

**68. Transformation of PGO into a Calculable
Expression: Problem-Solving
Machines. III**

By Motokiti KONDÔ^{*)} and Haruo MURATA^{**)}

(Comm. by Zyoiti SUTUNA, M.J.A., April 12, 1966)

A theorem of elementary geometry can be expressed logically in the following way [1].

By a *term* is meant concatenated five digits such as 30110, which represents intuitively an object in elementary geometry such as a vertex of a triangle. By a *predicate letter* is meant concatenated three digits such as 710, which represents a relation between terms such as equality. Let R be a predicate letter. Let A_1, A_2, \dots, A_n be terms, respectively. Then we call $R(A_1, A_2, \dots, A_n)$ an *atomic formula*, so that it shows that there is a relation R among terms A_1, A_2, \dots, A_n . By a *formula* of elementary geometry is meant an expression built up from atomic formulas by use of logical symbols: $\supset, \cup, \cap, \rightarrow$. Each term may be regarded as a code assigned to an object of plane geometry and we call this code system PGO.

A problem-solving machine for elementary geometry has a memory to store theorems of elementary geometry in the form of PGO-expression. Given a problem in a natural sentence, the problem-solving machine translates it into a PGO-expression and retrieves the memory by use of standard form [2]. If retrieval is unsuccessful, the PGO-expression will be transformed into a computer calculable expression by use of analytical geometry. The transformation procedure will be described in the following way.

The last digit of each term is a parameter to distinguish one object from others.

Let ϕ be a formula of PGO. Let $0000i$ be a code of a point occurring in ϕ , where i is a digit of parameter. Then, with $0000i$ we correlate a pair of variables (x_i, y_i) , where the parameter i of PGO acts as the suffix of the variable.

Let $1p00i$ be a code of a straight line or a segment occurring in ϕ , where p is a factor to decide whether it is a straight line or a segment in accordance with 0 or 1. Then, with $1p00i$ we correlate two distinct pairs of variables (x_{i0}, y_{i0}) and (x_{i1}, y_{i1}) .

Let $3pqri$ be a code associated with a triangle occurring in ϕ ,

^{*)} Tokyo Metropolitan University, Tokyo.

^{**)} Sophia University, Tokyo.