

Systematic Review on Techniques of Machine Translation for Indian Languages

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Abstract: Machine Translation is the branch of Natural Language Processing, which deals the use of Machine Translation software to convert from one language to other natural languages with the help of machine Translation Approaches. The objective is to fill the language gap between two different languages speaking people, communities or countries. In India we have multiple and greatly distinct language scripts, hence scope of need of language translation. In this purpose we present Literature survey on machine translation on the current scenario of research machine translation in India. There is various Machine Translations system. Machine translation is considered an important task that can be used to attain information from documents written in different languages. In this paper examine the rule based machine translation is useful for translate for English to Indian languages.

Keywords: NLP, Machine Translation, Techniques, RBMT

1. INTRODUCTION

Natural language processing can be classified as a subset of the broader field of speech and language processing. Because of this, NLP shares similarities with parallel disciplines such as computational linguistics, which is concerned with modeling language using rule-based models. The goal of natural language processing is to build computational models of natural language for its analysis and generation. First, there is technological motivation of building intelligent computer system such as machine translation system natural language interfaces to databases, man-machine interfaces to computer in general, speech understanding system, text analysis and understanding system, computer aided instruction systems, systems that read and understand printed or handwritten text. Second, there is a cognitive and linguistic motivation to gain better insights into how humans communicate using natural language. The tools of work in NLP are grammar formalisms, algorithms for representing world knowledge, reasoning mechanisms, etc. Natural language interfaces to databases, natural language interfaces to computer, question answering system, story understanding and machine translation system these all the application of natural language processing. We are focusing in the machine translation application and these approaches. Machine Translation (MT) is the field of computational

linguistics (CL) and Natural Language Processing (NLP) that explores the use of computer/mobile application to translate text or speech from one natural language known as the source language to another known as target language.

Like translation done by human, MT does not simply substituting words but the application of complex linguistic knowledge; morphology, grammar, meaning all this things is taken into consideration. Generally, MT is classified into various categories: Direct based, rule-based, corpus based, statistical-based, hybrid-based, example-based, knowledge-based, principle-based, and online interactive based methods. At present, most of the MT related research is based on Rule based approaches because rule based is always extensible and maintainable. Morphological analysis, part of speech tagging, chunking, parsing and word sense disambiguation this is the major goals of machine translation. In this paper, we are present a systematic literature review of the techniques used for machine translation. We have also mentioned recent work in the table from.

2. Literature Review

Table 1: Review for Machine Translation Techniques

Sr. No	PAPER NAME	AUTHER	YE AR	LAGUA GE PAIR	TECHNI QUES
1	TRANSLATION OF TELUGU-MARATHI AND VICE-VERSA USING RULE BASED MACHINE TRANSLATION	DR. SIDDHARTHA GHOSH, SUJATA THAMKE AND KALYANI U.R.S	2014	TELU GU-MAR ATHI	RULE-BASED AND STATIST ICAL-BASED
2	RULE BASED ENGLISH TO URDU MACHINE TRANSLATION	NAILA ATA, BUSHRA JAWAID, AMIR KAMRAN	-	ENGLI SH TO URDU	RULE BASED MACHIN E TRANSL ATION
3	TRANSLATION OF SIMPLE ENGLISH INTERROGATIVE SENTENCES TO MARATHI SENTENCES	PROF. GORAKSH V.GARJE, MANISHA MARATHE, URMILA ADSULE	2014	ENGLI SH TO MARA THI	RULE BASED MACHIN E TRANSL ATION, TRANSF ER MT
4	HYBRID		2018	MARA	HYBRID

