

COMPUTER AIDS IN TRANSLATION

The presentation is based on the results of an international meeting for establishing the state of the art and for making recommendations for continued research and development in the field. The meeting was arranged by Kval on behalf of the AILA Commission for Computational Linguistics in conjunction with the Committee for Linguistics in Documentation within the International Federation for Documentation (FID/LD). See statement on pp 99-101. The conclusions below, though in tune with that statement, have been formulated by the author, who therefore alone carries the responsibility for them.

0. Theory and applications

The title of this presentation was chosen with care. Nonetheless many of those who read it casually will most certainly mistake it for one of the following two topics:

Machine translation
Computer-aided translation

These are well-known topics which, each in its way, evokes a set of standard expectations and prejudiced protests. Though we are concerned with both, our perspective is another one, and the difference is essential. It has to do with the roles of applications and research in applied linguistics, roles too often not properly distinguished even within AILA. We would therefore want to emphasize what Bertil Malmberg in his opening speech (p. 7) said about the interaction between theory and application. Solid theory is likely to have practical applications and serious practical investigations are likely to have theoretical implications. But an amorphous mixture of the two is likely to be both impractical and theoretically uninteresting if not confusing.

In the field of translation, now, we may do one of three things:

a We can take the need to produce translations as a starting point and investigate what tools we can supply - now or later - from linguistic research and, inversely, what implications the failures to solve the practical

problems have on our theory.

b We can depart from existing tools - models, procedures, experimental computer programs - and see what useful tasks outside the laboratories they might be exploited for.

c We can use translation as a pretext for theoretical experiments.

All three approaches are respectable scientific activities; the first two belong to applied science. What is unscientific is the mixed approach: to take a given procedure and try to adopt it to a given task. When starting-point as well as target for the race are predetermined, we have left research and turned to development, in which our efforts should be judged according to uncompromising commercial standards and these only.

Our perspective now is the first one of these three. We therefore want to survey how computers can aid translation in one way or another. We are careful, then, not to anticipate in our very question whether a fully automatic procedure is the target or a procedure where the machine has a subordinate position as an assistant to a human who still deserves the title of translator. Those choices should be the outcome, not the presuppositions, of our examination.

We could have chosen another approach. One could, e.g., meet the challenge to produce a translation untouched by human hand. Since translating seems basically so simple and repetitive - particularly to people who are not themselves competent to perform it - it is an intriguing question why it has withstood a quarter of a century of attempts, not always underfinanced, at mechanization. It is a seemingly well-defined intellectual task and a proper field for testing artificial intelligence hypotheses on a language material. The fact that machine translation fails - as we shall soon see that it does, except under very special conditions - is then no reason to discontinue research. On the contrary, it is very rewarding to try to understand why and how, just as physicists talk with fervour about their perpetuum mobile machines - not in spite of, but because of, the fact that these fail. Thus, if translation did not exist - if nobody ever wanted a translation printed out for its own sake - it would have to be invented for the benefit of machine translation. Sillier experiments have been made! Whatever can be said about pure machine translation as a means to produce translations, I am willing to defend it as a branch of pure theory.

Let us now proceed to summarize the needs and then investigate how these are matched by the computational support offered today. After that, we can discuss what further support could be given today or promised by us as linguists for the future. Those promises will then be the basis for a research programme. Finally, we shall reverse the perspective and glance at the possible implications for the development of linguistic theory.

1. Needs of Translation Aids

a. Cost

The cost of qualified professional translation is enormous and the amounts to be translated large, even if we disregard, as we want to do in this connection, all literary translation and all personal communication. The costs are higher and the volumes are larger than laymen - most professional linguists included - would surmise. If only a small portion of these costs could be saved, the gain would be many times greater than the resources spent on linguistics today.

The prices vary, of course, from place to place, but the magnitude compared to the general cost level in a country are the same. In Sweden, the free-lance translator's default fee, applicable when special arrangements have not been made, is equivalent to about 50 US dollars per page; the total cost if subsequent verification and revision is included may often be much higher. In-house translations, whenever the real cost can at all be estimated, normally cost much more. Another measure of the resources necessary for translation today is the time spent over a page. Typically, an average output of 4-8 pages per manday is mentioned as a target; that is probably over-optimistic.

The volumes are large and increasing. The central administration of the European Common Market alone handles more than half a million of pages, many of which are translated into several languages.

