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MACHINE TRANSLATION APPROACHES: ISSUES & CHALLENGES

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Abstract
Language is a communication tool for different cultures around the world. Hence, accessibility to other language web documents has always been a concern for information professionals. Consequently, the Machine Translation approach, which is software used to translate a text from one language into another, is widely utilized. It is possible to refer to automatic or immediate translator as compared with human translator it is much quicker. In addition, with the fast change in information and communication technology (ICT), the world has become a small village where individuals can interact with each other via MT. Then MT performs an significant position in personal and business areas and is highly relevant. The translation system can be bilingual or multilingual. Most machine translations are bidirectional, either from origin to target or from destination to source language. The article focuses on MT's various approaches and also presents several challenges faced in the language translation and also advantages and disadvantages.

Key words: Communication, Machine Translation, ICT, Human translator, Language.

Introduction

In the modern world, there is an increased need for language translations owing to the fact that language is an effective medium of communication. The demand for translation has become more in recent years due to increase in the exchange of information between various regions using different regional languages. Accessibility to web document in other languages, for instance, has been a concern for information Professionals. Machine translation (MT), a subfield under Artificial Intelligence, is the application of computers to the task of translating texts from one natural (human) language to another. Many approaches have been used in the recent times to develop an MT system. Each of these approaches has its own advantages and challenges. This paper takes a look at these approaches with the few of identifying their individual features, challenges and the best domain they are best suited to.

In recent times, the technology of information and communication (ICT) has risen quickly. This has influenced the growth of business (Luo & Bu, 2016) and the telecommunications technologies, in which people from many other cultures are able to interact. Languages are thus an important instrument for communication based on their significance in terms of trade, study or relationship with others from other groups and religions (Newmark, 1988). Languages are necessary to deliver emails and comprehend the texts they also receive. It is therefore essential to have a technique of translation that means the exchange of two texts in two distinct codes.

Translation is a very rapid growing activity these days (Hatim & Munday, 2004). It is an active means to transfer the culture and language due to the contact with one other (Newmark, 1988). Its main aspect understands the meaning assigned to the words in the vocabularies of the language (Jakobson, 1959). Any translated text is judged and accepted by the reviewers when it is read as it was meant in its source language, in other words, it is not literally translated, this is because the author may express his or her thoughts and feelings in writing or speaking (Venuti, 2008).

Machine translation (MT) is still a huge challenge for both IT developers and users. From the beginning of machine translation, problems at the syntactic and semantic levels have been faced. Today despite progress in the development of MT, its systems still fail to recognise which synonym, collocation or word meaning should be used. Although mobile apps are very popular among users, errors in their translation output create misunderstandings.

Machine translation (MT) is the task to translate a text from a source language to its counterpart in a target language. There are many challenging aspects of MT: 1) the large variety of languages, alphabets and grammars; 2) the task to translate a sequence (a sentence for example) to a sequence is harder for a computer than working with numbers only; 3) there is no one correct answer (e.g.: translating from a language without gender-dependent pronouns, he and she can be the same).

Machine Translation History and Emergence

The idea of machine translation may be traced back to the 17th century. In 1629, René Descartes proposed a universal language, with equivalent ideas in different tongues sharing one symbol. The field of -machine translation" appeared in Warren Weaver's Memorandum on Translation (1949). The first researcher in the field, Yehosha Bar-Hillel, began his research at MIT (1951). A Georgetown MT research team followed (1951) with a public demonstration of its system in 1954. MT research programmes popped up in Japan and Russia (1955), and the first MT conference was held in London (1956). Researchers continued to join the field as the Association for Machine Translation and Computational Linguistics was formed in the U.S. (1962) and the National Academy of Sciences formed the Automatic Language Processing Advisory Committee (ALPAC) to study MT (1964).

This story is an overview of the field of Machine Translation. The story introduces several highly cited literature and famous applications, but I'd like to encourage you to share your opinion in the comments. The aim of this story is to provide a good start for someone new to the field. It covers the three main approaches of machine translation as well as several challenges of the field. Hopefully, the literature mentioned in the story presents the history of the problem as well as the state-of-the-art solutions.