	MACHINE TRANSLATION FROM MARATHI TO ENGLISH: A RESEARCH EVOLUTION IN MACHINE TRANSLATION	PROF. ABHAPATHAK , ANCHAL KUMARI , AKANKSHA PRASAD , ASHWINI TOPRE , RUTUJALONDH E		THI TO ENGLI SH	MACHIN E TRANSL ATION					
5	TRANSMUTER: AN APPROACH TO RULE-BASED ENGLISH TO MARATHI MACHINE TRANSLATION	G V GARJE, G K KHARATE, HARSHAD KULKARNI	2014	ENGLI SH TO MARA THI	RULE BASED MACHIN E TRANSL ATION					
6	MARATHI TO ENGLISH SENTENCE TRANSLATOR FOR SIMPLE ASSERTIVE AND INTERROGATIVE SENTENCES	G.V. GARJE, PhD, AKSHAY BANSODE, SUYOG GANDHI, ADITA KULKARNI	2016	MARA THI TO ENGLI SH	RULE BASED TRANSL ATION APPROA CH					
7	ENGLISH TO MARATHI RULE-BASED MACHINE TRANSLATION OF SIMPLE ASSERTIVE SENTENCES	G.V. GARJE, G.K. KHARATE AND M.L. DHORE	2015	ENGLI SH TO MARA THI	RULE BASED MACHIN E TRANSL ATION					
8	NEURAL MACHINE TRANSLATION FOR ENGLISH TO HINDI	SANDEEP SAINI, VINEET SAHULA	2018	ENGLI SH TO HINDI	NEURAL MACHIN E TRANSL ATION					
9	NEURAL MACHINE TRANSLATION OF INDIAN LANGUAGES	KARTHIK REVANURU, KAUSHIK TURLAPATY, SHRISHA RAO	2017	INDIA N LANG UAGE S	NEURAL MACHIN E TRANSL ATION					
10	NEURAL MACHINE TRANSLATION FOR ENGLISH-TAMIL	HIMANSHU CHOUDHARY, ADITYA KUMAR PATHAK	-	ENGLI SH- TAMI L	NEURAL MACHIN E TRANSL ATION					
11	STATISTICAL MACHINE TRANSLATION FROM ENGLISH TO HINDI	SUBALALITH, AARTHI VENKATARAMA N,BASIMSHAHI DBAQUI	2018	ENGLI SH TO HINDI	STATIST ICAL MACHIN E TRANSL ATION					
12	MACHINE TRANSLATION FROM ENGLISH TO HINDI	G.SURYAKALA ESWARI, N.V.S.SOWJAN YA,P.SURYAPR ABHAKAR RAO	2018	ENGLI SH TO HINDI	STATIST ICAL MACHIN E TRANSL ATION					
13	ETRANS-ENGLISH TO SANSKRIT MACHINE TRANSLATION	PROMILA BAHADUR, A.K.JAIN, D.S.CHAUHAN	2012	ENGLI SH TO SANS KRIT	RULE BASED MACHIN E TRANSL ATION					
14	TRANSFORMATION OF MULTIPLE ENGLISH TEXT SENTENCES TO VOCAL SANSKRIT USING RULE BASED	MR.UDAY C. PATKAR, PROF.PRAKASH R. DEVALE, PROF.DR.SUHA S.H.PATIL	2012	ENGLI SH TO SANS KRIT	RULE BASED MACHIN E TRANSL ATION					
15	TECHNIQUE WEB BASED HINDI TO PUNJABI MACHINE TRANSLATION SYSTEM	VISHAL GOYAL AND GURPREET SINGH LEHAL	2010					HINDI TO PUNJ ABI		DIRECT TRANSL ATION
16	A HEURISTIC APPROACH FOR GRAPH BASED MACHINE TRANSLATION	PRIYANKA MALVIYA, GAURI RAO, ROHINI B. JADHAV, MAYURI H. MOLAWADE	2017					ENGLI SH TO HINDI		GRAPH BASED APPROA CH
17	DEVELOPMENT OF TELUGU-TAMIL TRANSFER-BASED MACHINE TRANSLATION SYSTEM: WITH SPECIAL REFERENCE TO DIVERGENCE INDEX	K. PARAMESWARI	2015					TELU GU- TAMI L		TRANSF ER- BASED MACHIN E TRANSL ATION SYSTEM
18	AN ENGLISH TO HINDI MACHINE-AIDED TRANSLATION SYSTEM	R.M.K. SINHA, A. JAIN	2003					ENGLI SH TO HINDI		RULE- BASED AND EXAMPL E- BASED
19	ENGLISH-HINDI TRANSLATION IN 21 DAYS	ONDŘEJ BOJAR, PAVEL STRAÑÁK, DANIEL ZEMAN	2008					ENGLI SH TO HINDI		RULE- BASED AND EXAMPL E- BASED
20	SIMPLE SYNTACTIC AND MORPHOLOGICA L PROCESSING CAN HELP ENGLISH-HINDI STATISTICAL MACHINE TRANSLATION	ANANTHAKRIS HANAN RAMANATHAN, PUSHPAK BHATTACHARY YA, JAYPRASAD HEGDE, RITESH M. SHAH,SASIKUM AR M	2008					ENGLI SH- HINDI		STATIST ICAL MACHIN E TRANSL ATION
21	EXAMPLE BASED MACHINE TRANSLATION FOR ENGLISH-SINHALA TRANSLATIONS	F.H.A.M. SILVA , A.R.WEERASIN GHE AND H.L.PREMARAT ENE	2015					ENGLI SH- SINHA LA		EXAMPL E BASED MACHIN E TRANSL ATION
22	A NOVEL APPROCH FOR INTERLINGUAL EXAMPLE-BASED TRANSLATION OF ENGLISH TO MARATHI	PROF.KRUSHNA DEO.T.BELERA O, PROF.VINOD. S. WADNE ,PROF. S. V. PHULARI, PROF. B.S. KANKATE	2014					ENGLI SH TO MARA THI		EXAMPL E- BASED MACHIN E TRANSL ATION
23	DESIGN AND DEVELOPMENT OF A MALAYALAM TO ENGLISH TRANSLATOR- A TRANSFER BASED APPROACH	LATHA R NAIR, DAVID PETER S, RENJITH P RAVINDRAN	2012					MALA YALA M TO ENGLI SH		A TRANSF ER BASED APPROA CH
24	MALAYALAM TO	ANISREE P GI,	2016					MALA		HYBRID