On the other hand, low quality translations are cheaper and in smaller demand than laymen expect. The price amplitudes dependent on quality may represent a factor of five. Amateurish, unspecialized translators find it hard to get assignments and make a poor living from their work even when they are busy.

b. Capacity

If we look towards the future, there is a capacity problem as well as a cost problem. There will simply not be translators available for manual translation on the scale required by the internationalization which is now expected or desired. In cost terms: the price may increase towards infinity when we want to increase the volume beyond some not very remote limit. We can compare with the situation for telephone operators. For a city like Stockholm, it has been calculated, today's telephone traffic load, if handled by manual switchboard operators, would require more operators than the total population of the city. Similarly, some of the political dreams today would imply that in the next generation everybody spent his days translating other persons' speeches - unless technology rationalizes this task.

It should be noted, however, that while there is a shortage of qualified translators, there is an over-supply at present of unskilled translators. Every translation agency has the unpleasant task of dismissing willing, well educated and nice but unprofessional people who claim to be bilingual and/or have passed examinations from interpreter and translation schools.

c. Speed

Another reason for mechanization is the need for greater speed. No manner of organizing manual translation can reduce the delivery time to the levels required for, say, on-line communication with multi-lingual databases available over a computer network.

d. Quality

Translation, it might seem, is a dull task to mechanize since it is one which - unlike, e.g., large scale document retrieval - succeeds today, although one might want it cheaper, faster and in larger volumes. The computer could, in this trade, at best achieve what trained people already do well. However, the view of today's standard as an optimum is not shared by people with some practical experience in the field. The translations produced today - often under time pressure, late at night to be ready for a meeting the next morning, where the translator's guesses are rapidly transformed into binding precedence cases - abound in minor or greater inadequacies in style, terminology, grammar and spelling. And even the best translations do contain errors, some of which may lead to misunderstandings but all of which delay the reader. And as the staff has to be rapidly expanded, with little time for training, the quality problem becomes crucial. While human translation is often held against machine translation as an unattainable target, it is not true that human performance is good enough for all purposes. Beside the need for translating large volumes cheaper and faster, we also need aids to make better texts - possibly at higher costs - than we are capable of producing today.

2. Computational Aids Offered Today

What, then, has been offered?

2.1 Automatic Translation

All over the world, the first attempts at computerization of translation work have aimed at a procedure where the nucleus is a phase of completely

automatic translation, possibly preceded and/or followed by manual pre-editing and post-editing, respectively. Let us call this pure approach automatic translation.

a. Experiment or production?

Now, how far have these attempts advanced by now? Looking round internationally, as we did at the international seminar arranged by our AILA Commission, we must notice that today's technology applies successfully only where there are large amounts of extremely homogeneous text material so that the system can be tuned to suit the input. And homogeneity means not only a reduced vocabulary and 'simple' grammar - whatever that is. Complex sentence structure and a large dictionary are no real problems: computers are good at handling complicated rules, if strict, and in remembering long lists, if used in a predetermined way. But homogeneity must extend also to semantics - new perspectives, new interpretations, new secondary meanings lead the program astray, even in simple cases, in a manner which would baffle even the most disillusioned school teacher.

b. Stereotype texts

An example of an application which is actually running is the Canadian Taum project for translating weather bulletins. Here, the text is truly repetitive and the semantic field restricted. Also, the amounts of text - to be translated night and day - are considerable. But the bulletins are texts, not formulae or merely sets of standard phrases. They are, in other words, very uniform without being completely standardized into a code language.

The computerized translation system adapted - in fact designed - for this particular task does quite well. However, though it is an automatic translator in the sense that it performs on its own without interaction with a human, it shares the job with a human stand-by translator in that it turns over to him the sentences it finds hard to handle. It has been reported that the system's self-criticism is very adequate: in the sentences it undertakes to translate, very few errors are committed; the rest of the sentences the machine does not even try to touch. Its judgement in that respect, then, is better than that of many ambitious humans.

The number of sentences rejected as being beyond the system's capacity is not negligible. It is about one in every seven. Interestingly, this average varies significantly with the weather. When the weather is what it is supposed to be in Canada, the automatized portion is greater, but when there are thunderstorms or other unexpected phenomena, with warnings to the public, the computer must ask for assistance more often. This little statistical observation may perhaps help us remember how intimately translation is

connected to other aspects of the texts than mere word combinatorics.

So even on this very specialized material, mechanical translation is not a trivial task. That is the present borderline between success and failure - or between actual and only pretended practical performance.

