

## **Machine translation, machine-aided translation, and machine-impeded translation**

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*The paper describes the general philosophy behind the range of translation aids developed by Automated Language Processing Systems, which include interactive machine translation.*

In the more than thirty years which have transpired since Warren Weaver circulated his now famous memo 'Translation', a great many computer systems have been proposed for dealing with the problem of translating between human languages. Many of these systems evidence a real understanding of the ways in which the computer can best be brought to bear in support of the translation process. They are an aid to translation. Other systems are insensitive to the abilities and shortcomings of both man and machine. In spite of the best intentions of their designers, they are often an impediment to translation.

The aptness of a translation system is a relative thing - relative to the text to be translated, the needs of the intended audience, and the requirements of the organisation providing the translation, among other considerations. It follows that a general translation system must incorporate a variety of translation aids to match the multiplicity of translation requirements.

### **RANGE OF MACHINE AIDS TO TRANSLATION**

There is a broad continuum of ways in which man and machine can share the translation responsibility. It ranges from Bar-Hillel's FAHQT (Fully Automatic, High Quality

Translation) to Kay's HTLGI (Human Translation Like God Intended). Intermediate points are occupied by MAHT (Machine-Assisted Human Translation) and HAMT (Human-Assisted Machine Translation).

It is generally acknowledged that FAHQT does not exist today. As a result, many people have felt at a loss to describe existing automatic translation systems, all of which require some human intervention to produce high-quality translation. Terms such as 'semi-automatic', 'machine-aided', 'automatised', and 'traditional MT' have been proposed by various observers to refer to this class of translation systems. The only term which has rivalled the standard appellation, 'machine translation', with any degree of success has been 'machine-aided translation'. Unfortunately, this term is taken by many to refer to MAHT and HAMT noted above. The initialisms HTLGI, MAHT, HAMT, and FAHQT (or FAMT, for 'Fully Automatic Machine Translation') have a fairly standard interpretation, but they are hardly transparent to the newcomer to the field of translation technology.

In an effort to cut through some of the terminological confusion (and at the risk of compounding it further), may I propose the following straightforward descriptions of the four major points in the continuum: 'writing aids', 'translation aids', 'interactive translation', and 'automatic translation'. A brief description of each will serve to clarify its meaning.

'Writing aids' refers to a set of monolingual programs and reference files made available to a writer to help him compose or edit a document. The most basic writing aid is a good word processor. Other writing aids range from spelling and punctuation checkers to style and readability analysers. Inasmuch as translation is a special case of writing, translators can profit from having access to tools which help them write better.

'Translation aids' refers to a variety of bilingual and multilingual aids which stop short of proposing whole sentence translations. They include such diverse aids as term bank systems and systems for spotting existing translations. Translation aids have proven effective in increasing translator productivity, quality, and satisfaction.

'Interactive translation' refers to any system in which the computer produces a translation of complete sentences under the interactive guidance of a human operator. It differs from translation aids in that with translation aids the human assumes the primary role in producing a translation, whereas with interactive translation the computer takes the lead. Interactive translation differs from automatic translation in its provision for consulting with a human operator during the translation process.

'Automatic translation' refers to any system in which the computer produces a translation of complete sentences based entirely on its own resources (algorithms, grammars, and dictionaries). The fact that texts which are translated with an automatic translation system may be subject to pre-editing or post-editing does not make the translation system itself any less automatic.

The notion that the range of useful machine aids to translation encompasses more than automatic translation is not new. It was one of the major conclusions of the ALPAC report in 1966.

In 1976 Bernard Vauquois made the following recommendation: 'Consider now the feasibility of A.T. systems which merge human translators and the computer in a hybrid process. We can imagine several different strategies',(1) whereupon he gave a brief description of a pre-edit/post-edit system and an interactive system, calling the latter 'the ideal way for the future'.

In 1979 an international committee of experts in machine translation gathered in Belgium under the auspices of the International Federation for Documentation (FID) and the International Association of Applied Linguistics (AILA). Donald Walker and Hans Karlgren reported this conclusion reached by the committee: 'Encouraging developments are expected in the area of refined combinations of machine and human cooperation, rather than attempts at complete automatization. Mere post-editing of machine output does not seem to be a realistic way of producing adequate translation'. (2)

In 1980 Martin Kay published his marvellous essay, 'The proper place of men and machines in language translation'. In it he stated:

The need for translated texts will not be filled by a program of research that devotes all of its resources to a distant ideal, and linguists and computer experts will be denied the proper rewards of their labors if they must promise to reach the ideal by some specific time. A healthy climate for FAHQT will be one in which a variety of different though related goals are being pursued with equal vigor for the intellectual and practical benefits that they may bring. (3)

In 1981 at a workshop on 'Applied computational linguistics in perspective', a panel on machine translation, chaired by Martin Kay, based its recommendations on this observation:

The translation problem is real and will in fact rapidly reach crisis proportions unless some action is taken...