	ENGLISH MACHINE TRANSLATION: A HYBRID APPROACH	RADHIKA KT2		YALAM TO ENGLISH	APPROACH
25	A HYBRID APPROACH TO ENGLISH TO MALAYALAM MACHINE TRANSLATION	NITHYA B, SHIBILY JOSEPH	2013	ENGLISH TO MALAYALAM	HYBRID APPROACH
26	A RULE BASED APPROACH FOR TRANSLATION OF CAUSATIVE CONSTRUCTION OF ENGLISH AND MALAYALAM FOR THE DEVELOPMENT OF PROTOTYPE FOR MALAYALAM TO ENGLISH AND ENGLISH TO MALAYALAM BILINGUAL MACHINE TRANSLATION SYSTEM	T.K. BIJIMOLI*, JOHN T. ABRAHAM2	2018	MALAYALAM TO ENGLISH AND ENGLISH TO MALAYALAM	A RULE BASED APPROACH
27	RULE BASED MACHINE TRANSLATION FROM ENGLISH TO MALAYALAM	R. REMYA, S. REMYA, R. REMYA, AND K. P. SOMAN	2009	ENGLISH TO MALAYALAM	RULE BASED MACHINE TRANSLATION

3.1 Rule Based Translation

A Rule-Based Machine Translation (RBMT) system consists of collection of various rules, called grammar rules, a bilingual lexicon or dictionary, and software programs to process the rules. Rule-Based Machine Translation (RBMT), also known as Humanistic methods of MT, is a general term that indicates machine translation systems based on linguistic information about source and target languages basically recover from (bilingual) dictionaries and grammars covering the main semantic, morphological, and syntactic consistencies of each language respectively. Having source language sentences, an RBMT system generates them to target language sentences on the support of morphological, syntactic, and advantages of RBMT system is that the interlingua develop into more valuable as the amount of target languages it can be turned into development. Interlingual machine translation system has been built operational at the economical level is the KANT system (Nyberg and Mitamura, 1992), which is develop to translate Caterpillar Technical English (CTE) into other languages. The interlingual technique is clearly attractive for multilingual systems. All other analysis modules and of all generation modules both of analysis module can be independent.