The idea of automatic translation has been around for centuries. It's been put forward by such scientists as Leibniz and Descartes. But only with the emergence of computing devices in the twentieth century, the machine translation concept took shape. Here are the highlights of machine translation (MT):

- The first attempts of machine translation were made in the **1950s**. The first dictionary included only 250 words and six grammar rules. However, this was enough to see the great future of MT. Many countries started to develop MT systems.
- After the ALPAC (Automatic Language Processing Advisory Committee) report in **1966**, the funding for MT research was reduced significantly. The report highlighted the clumsiness, lack of accuracy, and high cost of MT compared to human translators and predicted a dismal future for MT development. Most worldwide MT research declined.
- In the late **1970s** and early **1980s**, research focused more on the rule-based approach that was less complicated than interlingua and more suited to working with multiple languages than a direct translation.

- In the **1990s**, the third generation of machine translation systems emerged based on the statistical and example approaches. It formed the basis of translation memory tools.
- The Internet offered all the opportunities for the development of machine translation in the **2000s**. Japan created speech-to-speech translations for mobile phones.
- In **2016** Google informed the public that the implementation of a neural network approach improved clarity across Google Translate. Computer systems with neural networks replaced memory-based functions.
- Recent developments in machine translation are the combination of deep learning and neural networks that increase accuracy. Neural-based MT engines are much more capable of spotting the meaning of a sentence and quickly replacing older statistical models.

MT Approaches

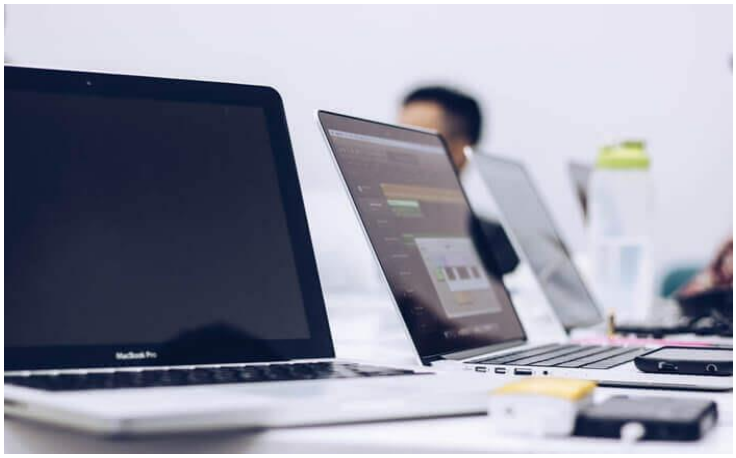
Most study discuss about the development of Machine Translation, which covers three types: Statistical Machine Translation (SMT), Machine Translation using Semantic Web, and Neural Machine Translation (NMT). To the best of our knowledge, none of these machines give precise translation like the human translation (Taylor, 2009). Except for the translation of the texts, this recorded in the knowledge base of the machine as assigned phrases which are the full phrases from the source language and its meaning in the target language (Koehn et al., 2003, Brown, Cocke, Pietra, Pietra, Jelinek, & Lafferty, 1990). That is because the words translation has been saved as it is to the knowledge base as translation experts translate it. However, we cannot insert every single phrase and ask the user to translate it. The wheel of the sciences did not stop.

Machine translation is a relatively old task. From the 1970s, there were projects to achieve automatic translation. Over the years, three major approaches emerged:

- Rule-based Machine Translation (RBMT): 1970s-1990s
- Statistical Machine Translation (SMT): 1990s-2010s

Neural Machine Translation (NMT): 2014

Machine Translation is impressive technology and has come far from those early stages. Modern MT software can compete with human translators to an extent. We have gathered the most promising translation tools that help ease the translation process and improve efficiency, consistency, and quality.



Machine Translation Software

Translation software is designed to make the translation process faster and more efficient. Therefore, machine translation software is best suited when companies need quick, one-time translations, and accuracy is not so important.

- **Google Translate**. You definitely heard of it. It is the most popular machine translation software. It's free, and it supports more languages than any other translation tool - over 100. Being a part of a large company with resources, Google Translate is improved continuously.
- **Amazon Translate**. A neural MT service that supports 71 languages. It is integrated into your business applications. Amazon Translate service is fee-based, where you pay for the number of characters of text you process and customize your plan according to these data.
- **Microsoft Translator**. The next software has over 70 languages available, and it's already integrated into other Microsoft services. The service is free for general use.
- **DeepL**. With only 13 languages, DeepL's strength is in the quality. Here, the machine learns extensively from reliable linguistic sources with or without human supervision. This free service helps to grasp the context and nuances that allow for more accurate and natural translations.
- **Baidu Translate**. The free Chinese equivalent of Google, so if your business is looking to localize in Chinese markets, Baidu Translate is a good option!