Now, this example is not only one example out of many. It is *the* example which is quoted again and again as the illustration that pure machine translation runs now in practice. Other examples of actual practice have been quoted but the majority of them are alleged applications where it is not possible to verify that the 'use' of the systems is of a production character and not only demonstration or experiment; where such verification has been possible, the claims have, more often than not, been shown to be unfounded.

However, we know of a few other unpublished applications where today's technology performs well on deliberately homogenized text material. Thus, good results seem to have been obtained where a large organization can control the writing of the documents, obliging the technical writers to follow a very specific and detailed standard on all levels, from contents structure and terminology down to grammatical patterns. Such subsets of English, rather than pre-edited texts, seem to lend themselves to mechanical treatment.

These cases are atypical. Almost all texts to be translated - even the most barren economical or political report, seemingly void of innovations in style or content - are by far too varied to suit today's tools.

In short, machine translation without further improvement could be very profitable for very large recurrent text volumes of sufficient homogeneity. The person who finds - or creates - an appropriate domain could clearly make a fortune by setting up an ad hoc translation service. However, the same is true without automation. The large recurrent tasks of essentially the 'same kind' have been the dream of translation agents as long as agencies have existed. These would make it possible to set up an efficient high-throughput shop with very cheap but thankful and trustworthy labour, working along very specific instructions. Once the model translations, style sheets and term lists have been drawn up, the actual formulation of the texts could be entrusted to cheap routine staff. Unfortunately, though many texts appear monotonous enough to a reader or a human translator, most sources vary with time too much for this kind of operation. Therefore, industrial scale translation agencies are non-existent even in the biggest cities. The chances for *creating* suitable material for stream-lined translation seem to be greater than finding them, but a scheme involving controlling the original writer requires large organizational resources. Such schemes are profitable in themselves but, clearly, here machine translation may enhance profitability.

c. Machine output as raw material

Now, if the machine input is not good enough per se it is argued that manual pre- and postediting can make up for machine shortcomings. However, as was pointed out in the first publications in the mid-fifties - the discussion is distressingly similar now - pre-editing requires, fundamentally at least, as sophisticated an editor as translating; and the machine output is *not* a good raw text for editing. In fact, it is even worse seen as raw material than as final output. The amount of editing - counted in characters replaced or hours spent - is not small even if the text is only slightly off the point. It is not a matter merely of replacing wrong terms. The whole structure is often wrong, not to speak of rhythm and style.

d. SOT

One might argue that it does not matter so much if the translation is imperfect. The reader can follow the presentation in spite of a lack of style and elegance. Critics representing the translator's trade or academic linguists are always accused of thinking of aesthetic values, neglecting the hard economic pressure under which text production in, say, a large administration lives, computers or no computers. This is wrong. I am myself, like the majority of my colleagues, a reassuringly prosaic person. And the kinds of linguists who have investigated the matter in some depth are exactly such as are interested in language as a communication tool, examining its 'technical' features in an informative process. The criticism, which is more or less unanimous from all who have a professional insight into text evaluation, is not that the texts sound awkward but that they are inefficient because the style makes reading very cumbersome, often bars understanding altogether and occasionally suggests a wrong meaning.

To investigate intelligibility, an investigation was made at KVAL by a seminar, led by Max Gorosch and consisting of professional translators with very vast practical experience and an interest in scientific analysis. Unedited machine output from the English-French machine translation system installed at the European Common Market administration in Brussels was analyzed. It was first noted that the amount of editing necessary to turn this into proper French was considerable. Not only had minor corrections to be made, as is customary in revision work, but quite often whole sentences had to be entirely rewritten.

To see to what extent these amendments were really necessary for comprehension, texts were given to some participants to read without access to the original. Since the texts look rather similar to French on casual reading - if you disregard some conspicuous barbarisms - it was surprising to find that these trained readers failed. On every page there were several passages

where they could not reconstruct the meaning. These passages were later analyzed sentence by sentence, and the conclusion was that they were not difficult but impossible to understand. Native knowledge of French, good proficiency in English, years of training in the detective task of setting right what sloppy writers have confused, linguistic analysis and unlimited amounts of time were not enough to decode the text. The distortion produced by computer processing proved to be irreversible.

