Machine Translation in Practice

Jelena Šimić, Damir Vuk
Virovitica College
Trg Ljudevita Patačića 3, 33000 Virovitica, Croatia
{jelena.simic, damir.vuk}@vsmti.hr

Abstract. *Machine translation is an important tool in establishing successful communication. There is an increasing number of different software available for users, with higher and higher percentage of accuracy as well as speed, which translate terms, phrases or whole paragraphs from one language into another. Now online machine translation gives new possibilities to wider masses of users to use machine translation on an easy and free way. However, most users neglect the fact that those translations are often of low quality. There is increasing number of users who rely on machine translation, and go public with their translation without any verification or making sure that it is correct and clear. Such translation in some circumstances can be considered useless, and sometimes even risky.*
With the advent of Internet era, new challenges and opportunities for online machine translation are coming. This paper deals with machine translation in the Internet era, and includes a brief examination of user's experience in online machine translation, based on student's population.

Keywords. Machine translation, online MT

1 Introduction

At the beginning, it would be useful to mention the most significant steps in the machine translation (MT) history, at least for readers less familiar with the MT field. For a detailed review of MT history, a good resource is Hutchins paper [10].

Although the idea of machine translation origins back before the advent of digital computers, first attempts to practically realize automatic language translation started soon after the beginning of digital computers era.

At the beginning, 1946 – 1948 Warren Weaver investigated theoretic aspect of machine translation and suggested some practical ideas. That was a starting impulse for further research in the field of MT.

Few years later in the year 1952, the first MT conference was held at MIT, initiated by MIT researcher Yehoshua Bar-Hillel. The conference was full of new ideas, although it was acknowledged that MT is not an easy task, and that serious problems in good quality machine translation were apparent.

Two years later the first public demonstration of MT was held – a grammatical rule-based translation of simple text in Russian into English. By the end of the decade, various empirically based experiments tended to find the way to the human translator quality MT. Theoretical research from the linguistic point of view started as a new science field: "computing linguistics", as it was later named.

In the year 1960, Bar-Hillel publicized a revised report *'The present status of automatic translation of languages'* for the journal 'Advances in Computers' [2]. He expressed scepticism about possibility of *'fully automatic high quality translation'* (FAHQT), and he criticized each current MT project which tended not to take into account non-feasibility of FAHQT.

Bar-Hillel based his belief on the fact that all ambiguities in MT are solvable only by human translator. Otherwise, the machine must be able to process a meaning as humans do, which is highly unrealistic to expect. Bar-Hillel believed that FAHQT should not be the main goal for MT.

He proposed less demanding objectives of more practical significance.

Bar-Hillel considered that processing of meaning could only be based on logic system, but that logic system could not be directly connected with natural language, instead it must be based on separated logical notations, so he qualified that logical system as unattainable.

Six years later, in 1966, ALPAC report produced a negative impact on machine translation foundations in the USA [11]. ALPAC, an acronym for "Automatic Language Processing Advisory Committee", was set up mainly for US military and intelligence agencies needs. This report mainly rejected MT because *"there is no immediate or predictable prospect of useful machine translation"* [11]. In fact, ALPAC mainly reviewed MT from the military and intelligence point of view, i.e. investigating and scanning Russian-language documents and scientific publications.

After ALPAC, more MT systems were based on indirect translation models, in contrast to direct translations in pre-ALPAC period. In post-ALPAC period, many new MT systems were developed in USA, Canada, Japan, Hong Kong, and Europe.

The Most significant was Systran with roots in Georgetown machine translation research. Systran is a long-lived MT project constantly being improved and having great impact to the present time. It was also applied to translations of US DoD and EU Commission documents.

The Advent of personal computers in 1980s arose new opportunities for different MT tools for professional translators and for other PC-users. MT had opportunity to increase attendance at much wider user base. End users of MT tools had opportunity to choose appropriate MT tools at acceptable costs, optionally with tight integration with desktop applications like word processors and others.

2 Internet age of MT

Internet use after mid 1990s had great impact on MT. The Impact of Internet on MT in general is manifold. Yet, three factors, not highly apparent in the beginning of Internet era, are now most important.

Firstly, online access to millions of web sites and huge number of documents often in not understandable languages need automatic translation. Here FAHQT is not necessarily required; users are in some aspects satisfied with poor or low quality translations. For example, in case when only screening of information is needed or required. Secondly, Internet is huge dynamic repository of highly differentiated information. Thirdly, billions of users are good (market) target for new kind of applications, which have never existed before. This will be much intensified in the next few years with increasing acceptance of tablet computers and smart phones.

