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A BASIC SURVEY OF PRACTICAL MACHINE TRANSLATION

Veronica Lawson
Editor, "Language Monthly"
30 Half Moon Lane
London SE24 9HU
England

Machine translation (MT): what types of system are there, how well do they work, and will they improve?

This brief introduction to the different types of machine translation (MT) is intended as a kind of "child's guide" for those participants unfamiliar with the field. Its subject is not the linguistics of MT (which other papers will cover), but the practical applications of it, as viewed by a translator.

If you recognise some of this, I apologise. Being a basic survey it is based, not surprisingly, on my earlier work, in particular my chapter on MT in "The Translator's Handbook" (8).

Definition

First, what is MT? For the purpose of this paper it is automatic translation, done by a computer with or without human assistance. The machine offers translations of whole sentences. It is not computerised term banks, word processors or other machine aids for translators (where the actual translating is done by a human).

(In reality, however, usage varies: "MT", "machine aids" and all their synonyms - machine-aided and computer-assisted translation (MAT, CAT), mechanical and computer (-ised) translation etc. - may be applied to either concept or both, for both use machines to aid translation.)

How automatic?

MT, then, need not be entirely automatic. Still less need it be fully automatic high quality translation (FAHQT), the idea rejected by the notorious ALPAC report (l) in 1966. Although that report effectively ended the US government's major MT research effort, work continued elsewhere, often on a small budget. (For MT's history, see Hutchins (4,5).) MT may have been less academically respectable, but its quality was improving, and the translation market was still expanding. Users increasingly found that MT,for all its limitations, could be worthwhile if used sensibly; and MT is now in practical use

in a number of organisations and for a variety of applications. It is not yet cheap enough for all translation services, nor will it ever (I believe) be good enough for all kinds of translation (far from it). The difference now is that people are prepared to acknowledge MT's limitations, and that the pressure for more and better MT, which before ALPAC came mainly from researchers, is now from users.

Who can obtain NT?

So far, of course, machine translation has tended to be the preserve of large translation users such as government or intergovernmental agencies, multinationals or translation companies. This situation, however, is beginning to change. Some of these users, like ITT in the UK, offer bureau facilities to smaller users or freelance translators, or alternatively the latter may form a consortium to buy a system. NT may also be available on demand from a bureau (service centre): Weidner have one in Chicago, Control Data are to offer an ALPS bureau in Paris, and a Logos one exists in Switzerland. With modern telecommunications, of course, the MT system need not be in-house: it can be run on a computer anywhere, and users can access it by telephone (line quality permitting). Since editing needs less computer capacity than actual NT, therefore, a typical future pattern is likely to be a relatively large central computer for the actual MT and a number of distributed smaller computers for the editing.

Some points for costing

Users wanting their own system can rent, lease or buy a program, with or without a computer. (The options vary with the NT supplier.) In costing a scheme it is important to allow for all the initial costs. If the program is to run on the customer's existing hardware, for example, interface programs may have to be written at his expense; and production cannot even begin until after lengthy initial dictionary building. As for the running costs of an MT system, machine time (central processing unit time) makes up a relatively minor part of these. There is also the cost of input and output, handling, printing, and of course in most cases editing. The cost of a page of raw NT will probably be between £1 and £2, depending on the environment. Input will be cheaper, of course, if source texts are already in machine-readable form, and both input and output costs will be reduced if MT is integrated with office word processing.

It has been suggested that a turnover of perhaps 2,000,000 words/year in a given language pair and broad subject area (e.g. chemistry) justifies the purchase of a high quality MT system on a mainframe computer. Such a system can multiply a translator's output by three to five, although probably only after a run-in period: performance in editing, like most professional skills, improves with experience and training. A simpler, less versatile system is likely to have

a lower breakeven point, although it will not necessarily increase output by as much. Much depends, as usual, on the standard required and of course on the translator's previous output (probably between 300,000 and 900,000 words/year according to the time spent on research and non-translating duties). More information on MT costs can be found in Van Slype (12).

MT can be expected to come down in price as the price of computer storage falls and programs are tailored to smaller computers. Systran, designed for a mainframe computer, will also go on a minicomputer, Weidner and ALPS run on an IBM personal computer or Convergent Technologies micro as well as their usual minis, and ICL, for example, plan to offer MT on a micro shortly.

Kinds of machine translation

The MT field, like human translation, is very varied. Tables I and II show two ways of breaking it down, first by the type of system and then by the nature of any human intervention.

What purposes?

What place have these various kinds of MT in the translation market? Take a series of translation types such as the six Simpkin specifications (ll): literary, legal, publication, information, selective and gist.

For the first - literary translation - MT appears to be a non-starter; it is doubtful whether even the most skilful editing can introduce the subtleties of rhythm on which literary style and nuance finally depend. For legal translation, too, MT may seem unpromising, although Systran can cope with some Euro-legalese if postedited, and even raw Systran may be useful to a legal user of patents (at least of chemical patents) who is prepared, as often happens, to do his own editing. For the purpose of (non-literary) publication, however, MT is already in use, although never raw unless its input is restricted (as with Meteo's weather forecasts). As for documents wanted for information, MT has been used for these for many years, in North American, Europe, the Soviet Union or the Far East. Full editing is not necessarily essential, for the expert reader's subject knowledge enables him to decode texts which a translator would regard as nonsense. As Lanna Castellano has said (3), the translator "is far more concerned with the true quality of the product than is the user". Rapid postediting of only glaring errors suffices for many users, and even raw machine translation may be useful for information scanning. Raw MT can also assist in "selective" translation, by indicating which passages need an edited or human translation. "Gist", of course, is a different matter from pure translation, but presumably any MT good enough for information scanning can be expected to assist the person extracting the gist.