The last defense line is, then, that the texts are not really intended for reading in the common sense of the word but, as the phrase goes, to provide the user with 'current awareness'. In other words, since machine translation as implemented today cannot cater for the translation needs as known today, it launches a new product, let us call it 'skim-only-translation', SOT. There is nothing wrong in trying to create a market for a product when we happen to have one (which does not suit the market it was intended for). Is there a market for SOTs - raw translation delivered cheap and fast?

Considering that these texts can only serve the need for a general overview of what is written about, they are not cheap and simple enough. They are too sophisticated, since the rendering of grammatical constructions (which we are not, as readers, prepared to trust anyhow) is not needed. It is overkill to translate *who* and *and* and *it* if just a content skeleton is what we hope to get. A mere translation of all words, except for a few grammatical words, without any attempt at grammar, gives the expert in the field a good way of following the development of the argument.¹ Just as, say, a politician or economist may successfully pretend he can read foreign books in his field if only he masters a small set of key terms, he will be able to do the same without learning even those terms if we give him a word-for-word translation of all non-non-key-words of the text.² Further, if a contents survey is what we really want, we can most often get it cheaper and better by asking a person who reads the language of the document and who is familiar with the client's purpose to summarize the relevant points in a few words.

By and large, then, automatic translation, has failed as a practical undertaking. The output of the best systems so far available is a very poor text - when it can be called a text. Linguistically much more adequate and com-

¹ It is in fact a *better* way than faulty translation, since the procedure is completely transparent. Machine translation, by trying to be intelligent, introduces what the reader sees as inconsistencies. He can *not* rely on the machine to render each word the same way each time!

² The term is current in information retrieval, where sometimes all words are used as keywords in an automatic procedure unless they are contained in a particular list of non-keywords, also called the 'stop list'.

putationally better designs exist in prototype version - I am thinking particularly of the Geta system constructed at the University of Grenoble. But we know now, from experience as well as from theoretical considerations, what some wise people said 25 years ago, that the fundamental problems are so complex that there is no hope that the machine output will be anything but very inadequate for a long time yet to come except for very stereotype texts. It is not only that the present performance is poor; it will necessarily remain so the foreseeable future. The development to be expected in the next few years is that the requirement on stereotypicity can be slackened and, more important, the cost to implement a tailored system for a given genre reduced.

What can be offered, then, is mass production of poor text. But that is exactly the kind of product for which we have already an over-capacity! The problem is high-quality, not crude translations. The best machine translations are still far below the quality of the mediocre translators. And the cost, even if computer time and program costs are set to nil in the calculation, is competitive only if machine-readable input is available: mere data entry - which costs about what ordinary typing costs - is more expensive than the fee to a non-specialist translator for translating, and proof-reading.

2.2 Support for translators

Whereas enormous resources have been spent on replacing the translator, very little has been done to help him by giving him tools to promote his productivity and reliability, not to mention convenience and pleasure. Many translators of top professional capacity still waste time over inserting corrections in carbon copies. Computer support for the not very heroic tasks of simple text editing are rarely placed at the active translator's disposal. One might reflect over the reasons for this non-use of existing technology. The research centers have been ignorant of or uninterested in such trivial but useful matters; the translators themselves are often free-lancers or otherwise operating in organizations with small resources for capital investments; the large translation organizations are often governmental and have a built-in conservatism.

However, some very promising developments on the immediate practical level have been made in the last few years.

More sophisticated tools at the disposal of some translators today are term banks and some other data banks for reference data. The value of such services would be greatly increased if text editing and communication functions were properly installed. There is today a gap between the ambi-

tions of terminology centers and the commonplace of the translator's daily life. Few people have found it worth their while to study how the translator can in practice integrate these external services. If the term bank information or computerized dictionary is not at his finger top command, they will be used rarely. Even if the translator need not leave his office to go to an enquiry desk but has his own electronical work station, the interrupt costs too much. He cannot afford to log out from his text editor, log in with some term data bank, make his enquiries, note down the results on a paper slip, log out from the data bank, log in again in his editor, retrieve the file and the place he got stuck at, insert the information he jotted down on the paper slip. That kind of slow-motion computerization is not competitive with what he does today, viz., lift the telephone receiver and call a friend - or just skip the problem and make an intelligent guess.

3. Mechanizable subtasks

What are the essential functions of a translator and where can he be helped?

a. Typing and correcting

An important and dull part of a translator's job is of course to type and retype the output. Ambitious craftsmen would perhaps stress the retyping - only those who are very sloppy stylists believe that their first version is good enough without any amendments. Automatic functions can take over much of the (re)typing.

b. Reading

Further, while his task is ultimately to write, you are likely to find a translator reading if you surprise him at work. Or looking for a passage to read.