3.2 Direct Translation:

One of the simplest machine translation techniques is Direct Machine Translation in which technique with the help of bilingual dictionary direct word to word translation is done. Starting with the shallowest level at the bottom of the pyramid is the Direct Machine Translation Technique. DMT technique is the oldest technique and also less popular technique. Direct translation is made at the word level. Machine translation systems that use this approach are capable of translating a language, source language (SL) directly to target language (TL). Words of the source language are translated without passing through an additional/intermediary representation. The analysis of source language texts is oriented to only one target language. Direct translation systems are basically bilingual and uni-directional. Direct translation technique needs only a little syntactic and semantic analysis. SL analysis is oriented specifically to the production of representations applicable for one particular Target language. DMT is a word-by-word translation technique with some simple grammatical adjustments.

3. Overview of machine translation Approaches

Researchers proposed many approaches for the Machine Translation. Overview of main approaches is presented here. There are two broad categories of Machine Translation Systems, namely Rule-Based and Empirical Based Machine Translation Systems. Hybrid Machine Translation system takes the benefits from both Rule-Based Machine Translation System and Empirical Based Machine Translation System. Rule-Based Machine Translation System is further classified into Direct, Transfer and Interlingua, while Empirical Based Translation System is classified into Statistical and Example based machine translation system

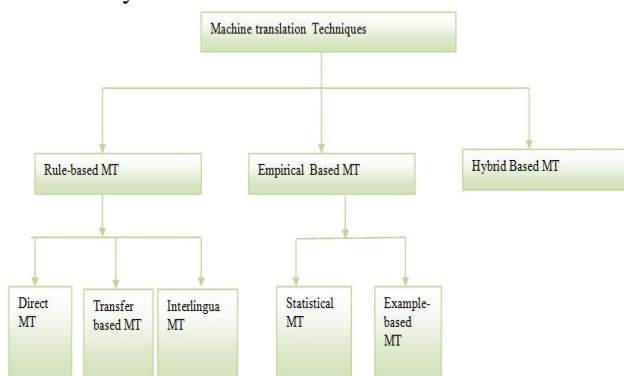


Figure1. Technique of Machine Translation

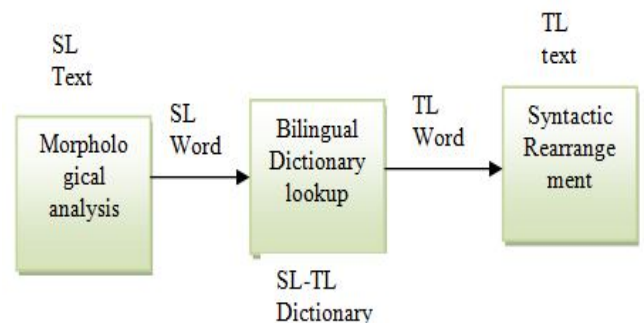


Figure 2: Direct Machine translation Approach

3.3. Statistical-based Approach:

SMT can be described as the process of finding and matching identical pairs from SL and TL in parallel corpora. The goal of SMT is to make an optimal decision in language translation by using statistical decision theory, based on probability distribution function. The important feature of SMT is the presence of statistical table, which can be built by using supervised or unsupervised statistical machine learning algorithms. Statistical table generally contains statistical information pertaining to sentences or languages. SMT relies on a statistical calculation of the probabilities of a match [17] by using two probabilistic models: Language model and Translation model, rather than relying on linguistic translation algorithms. The idea of SMT is that document can be translated on the basis of probability distribution function $P(t/s)$, where $P(t/s)$ is the probability of translating a sentence, say 's' in SL to a sentence 't' in TL. And this function is generated easily by using Bayes theorem. In Bayes theorem probability distribution $p(t/s)$ is obtained from the product of $P(s/t)$ and $p(t)$, where $P(s/t)$ is the probability that the source sentence is a translation of the target sentence, and $P(t)$ is the probability of the TL

