58. *On Proof Retrieval: Problem-Solving Machines. I*

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1. Introduction. Various kinds of methods have been considered on a problem solving machine which can understand the sentences written in a natural language and solve the problems in mathematics described in sentences. Here are described one method to execute computer programs that retrieve the proof of each theorem in plane geometry, for example, which is done by transforming a sentence written in natural language into a unique code formula.

In order that we develop a computer into a general problem solving machine, it is required for the computer to recognize any given ploblem exactly and to make use of the knowledge obtained already for solving the problem. For this purpose, it is fundamental to retrieve the proof from the memory, encoding any given problem in plane geometry by a unique code expression of the problem, and using it as an index.

The code system of plane geometry, PG0, consists of terms such as 3000 (triangle), 3053 (exterior angle), etc., and predicate such as R(A, B, $\cdots$, C), where R is a predicate letter and A, B, and C are terms. The formula R(A, B, $\cdots$, C) is called atomic formula. These codes must be one to one correspondence with the semantic meaning of human language. In fact both of 'isosceles triangle' and 'triangle having two equal sides' have the same code '3100'. This encoding technique is possible using SEE ALSO technique.

The transformation procedure from a sentence into its code expression is as follows:

1. Smoothing routine, which supplements all omissions in given sentences.
2. Classification of each word into parts of speech, which are conjunction, verb, article and numeral, adjective, noun, preposition, and relative pronoun.
3. Coding routine, which finds the association of words and puts the code using the thesaurus in the memory.
4. Formation of predicate from codes according to formation grammar.
5. Boolean combination of atomic formulas.
6. Normalizing routine, which arranges the codes into lexi-

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