Table I. Types of machine translation system in ascending order of versatility

1. *Single corpus*
   If its developers concentrate on a single corpus of text, an MT system may translate that well, but fail completely on other, similar texts. Such systems are essentially for research, and not the concern of this handbook.

2. *Restricted language*
   Some systems are designed to translate only artificially restricted language:
   (a) pre-edited natural language;
   (b) texts specially written according to certain rules of syntax and/or vocabulary (Meteo, TITUS, the Xerox Systran).

3. *Interactive*
   These make it particularly easy for the user to put in his own dictionary and even text-related vocabulary. Examples: CULT, Weidner, ALPS. Some call on the user to resolve parsing problems and ambiguities.

4. *'Try anything'*
   This will have a good try at anything fed to it, although naturally with variable success. So far the price of such versatility seems to be a mainframe machine. Examples: Systran, Logos.

Table II. The different modes of machine translation according to the human's intervention

1. *Pre-edited or specially written input*
   (a) A pre-editor alters the source text in any of a number of ways before it is machine-translated. He may mark parts of speech, identify the boundaries of clauses or expressions, try to spot and remove ambiguities. (Humans are notoriously unreliable in spotting what is ambiguous to a machine.) To pre-edit effectively is not unlike half translating the document in one's head, and it does not make postediting unnecessary. It may be worthwhile, however, particularly if the text is to be translated into more than two languages.
   (b) Specially written input exhibits a limited range of grammar and/or vocabulary. The rules may be for a short document type such as weather forecasts (Meteo) or abstracts (TITUS) or for a wider document range (the Xerox Systran).

2. *Interactive editing*
   The editor intervenes during the machine translation process. He may input vocabulary after the machine has searched its dictionaries, but before it has run its actual translation program; and he may, like a pre-editor, resolve parsing problems or ambiguities.

3. *Postedited output*
   The raw machine translation is revised by a posteditor, normally a translator. He may use a word processor screen or work on hard copy (computer printout). Postediting, which is very different from the revision of human translation, is described in detail in (2).

4. *Raw output*
   Unedited machine translations, faulty though they are, can be adequate for some purposes, but must be treated with care. To protect the user, raw MT (indeed, all machine-synthesized text) should be clearly and indelibly labelled as such. Possibly the term 'machine translation' itself should be replaced with the more cautious 'machine *pre*-translation'. Note that the number of potential users of raw MT seems to have risen in the past year.

From the author's chapter on machine translation
in C. PICKEN, ed. The Translator's Handbook
London: Aslib, 1983

What are the practical MT systems?

While there are numerous research systems, far fewer systems are actually used in "real life". Only a small handful are widely marketed, the most successful so far being Systran and Weidner, followed by Logos and ALPS.

(For a table of practical systems as of spring 1983, and also a selection of research projects, see Lawson (8).)

How much do MT dictionaries matter?

Many MT systems are available in more than one language pair. With luck the supplier will sell a given language pair more than once, but in this case the different customers are likely to produce quite different results. The normal practice is for all customers to receive periodic updates of the MT program, so that in one sense they all have the same system. Each customer's dictionaries, however, are tailor-made, with the result that, say, a European Commission Systran may perform better on administrative texts and worse on technical texts than a Canadian Systran (7). Given the power of some MT dictionaries, with syntactic and semantic (10) coding and context rules, their effect on a program's performance is hardly surprising.

MT research

The output of the many research-oriented MT projects, if any, is too limited, slow or expensive to be of commercial interest, but they dominate the MT literature. Even in the popular scientific press MT articles tend to be on these research projects, instead of on systems which are actually used. Academics must publish, whereas commercial companies must keep their knowhow secret (particularly software, which is notoriously hard to protect).

Recent changes

The last three years have seen considerable changes, as machine translation has become more widely available. A notable difference is the greater acceptance in MT circles of the translator's role, partly because the European Commission has been demanding MT not only of a wider range of texts than any previous user, but of a higher quality. It is now widely accepted that such MT requires the insight of the professional translator, as well as the skills of the computer scientist and linguistics expert. Meanwhile hardware has become cheaper and commoner and started storing a higher proportion of documents. The ratio of textual to numeric data stored on computers is estimated at 1:9 now, but is expected to reverse by the end of the decade.

The cliche[1] "machine translation will never work" is rarely heard now. It obviously does work, within limits. But wall MT ever work perfectly? I believe that natural language is too subtle and changeable, too much alive, to machine-translate perfectly - unless of course the system has been altered to cope with the particular text concerned. This kind

of cheating or self-delusion was once found very tempting in MT circles, but has given way before the acknowledgment of MT's limitations. Users no longer necessarily expect human translation quality, and rigging has rather gone out of style.

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