And he does not primarily read dictionaries or term lists as many terminologists believe. In his special field he consults them occasionally but almost never while actually translating. A well-known translator phrased his attitude towards printed dictionaries thus: 'Dictionaries? I don't read them, I write them.'

Important sub-tasks for a translator are to extract information from

- i* dictionaries
- ii* term banks
- iii* background literature
- iv* the client
- v* colleagues and friends
- vi* the source text document and the not-yet-ready translation.

It might surprise some people that the last item is, quantitatively, the most important one. The translator keeps turning pages back and forth, to compare and verify. And it takes time to retrieve, even among as little as a dozen pages one has written oneself - or one's colleague wrote last night - the passage where the same expression appeared. New techniques for information retrieval can operate within a general computer-based editing system.

c. Verification

A heavy part of the job is what is often disdainfully called proofreading, which includes checking correctness and consistency on many levels, from spelling upwards. No tools are offered for this task today, but intelligent text processing procedures could help.

To summarize the support functions which are desirable and reasonable to promise:

- powerful text editing techniques
- intelligent information retrieval
- some level of the computer's text comprehension to make the system capable of detecting at least some errors - or at least to warn when inconsistencies are introduced which with high probability are unintentional.

These capabilities, clearly, are necessary for many other intellectual tasks as well. Translation is not that special!

d. Editing functions for translators

One may add some special functions. Thus, though the machine will not be let loose to translate long passages for subsequent rewriting, an attractive function in a future complete package would be 'Suggest translation of phrase xxx'.

In its simplest version that function would merely echo recent renderings made by the user. A more sophisticated model will include everything we today have in translation programs. Automatic translation, then, as a *practical* facility, should be seen as one macro of an editor!

4. Directions for research

To be able to supply translators with better tools, where should the impetus of research be directed?

a. Translation theory

The study of what translation really is and how the human proceeds is fundamental; there remains much to be done, and the results which have been obtained in studies unconnected with computerization are often not exploited. Here, as so often in other areas, research is delayed by mutual ignorance between different professional groups.

b. Man-machine interaction

Text-editing facilities must be elaborated with better technology. This is primarily a technological problem - with, say, split-screen terminals, better visual presentation, integration between different computer programs - but there are also linguistic aspects of how man and machine could enter into an efficient dialogue.

c. Communication and networking

The use of the computer as a means of communicating with other persons, information banks and institutes again requires study both of technical integration and linguistic capabilities. The concept of computer conferencing and electronic mail - intensely studied today in computer science - should be followed by the applied linguists (and their more theoretical colleagues; we are here involved with new manners of using language in writing).

d. Retrieval

Merely to recognize previous instances of a phrase requires non trivial programs. Did we have 'take into consideration' before and how did I translate that? - We must find at least cases like 'He did not take this into immediate consideration', perhaps also the passage 'not considering the costs', neither of which match letter by letter.

Here, as elsewhere, more powerful retrieval capacities require powerful linguistic analysis - of essentially the same complexity as that of a machine translation system.

e. Linguistics

Linguistic analysis and synthesis, on all levels, clearly depends on deeper insights into structures and processes.

f. Text comprehension

One might wonder how a computer, which is not trusted to make simple translations on its own, could help correct and guide the human translator. However, simple checks can be made with present-day technology - warn-

ings against what seems like spelling errors and some other inconsistencies - and some more sophisticated warnings have been elaborated (i.a., in a KVAL project, Term-Tuning, carried out together with the Ministry of Justice in Helsinki, for the evaluation of bilingual law texts). We here soon approach high-level artificial intelligence.

The recommendations for research planning, therefore, are

- a to exploit immediately the simple tools we know will function as an integrated Translator's assistant' (as Martin Kay has called it in a paper where he elaborates this point; cf the Reference *infra*), capable of being successively extended to host the more sophisticated procedures.
- b to invest now in serious long-range research projects in these areas.

Machine translation is a good exercise for the basic studies underlying a, e and f, possibly also b and d. Meagre funding of machine translation is therefore unjustifiable.

With this 'failsoft' approach, complex computer procedures can be inserted into an open-ended system without ever harming immediate operation. The human editor-translator retains his decision-making position.

