WASHINGTON COMMENTARY

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The Nebulous Future of Machine Translation

A report by the National Academy of Sciences that examines machine translation against the light of human translation has disturbed a good many research administrators in the government. So much bad publicity has been engendered by this report that the future of machine translation is uncertain, even though the technology is a scant twelve years old.

The report, titled "Language and Machines," recommends that the government withdraw its support of machine translation in favor of more theoretical areas, such as computational linguistics. "Languages and Machines" was written after a two-year study by the Automatic Language Processing Advisory Committee,* or Alpac, as it has become known. Much bitter debate followed its public release in November, 1966.

On January 24, two months after the report was released, a group of research administrators met in Washington to compare notes on the effects of the Alpac report. During the meeting, they formed arguments against two of Alpac's major conclusions:

(1) Alpac said the supply of translators in the U.S. far exceeds the demand for translation, and it is harmful to spend large sums of money on the mechanization of a small, economically depressed industry.

The administrators claim there is no such translator surplus. If anything, there is a shortage of skilled translators capable of working with technical material. The administrators cite a case where the Air Force tried to fill two vacancies for translators in one division. Despite nationwide advertising, they said, the vacancies could not be filled, and the division eventually lost the two positions under Civil Service regulations.

(2) There has been no acceptable machine translation of general scientific text without postediting, Alpac said, and no immediate prospects for any exist.

The administrators argue that machine translation is going on today in five facilities around the world. At some places, such as the Atomic Energy Commission's Oak Ridge Laboratory in Tennessee, there is no postediting. Keypunchers at Oak Ridge prepare input cards directly from scientific Russian text, and an IBM 7090 translation is given to scientists in raw form. Although the grammatical quality leaves much to be desired, the scientists like the speed of the service, which is much faster than human translations. The computer at Oak Ridge translates about 200,000 words a year as a sideline to its regular production with an increase in this rate expected in the future.

Why should two intelligent groups of men, all seated in chairs of responsibility, come to such divergent views on the same subject? The main reason seems to be that they are examining different information to form their conclusions. The government research administrators are looking at their projects as they exist today. The Alpac group looked at data that was probably two years old. And that is the basic weakness of the Alpac report.

Example: Machine translation has been going on since February, 1964 at the Air Force's Foreign Technology Division, Wright-Patterson Air Force Base, Ohio. These operations were the subject of two studies, one by Arthur D. Little, Inc., at the request of the Air Force, the other by six science editors and an owner of a commercial translation agency, at the request of Alpac. Translations from FTD were compared with translations from the Joint Publications Research Service, a Department of Commerce group that translates for the entire government.

On the basis of these studies, Alpac concluded that the postedited machine translations of FTD were "slow, expensive, of poor graphic arts quality, and not very good translations." However, the most recent FTD material cited in the Alpac report is dated November 6, 1964. Since the Alpac report was not completed until July 1966 and not pub-

lished until November 1966, it is hard to see how any validity can be attached to these comparative studies. They have aged too much.

The government administrators even claim that more recent information was available to the Alpac members but, for some reason, they chose to ignore it. They also claim that the FTD operation, which uses the IBM Mark II translator, has been continually improved since 1964.

As to the supply of human translators, the Alpac group in part of its study used statistics from the Washington office of the US Employment Service, which showed 523 people in the Washington area seeking part-time or full-time work as translators in 1964.

But this information was not properly interpreted. USES did have 523 "translators" on its rolls then, but some were free lance translators who would not be able to fill full-time openings or many part-time openings; others were immigrants who were in this country on visitors' visas; and others were bi-lingual people who had never been tested for their ability to translate technical documents.

USES had gone out and beat the bushes to find translators that year. Since then it has not had the staff to search out these people, and its "translator" rolls have shrunk to a couple of dozen.

"With opposition from within the government itself, will the Alpac report really change anything? Yes indeed; in fact, it already has. The National Science Foundation, one of three major supporters of natural language processing, has dropped all direct support of machine translation by its Office of Science Information Service. It has advised its grantees that support of computational linguistics research will now be administered by its Division of Social Sciences, which has supported linguistics research for several years, including some work in computational linguistics. The Office of Science Information Service is now charged with improving present translation practices, "including the use of machine aids wherever this proves to be practicable."

In the last eight months, Dr. Murray Aborn, of the Social Sciences Division,

has discussed all current NSF-supported projects with their directors. Some projects will run through the current year, but others have already been renewed, such as the Linguistic Transformations Project at the University of Pennsylvania, Philadelphia. NSF is supporting that work for another two years.

In addition, Dr. Aborn suspects that NSF will receive entirely new proposals for computational linguistics support because of the publicity connected with the internal shift at NSF. Some researchers are finding out for the first time that NSF funds are available for this type of work."

Thus, the effect of this report at NSF is a mixed bag. Machine translation has suffered, but computational linguistics has received a boost.

In other parts of the government it is hard to find such a clear-cut effect. The Central Intelligence Agency, the second supporter of natural language processing, operates under a mantle of secrecy, and its thoughts on this subject cannot be recorded. However, the word around Washington is that CIA goes along with the Alpac recommendations. But no one outside of CIA knows for sure.