The only hope for a thoroughgoing solution seems to lie with technology. But this is not to say that there is only one solution, namely machine translation, in the classical sense of a fully automatic procedure that carries a text from one language to another with human intervention only in the final revision. There is, in fact, a continuum of ways in which technology could be brought to bear, with fully automatic translation at one extreme, and word processing equipment and dictating machines at the other. (4)

In 1982, at COLING 82 held in Prague, Alan Melby raised the issue once more:

It is now quite respectable in computational linguistics to develop a computer system which is a TOOL used by a human expert to access information helpful in arriving at a diagnosis or other conclusion. Perhaps, then, it is time to entertain the possibility that it is also respectable to develop a machine translation system which includes sophisticated linguistic processing yet is designed to be used as a tool for the human translator. (5)

It is 1983 now, and it seems that the point has still not been made. With the exception of the very fine work on term banks in progress at a number of locations around the world, no-one seems very interested in focusing on the human-oriented translation systems.

To the best of my knowledge, the work carried on at the Translation Sciences Institute of Brigham Young University in the 1970s has been the only major research effort to concern itself with interactive translation. Its offshoot, ALPS, is apparently the only commercial enterprise pursuing this avenue of development at present. We at ALPS view this situation with mixed emotions: it is nice to stand apart from the pack, especially as we feel that we are on solid ground, but we are continually amazed that no-one has attempted to challenge our position.

#### SELECTION CRITERIA FOR MACHINE AIDS TO TRANSLATION

Assuming that each of the classes of machine aids has its place, it is important to know what considerations recommend one aid over another for a particular application. There are several factors worthy of consideration.

Probably the most obvious consideration is the nature of the text to be translated. Juan Sager reports this lesson

learned from the early history of machine translation: 'Documents requiring translation are so diverse in nature that no one system is ever likely to be suitable for all manner of texts; this opens the way for the concurrent development of several systems with different types of objective'.(6) Friedrich Krollmann has given this useful explanation of the amenability of a text to machine translation:

One can also categorise texts according to whether the difficulties involved are difficulties of formulation - the extreme case being that of esoteric or highly emotional texts - or difficulties presented by large numbers of specialised terms... That wide sector of translation work in which the translator's freedom of formulation is severely limited covers not only the translation of catalogues but also the translation of technical and scientific texts. The further we move in the direction of specialised vocabulary texts, the more help we can expect from the computer in the actual translation processes, for the time being at any rate; conversely, the practical applicability of the computer declines, the more formulation problems a text poses.(7)

Translation requirements are another obvious consideration. For whom is the translation intended? How homogeneous is the audience? What is the medium for the translation? Memo? Published book? What is the object of the translation? To sell? To instruct? To abstract? What is the budget? What is the deadline for the translation?

The answers to these and a hundred other questions have profound implications for the selection of a translation aid. The translation of newspaper articles for information-gathering purposes is well suited to an automatic system. The translation of a major policy speech to be read to a foreign parliament is better suited to a more human-oriented process.

Seven years ago, David Hays, in surveying the field of machine translation, was moved to comment that 'almost everyone hates translators. They arouse our xenophobia by bringing the enemy into our camp. To give them help in their task, or credit for doing it, is loathsome'.(8) I am not sure that we have progressed so very far in the interim. One can still perceive a 'father knows best' attitude on the part of some developers of machine translation. We should actively strive to educate and encourage users of our systems, but never ignore them. Boitet, Chatelin, and Daun Fraga concur that

the human and social aspects should not be neglected. To force a rigid system on revisors and translators is a guarantee of failure. It must be realised that AT can

only be introduced step by step into some preexisting organizational structure. The translators and revisors of the EC did not only reject Systran because of its poor quality but also because they felt themselves becoming 'slaves of the machine' and condemned to a repetitive and frustrating kind of work.(9)

In this conjunction, it might be noted that Kay's proposal for a 'translator's amanuensis' and Melby's description of a new interactive translation system both address the challenge of providing a range of translation aids to a competent human translator, who never loses control of the situation. As Kay puts it, 'The system proposed here will accumulate only experience of what was agreed upon between both human and mechanical members of the team, the mechanical always deferring to the human'.(3)

What is important to consider here is that different systems are well adapted to different users for a number of good and bad reasons. But a well-designed, flexible, user-friendly system will, by its nature, be well adapted to most users.