MT has never had such a great potential. Synergetic effects of new Web2 applications and innovative MT use may be unforeseeable yet, especially because of the positive feedback between both. There are different scenarios of possible applications and impact on the use of Internet. Social networks, business applications and collaborative tools may be first targeted by this impact. The main factor in the rapid popularity of MT on the web is the fact that it is free and is available on demand ('on click') [6].

Google as main innovator and market force in this area set MT on its priority list. It is important to notice that Google Translate system now is able to translate in any direction between fifty-two languages, and this number is growing. This is an absolute record in MT systems. Google Translate uses statistical machine translation with learning and optimisations algorithms. Its learning is based on parallel data sets where documents occur in at least two languages. Actually, Google Translate technology is based on data mining and learning algorithms, and the main resource of this data is web. Another source of parallel sets of data is Google Books with a growing set of books [13].

3 Quality of translation

Quality of translation is intuitively appreciated as the most important outcome of MT process. Human evaluation of MT includes at least three factors: adequacy, fluency and fidelity of translation [1], [8].

Human evaluation is mostly not appropriate because it is time and cost consuming. For the evaluation of large texts, it is more appropriate to use an automatic evaluation technique. The criteria for translation quality measuring are closeness of an automatic machine translation to the professional human translation (reference text).

The two best-known models of MT evaluation are BLEU and NIST [17], [1]. Both models use n-gram mean measure. NIST is based on BLEU. The Difference is in the way they calculate the mean. While BLEU calculates geometric mean, NIST calculates weighted arithmetic mean of n-gram precisions [5]. Another well-known metrics is F-measure. This is a metrics based on maximum matching between MT output and the reference text.

There is reported strong correlation between automatic and human assessment: '*we found that BLEU and human assessment scores correlate strong, positively and linearly*', as Coughlin stated [4]. This finding justifies the use of automatic assessment metrics as a replacement for human based assessment. Modern MT systems use an automatic evaluation model in the process of optimization of translation.

In addition to automatic assessment metrics, machine-learning techniques are used in process of machine translation quality improvement. Using automated metrics and machine-learning models to learn from data, seems to be a promising approach to automatic improvement of quality MT. For example, Google Translate does exactly that [13], [18].

4 Internet use of MT

As already mentioned, Internet MT is accepted from large population, it is easy to use and it is free. However, Internet MT is not without flows and deficiencies. Naïve users usually unrealistically expect high quality results of web based machine translation. They may believe that MT is correct and are in risk to apply an inappropriate translation for serious use. The cause for that situation may be user's poor knowledge of MT system performance, and too little experience with online MT systems. Another group of users are professional translators, which use web MT for a quick and rough output as basis for manual post-editing and further improvement or translation "polishing". For them, above deficiencies do not cause serious problems.

There have not been comprehensive surveys carried out on online MT users. As we stated before, this is a rapidly increasing group with growing importance in the future. Beside this, there is a need to know answers to some important questions: "*Who are they? What are the patterns they apply in online MT? What are their needs, expectations? What purposes they need online MT for? ...*"; as Gaspari and Hutchins considered [6].

We made a very brief survey of college students MT experience. The survey includes 282 respondents selected from all classes.

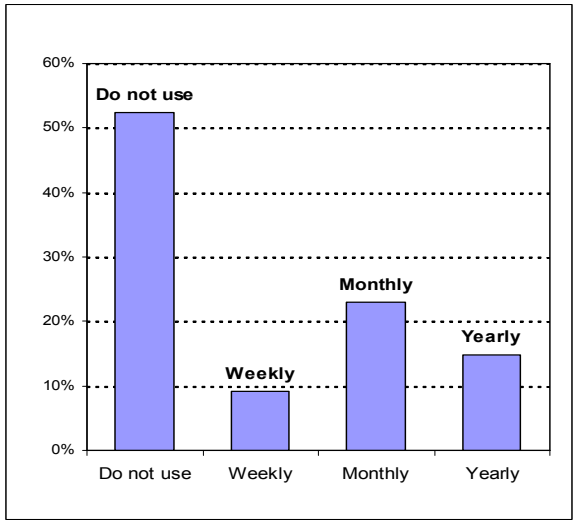

Figure 1. Frequency of online MT use

First, we want to know how many of them use online MT on a regular basis. About 47% respondents use MT regularly, at least few times a year. Fig.1 shows the frequency of use. From all respondents only 9.2% use the MT once a week or often, 23% use it at least once a month, 14.9% use it less than once a month, and 52.9% have no experience in MT use.