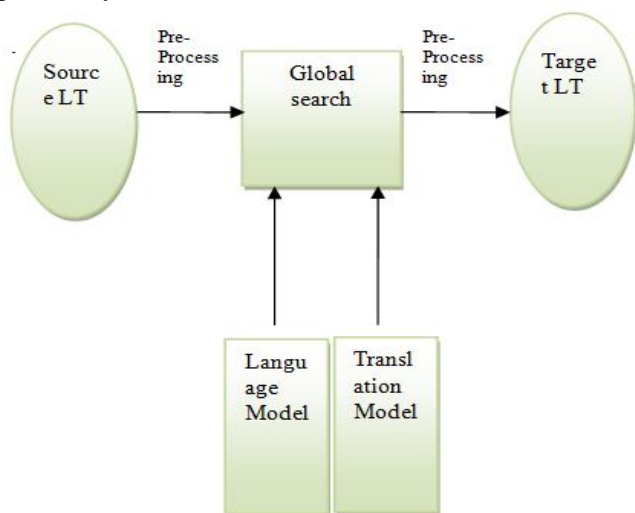


Figure 3: Statistical Machine Translation Approach

3.4. Example-based translation:

Basic idea of this MT is to reuse the examples of already existing translations. An example-based translation is uses a bilingual corpus as its main knowledge base and it is essentially translation by analogy. Example-based machine translation (EBMT) is define by its use of bilingual corpus with parallel texts as its main knowledge, in which translation by analogy is the main idea. An EBMT system is given a set of sentences in the source language (from which one is translating) and corresponding translations of each sentence in the target language with point to point mapping. These examples are used to covert similar types of sentences of source language to the target language. Example acquisition, example base and management, example application and synthesis this is four tasks in Example based machine translation system. At the base of

example-based machine translation is the idea of translation by analogy. The ethic of translation by analogy is encoded to example-based machine translation through the example translations that are used to train such a system.

3.5. Knowledge-Based MT:

Knowledge-Based Machine Translation (KBMT) requires complete understanding of the source text prior to the translation into the target text. KBMT is implemented on the Interlingua 56 International Journal on Natural Language Computing (IJNLC) Vol. 4, No.2, April 2015 57 architecture. KBMT must be supported by world knowledge and by linguistic semantic knowledge around meanings of words and their combinations.

3.6. Hybrid-based Translation:

Hybrid-based technique is develop using the advantages of SMT and EBMT methodologies. The hybrid technique used in a number of different ways. Translations are performed in the first level using a rule-based technique which is followed by adjusting or correcting the output using statistical information. other way in which rules are used to pre-process the input data and for post-process the statistical output of a statistical-based translation system. By taking the advantage of both statistical and rule-based translation methodologies, a new approach was developed, called hybrid-based approach, which has confirm to have better efficiency in the area of MT systems. Now days, several governmental and private based MT fields use this hybrid-based technique to develop covert from source to target language, which is based on both rules and statistics. The hybrid technique can be used in different ways. In some cases, translations are performed in the first level using a rule-based technique followed by adjusting or correcting the output using statistical information. Other way, rules are used to pre-process the input data as well as post-process the statistical output of a statistical Machine translation system. Hybrid based technique is better than the previous and has more power, flexibility, and control in translation. Hybrid technique integrating more than one MT paradigm are receiving increasing attention. The METIS-II MT system is an example of hybridization about the EBMT framework; it avoids the current need for parallel corpora by using a bilingual dictionary (similar to that found in most RBMT systems) and a monolingual corpus in the TL (Dirix et al., 2005). An example of hybridization about the rule-based paradigm is given by Open. It integrates statistical methods within an RBMT system to choose the best translation from a set of competing hypotheses (translations) generated using rule-based methods.

3.7. Neural Machine Translation:

Neural Machine Translation is an approach to MT that uses a neural network which directly models the conditional probability of translating a given source sentence to a target sentence.

4. Conclusion:

In this paper explain the various standardized approaches in the field of Machine translation word wide and especially

with context to Indian languages. Our aim is to be examining the machine translation technique. Rule based machine translation system this technique is useful for the machine translation for Indian languages. Now current most of use the neural machine translation system. Those techniques are useful for translation as per review. This paper will be useful for new researchers to understand the technique of machine translation system, so that they can enhance the methods and do the more useful to take all mankind close to each other.

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