There are a couple of other relevant criteria for the matching of translation aids to tasks which have to do with basic system capabilities. Some aids, interactive and automatic translation, for example, require the source language document to be in machine-readable form. Others (word processing and online dictionary consultation, for instance) work very well in conjunction with hard-copy input. The latter aids would be indicated if the translation requirements did not justify re-keying the contents of a hard-copy source document.

Another system consideration is language or language pair availability. A translation system can only be considered for translating documents in the languages it supports. While this is obvious, it has some ramifications for translation system development which may not be so obvious.

Consider, for example, the case of a system which attempts to address the translation needs of the United Nations. With six official languages, the UN must translate between thirty (ordered) language pairs. However, it is not the case that every language pair has an equal translation requirement. Chinese to Spanish translations are far less common than English to French translations. Therefore, it is hard to justify the expenditure of similar amounts of time and money in the development of translation aids for these language pairs.

This is a general pattern for virtually every type of organisation. A recent survey of translation requirements in twelve industrial nations (with eight major languages and

fifty-six language pairs internally) showed that 70 per cent of their total translation volume, including translation to other languages, was generated in twelve language pairs. Six language pairs accounted for 50 per cent of the translation demand, and two language pairs accounted for 20 per cent.(10)

The conclusion that can be drawn from all this is that translation systems for a handful of language pairs address the majority of the existing translation demand. It would seem reasonable, then, to address the remainder of the demand with translation aids which are more limited in scope and in development cost.

### PROPER APPLICATION OF MACHINE AIDS TO TRANSLATION

Even if it is not clear where each of the machine aids to translation is best applied, it should be obvious that each has its place. No single system is best suited for all applications. One size, alas, does not fit all.

Why, then, do some people insist that automatic translation (and here you may substitute interactive translation, translation aids, or writing aids) is never appropriate? Why do others go on as though it were the only possible choice? It is instructive to ask, what is the motivation for enlisting the help of the computer with translation in the first place? Is the interest primarily practical or is it purely academic?

Some people seem to feel that anything less ambitious than fully automatic machine translation is not worth pursuing, that resorting to a more synergistic use of man and machine contributions is a cop-out or is cheating somehow. This comment by Margaret Masterman, made in a slightly different context, is worth remembering: 'The object of having a machine to produce translation, after all, is not (as with chess) to take part in international M.T. competitions, but to produce usable translations'.(11) Nor is the object to take a happy, productive translator away from his regular assignments, stick him in front of a terminal, and ask him to help make the computer look good. Martin Kay gives an example of a technology misdeveloped and misapplied:

There was a long period - for all I know, it is not yet over - in which the following comedy was acted out nightly in the bowels of an American government office with the aim of rendering foreign texts into English. Passages of innocent prose on which it was desired to effect this delicate and complex operation were subjected to a process of vivisection at the hands of an

uncomprehending electronic monster that transformed them into stammering streams of verbal wreckage. These were then placed into only slightly more gentle hands for repair. But the damage had been done. Simple tools that would have done so much to make the repair work easier and more effective were not to be had, presumably because of the voracious appetite of the monster, which left no resources for anything else. In fact, such remedies as could be brought to the tortured remains of these texts were administered with colored pencils on paper and the final copy was produced by the action of human fingers on the keys of a typewriter. In short, one step was singled out of a fairly long and complex process at which to perpetrate automation. The step chosen was by far the least well understood and quite obviously the least apt for this kind of treatment.

Government and bureaucracy may be imbued with a sad fatalism that forces it to look to the future as destined to repeat the follies of the past, but we can surely take a moment to wonder at the follies of the past and nostalgically to muse about what a kinder and more rational world would be like.(3)

Whether the world of the future will be kinder or any more rational is uncertain. What is certain, though, is that it will be a world of our own making and, therefore, a world of our own deserving. The field of machine translation is at a crossroad. We can develop systems which attempt too much or systems which attempt too little. We can develop systems which capitalise on the special strengths of man and machine components or systems which ignore them. We can develop machine-aided translation or machine-impeded translation or some combination of the two.

The choice is ours. As for ALPS, we are committed to the goal of developing flexible systems which permit men and machines to interact productively using a set of tools appropriate to the requirements of a wide range of translation tasks.

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