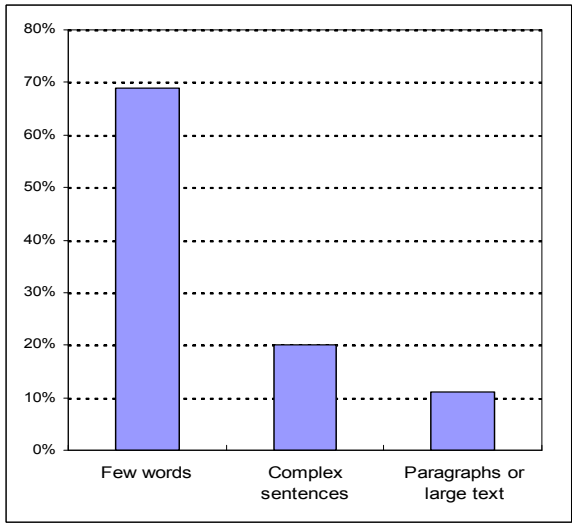

Figure 2. Size and complexity of MT - inputs

Next question was about the length and complexity of input texts. Fig. 2 shows the results. It is obvious that investigated students

population is mainly using MT for simple text processing (69%), moderately for translation of complex sentences (20%) and rarely for large texts (11%).

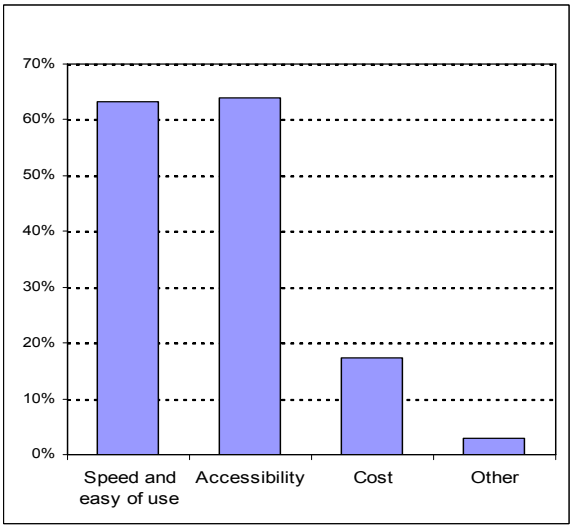

Figure 3. Advantages of online MT use

When asked about major advantages of online MT use, respondents clearly emphasized accessibility (62.9%), as well speed and easy of use (62.3%). Surprisingly, usual perception of low cost of online MT was not significantly scored (17.3%). Other advantages ware rarely identified as well (3%). Fig. 3 shows relative frequencies of perceived advantages.

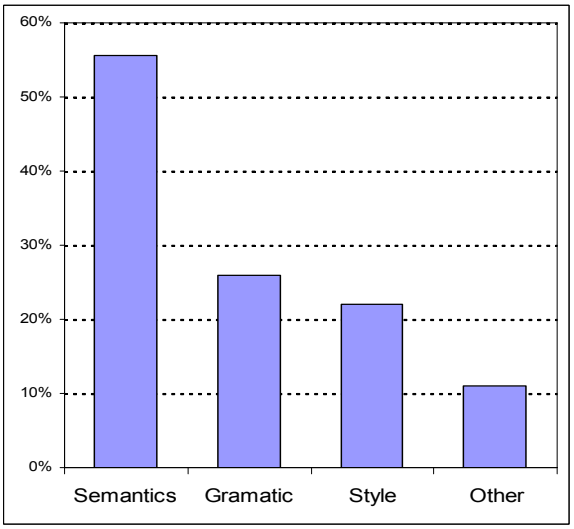

Figure 4. Major types of shortcomings of online MT

As we emphasized earlier, online MT cannot yet compete with the professional human translator with respect to accuracy and correctness of translation. Accordingly, Fig. 4 represents relative frequencies of major shortcoming types identified with relation to accuracy and correctness of online MT.

Semantic quality of translation in relation to translation accuracy of meanings of single words or phrases, are identified as major shortcoming of online MT (55.6%). Next are grammar errors (26.2%), and not appropriate style of MT output (22.1%). Last significant are other unspecified shortcomings (11.0%).

Regardless of small sample and taking into account narrow research focus, results correlate with former considerations.

5 Conclusion

Web-2 opens a wide global window for various types of public and private communication. Machine translation is present on web since the beginning of the public access of Internet. Yet, in the last few years it is obvious that a new strategic role of MT in the era of global communication approaches. Internet content is becoming huge and at the same time in many ways exceptionally diverse, covering more and more of human activities. Billions of Internet users, now and in the near future, are interfaced with incomprehensible contents, due to unknown languages and alphabets.

In the Internet era where MT is ubiquitous, good quality of MT is an ideal requirement that is rarely attainable, but for many purposes of content screening today's quality of MT is sufficient.

Machine translation of huge web content online and instantly, is a new challenge for MT. However, MT is also a challenge and strategic opportunity for future web applications.

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