Machine Translation Advantages

With the constant technology development, the translation process is changing as well. Nowadays, machine translation allows translating entire documents by clicking the button. The question arises: why bother to search for a human translator to get the work done? The apparent strengths of machine translation are:

1. **Low cost**. Professional translators demand enough money for each page, but we need just a general idea of what is said very often. In this case, the machine translation system is reliable and effective.
2. **Speed**. MT enables you to save your time while translating large texts when you need to get the gist of some considerable amount of information.
3. **Multitasking**. MT system is like the jack of all trades - it can translate any text of any area. In comparison, a professional translator specializes in a certain field. You can also translate between multiple languages using one tool.
4. **Privacy**. This is about financial documents or private emails, for example, because you wouldn't give your personal correspondence to some unknown translator as well as your financial affairs.
5. No bilingual text required
6. Domain-independent
7. Total control (a possible new rule for every situation)
8. Reusability (existing rules of languages can be transferred when paired with new languages)
9. Less manual work from linguistic experts
10. One SMT suitable for more language pairs
11. Less out-of-dictionary translation: with the right language model, the translation is more fluent

Disadvantages

- Requires good dictionaries
- Manually set rules (requires expertise)
- The more the rules the harder to deal with the system
- Requires bilingual corpus
- Specific errors are hard to fix
- Less suitable for language pairs with big differences in word order

Machine Translation Challenges

Despite the abovementioned perks of MT, there are certain problems. You can only overcome them by hiring a human translator. So keep it in mind before choosing to use machine translation as these problems with the translation will become business problems if they are not resolved:

- **Buy nice or buy twice**. The cost can also be a negative factor. You should understand what quality you get with a free/cheap option.
- **Easy does it**. Similar to the above - if something is completed very quickly, there is generally a reasonable expectation that it will not be of high quality. Quality work takes more time, care, and attention.
- **Lack of context**. The MT process can take the same term when it appears in different sections of a document and translates it differently. On the contrary, a human translator ensures that terminology is consistent throughout a project. This attribute is crucial so you do not confuse your reader when referring to the same thing.
- **The safety is at risk**. How can you be sure that the information you put into the free MT solutions is secured? Such software is open for everybody, their engines are placed on servers somewhere, and one should choose the translation system vendor very thoughtfully.
- **Formatting**. Complex formatting can pose a severe issue for MT. It will segment text in the middle of sentences, which would make the MT have no context.
- **Lack of creativity**. The art of language involves a lot of creativity. This is important to understand when communicating on the global market with your clients. Human translators are more creative with the subject matter at hand and deliver a more creative solution that will resonate with your business partners or customers.

Alternatives for Machine Translation

For most companies, the cost and time required to add just one new language to a product are measured in substantial amounts of money and years. Because this addition includes UI apps, documentation, design solutions, SEO localization, etc. For example, a single license for SDL Trados Studio (one of the most popular CAT tools) can cost thousands of euros. In addition, it is only useful for one individual, and the customizations are limited.

There are spheres where it is hard or impossible to apply machine translation. Such field as technical writing, for instance. Since the technical terms in the documentation have specialized meaning and the translated text accuracy is crucial. In addition, technical documentation often needs content for translation, for example, a screenshot that completes a text. Or such things as code examples, a plethora of abbreviations, etc. Here's when CAT tools are in place. These are standalone pieces of software requiring translators that use them to work locally and merge to a central repository.

Conclusion

Translation, due to its significance in the field of traditional operations, study and discussion of buddies, and sometimes in politics and law, is the primary event in our everyday life. There are many elements, kinds and characteristics of translation. Translation has lately been a business, in particular with the fast acceleration in ICT, requiring the development of computers and instruments that make communication between the two parties easier. MT was one of the machines needed if in any communication process it wasn't the hidden agent. However, MT could not until this moment transcends the human translation and fortunately, the research has not stopped in this area and hopefully will continue to contribute in this field. In order to function in practice, the benefits of all the kinds of MT described in this study could require hybrid studies on the three methods. Machine translation has the benefits of quickly translating content at a low cost and constantly developing and solving many practical problems; it doesn't cover all issues to the full extent. The challenges of MT can be resolved with human participation in the translation and localization process. And such human translators need special tools for that. In the technical writing field, these tools should be integrated into the tech writing system. aids technical writers to create multilingual documents providing built-in tools organizing the translation process.

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