Within the Department of Defense, the third supporter, there exists a much different atmosphere. Here is where publicity has had a detrimental effect. Articles in trade magazines based on the Alpac report have created what one spokesman called "a climate of opinion" that has burdened those Defense officials trying to justify machine translation to their superiors.

"The Air Force is the chief supporter of machine translation research. In roughly ten years, it contributed almost half of the $20 million worth of government support of machine translation and computational linguistics. Today, Air Force work is going on at Bunker-Ramo, IBM, the University of Texas, the Rand Corporation, and Informatics."

Air Force funding flows through the Machine-Aided Translation Project at the Rome Air Development Center, Griffiss Air Force Base, N.Y. Mr. Z. L. Panwokicz, director of the project, said their ultimate goal continues to be machine translation of natural languages, with emphasis on Russian, Chinese, and German, in that order. Today, however, work is "strictly software," consisting of research in computational linguistics and programming.

As of this writing, the Air Force program has not been changed to any degree by the Alpac report, but the "image" of the program has been damaged. Since it accounts for so much of the government support, any change by the Air Force in the future will have impact. But as Mr.

Pankowicz philosophically noted, "This is my ninth year in this field, and I don't remember a year without some controversy."

Both the Navy and the Army have small programs in this area. Army people say the Alpac report has had little effect on them, but the Navy is taking a hard look at all its research programs to see where it can cut back. It is under congressional pressure to conduct less research, and automatic language processing could very well receive the ax in fiscal 1968. But a decision has not yet been made and Alpac may not make any difference when it is made.

"Not surprisingly, Europeans have been quite interested in the Alpac report. A US government official, just returned from West Germany, said there were even press releases distributed in Germany, France, and Italy that reflected the Alpac recommendations. He said they caused a one-month delay in at least one contract award, but after examination by five or six research centers, the releases were dismissed at "not objective." It is not clear who was responsible for distribution of the publicity."

In industry an entirely different picture presents itself. In the early days—ten years ago—optimism for machine translation ran at a high pitch. Advertising, which eventually damaged the cause, glowed with promises of quick, clean translations. Marketing plans were laid for such ventures as automatic translating service centers, and one was opened by Itek Corporation in New York City. But it closed in a few months. Gradually, industry's enthusiasm for machine translation dwindled until it was either abandoned or submerged in other linguistic research.

IBM was one of the most enthusiastic supporters of machine translation ten years ago, and it had a considerable effort under way. With funds of its own and funds of the government, it built four translation machines based on photostorage and special-purpose, lexical processors: the Mark I, Mark II, the Research Language Processor, which was used at the 1964-65 World's Fair, and Alps, the Automatic Language Processing System. Two of these machines, Alps and Mark II, are still operating in the government.

Today, IBM still hopes for natural language processing by computer, but it recognizes that it is a distant, difficult goal to reach. IBM's orientation has shifted from production and operation of translating machines to research in transformational grammar and computational linguistics. Its research staff is much

smaller and more academic than the staff that developed the four machines, and this staff is studying more applications of language processing than just machine translation. Information retrieval, special programming languages, and the teaching of languages to children are three it mentioned.

Lest computational linguistics suffer by association with machine translation, the Alpac committee inserted a separate cover letter in the front of its report suggesting an annual expenditure of $2.5 to $3 million as "reasonable" support for computational linguistics research, mainly through the auspices of the National Science Foundation.

Alpac warned that large scale work is needed, "since small scale experiments and work with miniature models of language have proved seriously deceptive in the past, and one can come to grips with real problems only above a certain scale" of grammar size, dictionary size, and available literature. It further suggested splitting the annual funds among four or five centers. Thus, one center would have at least $600,000 a year to play with. This is a tidy sum; half again as large as any machine translation project. Ironically, there is a shortage of computational linguists and it is doubtful that enough could be found to adequately staff four or five large centers.

What does the future hold for machine translation? Even though he is highly critical of the Alpac report, Dr. R. Ross Macdonald, director of the Georgetown University Machine Translation Research Project, is optimistic. In fact, he believes freely usable machine translation could be available in four or five years if a group as far along as his were to receive $150,000 worth of support each year, one-fourth the amount Alpac recommended for computational linguistics. (Georgetown was one of the first groups in this work.)

"The advantages of machine translation will probably accrue," Dr. Macdonald said. "The whole process may be streamlined and made cheaper in the course of technological developments in the next few years. Our present system is programmed for the 7090. This means serial access to the dictionary, which is a somewhat slow process. In order to save time, we sort the text into alphabetic order, look up all the material, then re-sort it back into text order before beginning the translation.

"The third generation of computers is likely to provide dictionary access and dictionary storage not available earlier. With the new dictionaries, we expect to be able to put in whole groups of words

Machine Translation—continued

as items in the dictionary, instead of confining ourselves to individual words."

After talks with Dr. Macdonald and a dozen other people concerned with natural language processing, it seems premature to abandon support of machine translation after only twelve brief years, especially if the abandonment if based only on the findings of the Alpac committee. Even the critics of machine translation admit its contributions to the knowledge of linguistics. Who can say what contributions lie ahead?

As Dr. W. P. Lehmann, director of the Linguistics Research Center at the University of Texas, put it: "If Dr. Michael E. DeBakey devises a heart pump and it is not immediately successful in its application, the biological community does not raise a great hue-and-cry and return to theoretical research, shelving the heart pump. It continues experimentation."