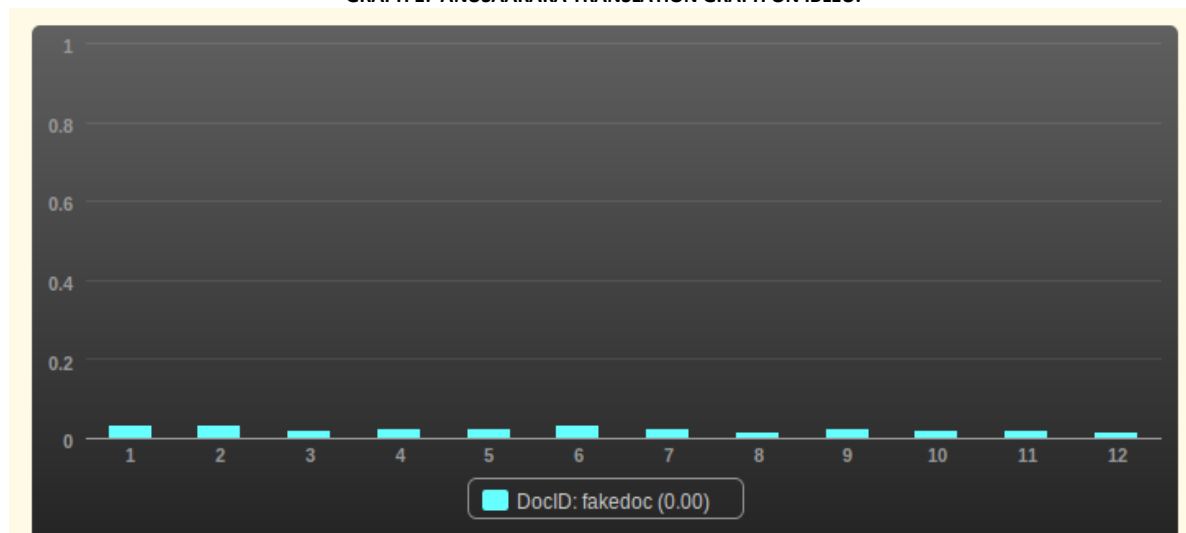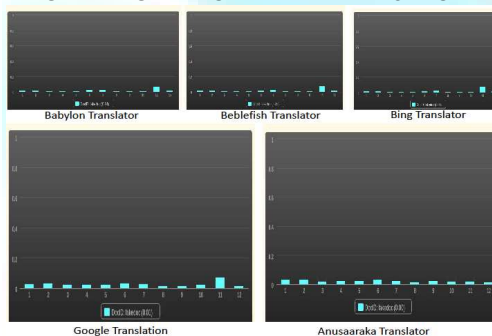Method: I take randomly twelve English sentences from online parallel corpus. These sentences run on different translators which are available online and compare with our Anusaaraka translator. Then we show the result with the help of graph.

GRAPH 2: GRAPH FOR DIFFERENT TRANSLATOR

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.

TABLE 2: GRAM COUNT FOR TRANSLATOR

Translator	Type	1-gram	2-gram	3-gram	4-gram
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
Bablefish	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.

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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3. www.anusaaraka.iiit.ac.in
4. www.Sanskrit.inria.fr/DATA/wx.html
5. www.wikipedia.org

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