5. Impact on theory

The indicated approach begins in a rather anti-intellectual way by suggesting the use of known but not well exploited techniques. In the subsequent steps, the translation system - or shall we say 'general interactive bilingual editing system'? - should host a large number of elaborate procedures for very advanced linguistic processing. These will concern a number of fundamental linguistic problems, not only those which schoolboys and managers believe to be the core of translation, like grammar, dictionary lookup and spelling. We will be forced to confront problems connected with retrieval operations and long range text structure and ultimately to face the problem of making machines in some sense 'understand' the text. There is much to learn from these efforts. Many new theories will be suggested by such work and - I feel warm at heart when I think of it - many loose 'models' of Language, Man, Machine and the Universe will be shattered.

The attempts at computerization of translation has brought with them, or rather reminded us of one important insight already: no human linguistic performance, however 'mechanical' it may seem, is the application of one isolatable skill. It is no coincidence that translation turns out to need the same capabilities as does information retrieval or man-machine dialogue.

Language can be cut into slices for examination only; when it works, it works as a whole. When computers learn to do better than they do today, they will have to exploit simultaneously many kinds of knowledge - syntactic, semantic, pragmatic or how we may choose to label the categories of rules or data - mimicking in some way the broad human approach. It was a grand but entirely unpractical idea to try to translate by dictionary and lexicon alone. But it was worth trying, if only to gain this keener sense for the wholeness of human performance.

Reference

KARLGRÉN, H & D WALKER (eds.). 1969. Computer aids in translation. Practice, prospects and recommendations for research and development. A report from an international seminar arranged by KVAL under the auspices of FID/LD and AILA. In press.

Computer Aids in Translation

Introduction

An international group of experts, under the auspices of FID (International Federation for Documentation) and AILA (International Association of Applied Linguistics), is preparing a report on *Computer Aids in Translation* to assess the state of the art and to establish guidelines for research and development in the area.

The theme includes all uses of computers for translation purposes, ranging from computer-based text editing for translators and revisers, to machine translation, unaided by human intervention.

At a meeting arranged by the KVAL Institute for Information Science (Stockholm, Sweden) over the weekend of 7-10 September 1979 at the Chateau d'Hanzinelle near Brussels, nineteen experts from nine countries outlined the present situation and made forecasts and recommendations for future efforts. The results were presented at a panel discussion sponsored by the Association Belge de Documentation at the Bibliotheque Royale in Brussels on 11 September 1979. We here briefly summarize the conclusions.

What computers can do now

Provide general word-processing capabilities for editing and revising texts, such as are becoming common in newspaper publishing houses;

Provide facilities for instant access to a variety of information required by

translators: terminology banks, dictionaries, translations of similar texts, and reference materials;

Provide means for easier communication between translators, terminologists, and other experts, presently available, at best, using telephones, conversations, and postal services;

Produce rough translations, quickly and without human intervention, that can be used for current awareness programs;

Provide adequate translations in narrowly constrained fields with specialized language use (such as weather reports) with the intervention of translators for difficult sentences, thereby relieving the translators of the tedium of repetitive material.

We conclude that substantial savings can be achieved immediately in comparison with current translation practices. These savings are available using existing techniques, particularly if adequately combined. We note that they are presently being used by some organizations and are open to inspection.

Critical areas for basic research

Investigation of the actual process of translating;

Development of criteria and procedures for evaluating the quality and functional adequacy of translations:

Study of the characteristics of language used by professional groups or otherwise for special purposes that require translation.

Most promising directions for research and development

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.

A computational system of modular model can make profitable use of the advanced mechanical translation designs which exist already in prototype or are being developed.

Modern "interactive computing" differs greatly from conventional computer processing. It makes possible "failsoft" systems in areas previously beyond the reach of computers. In a suitably designed fail-soft system for translators, responsibility and control of all processing remains with the translator, and the machine simply increases his productivity. Such systems allow small-scale experiments and the collection of valuable, but hitherto unavailable, information on the methods and work habits of professional translators.

Conclusions

The consensus of this international group of experts is that fully automatic, high quality translation is not feasible in the foreseeable future. Fully mechanized translation will have to be restricted, as it is today, to very specialized and highly stereotype kinds of text or to applications where quality requirements are exceptionally low.

However, there are highly promising prospects for successful combinations of human and machine. Thus, while there are several areas for immediate application of techniques that are well known but little used today, support for long term and high risk experimentation and for fundamental research must be intensified if there is to be future improvement.