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## **It's all done by machine Words go in in Russian, English sentence comes out**

by Earl Ubell

A huge electronic "brain" with a 250-word vocabulary translated mouth-filling Russian sentences yesterday into simple English in less than ten seconds.

As lights flashed and motors whirred inside the "brain" the instrument's automatic type-writer swiftly translated statements on politics, law, science and military affairs. Once the Russian words were fed to the machine no human mind intervened.

In demonstrating this feat for the first time scientists of the International Business Machine Corp. and Georgetown University, which collaborated in the project, said they hoped that within a few years such machines would be freely translating all languages.

At the demonstration in I.B.M. offices at 590 Madison Ave., Peter Sheridan, an I.B.M. mathematician, fed into the machine, filling a room as big as a tennis court, a series of cards carrying the Russian sentence:

"Myezhdunarodnoye ponyimaniye yavlyatetsya vazhim faktorom vryesnyenyiyi polytyichyeskiy voprosov."

The machine blinked its lights, was quiet for a moment as if thinking and within nine seconds the automatic typewriter clacked and out came:

"International understanding constitutes an important factor in decision of political questions."

Even though the machine can translate such complex sentences, it is limited by its vocabulary, and by its "knowledge" of grammar, according to Dr. Leon Dostert, Georgetown language scholar, who originated the project. Another drawback to the machine's operation is that before the machine can work on the Russian sentences they have to be encoded on punched cards similar to those on which government checks are printed and which the Internal Revenue Bureau uses for taxpayer's names and addresses. This slows up translation.

Dr. Dostert said that it will not be too long – possibly three to five years – when automatic text-reading machines will feed in Russian sentences automatically into the machines without punched-card intervention.

Then, Dr. Dostert said, complete libraries of Western technical works could be made available to non-industrial backward nations to give them the "Know-how" of western technology. "At present," he added, "we are at the 'Kitty Hawk' state."

Dr. Dostert also foresaw the day when simpler and cheaper machines than the \$500,000 I.B.M. super-calculator – the 701 – could be used. He said the 701 is "overdesigned" for the language translation problem and has many functions not necessary in this project but which were built in to solve problems in astronomy and physics.

### **How does the machine work?**

I.B.M. engineers gave assurances that there was no pint-sized bilingual Russian inside the instrument pulling the right levers.

The success was the result of a collaboration among engineers, mathematical logicians and linguists. It was Dr. Paul Garvin, Indiana University graduate, who with Dr. Dostert, analyzed the Russian and English languages. And it was Mr. Sheridan, a City College graduate, who worked six months setting up the machine.

### **Formulated Rules**

What Dr.Garvin did was to formulate rules that govern the translation of particular Russian words into English when those words appear in a particular context. Mr.Sheridan set up the machine to receive the rules in electrical form.

For example:

The word root “ugl” in Russian means either “angle” or “coal” depending upon its suffix. This root is stored in the form of electrical impulses on a magnetic drum together with its English meanings and the Garvin rules of syntax and context which determine its meaning.

The code is so set up so that when the machine gets electrical impulses via the punched cards that read “ugla” it translates it as “angle”, when “uglya” the translation is “coal”. Electrical code impulses activate the typewriter keys.

So far Dr.Garvin has formulated some six rules to govern the 250 words and their various English meanings. Dr.Dostert estimates that 100 rules would be needed to govern 20,000 words for free translation.

Eventually, the machine will be able to translate from Russian:

“She taxied her plane on the apron and then went home to do housework.”

In such a sentence with double-meaning words, the machine will be able to tell what meaning of apron and taxi would be needed in that particular context.

To do all this the machine performs about 60,000 operations a sentence. During the demonstration yesterday it had two “nervous breakdowns”. Random errors crept in which automatically shut the 701 down. “She” didn't cry.

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punched card illustration [top of page 5]

Electronic “brain” translates languages – This card holds in its punched-out holes the Russian sentence “Obrahotka provishayet kachyestvo nyfti.” The holes activated electrical signals of the International Business Machine's type 701 electronic data processing machine which translated the sentence into typed English: “Processing improves the quality of crude oil” at the company’s New York offices yesterday.