

DISSERTATION INFORMATION

Title : **Method for knowledge representation based on algebraic approach**
Major : Computer Science
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I. ABSTRACT

In artificial intelligence, knowledge representation and inference engine play the important role for building of intelligent systems. Knowledge representation is the research of performing the real knowledge domain on the computer. It is the method to organize the knowledge base to do some human's actions, especially the reasoning on it. Knowledge base and inference engine are the foundation of intelligent systems. The results of knowledge representation bring the impressive value to the development of computer science, and impact to the improvement the real-world intelligent software.

In this dissertation, the components of knowledge models are built, especially the components of concepts, knowledge of relations, knowledge of operators, and inference rules. These components are the structured-sets with their properties. The knowledge models represent many popular kinds of knowledge domains. They also can modelize problems of knowledge domains. Thought the model of problems, the existence of its solution is studied and proved. This is the foundation to design the algorithms for reasoning to solve problems.

II. THE MAIN CONTRIBUTIONS OF THE DISSERTATION

The main contributions of the dissertation are summarized as follows:

i/ Building the structure of the knowledge model of relations, called Rela-model. This model is a tube: **(C, R, Rules)**. In which, **C** is the set of concepts, each concept is a class of objects, each object has the structure and behavior solving the problems on itself; **R** is the set of relations between concepts; **Rules** is the set of inference rules. Models of problems are proposed: Problems on an object includes the determining of the closure of

set of attributes, the closure of set of facts, explaining the reasoning; Problems on the knowledge model includes the determining an object, a relation between objects. Rela-model is applied to represent the knowledge base and inference engine of practical intelligent systems, such as the intelligent problem solver in solid geometry.

ii/ Building the structure of the knowledge model of operators, called Ops-model. This model is a tube: **(C, Ops, Rules)**. In which, **Ops** is the set of operators between concepts: unary and binary operators. Beside the model of problems on an objects, model of general problems on Ops-model are proposed: Determine an object, compute the value of an expression, reduce an expression, transform an expression. Rela-model is applied to represent the knowledge base and inference engine of practical intelligent systems, such as the intelligent problem solvers in Vector algebra, Discrete mathematics.

iii/ Building the structure of the knowledge model of relations and operators, called Rela-Ops model. This model is a tube: **(C, R, Ops, Rules)**. In which, **Rules**-set and facts are defined and classified based on their structure in the Rela-model and Ops-model. Moreover, the relationship between components are studied clearly, especially the relations between components of relations **R**-set and operators **Ops**-set. Rela-Ops model is applied to represent the knowledge base and inference engine of practical intelligent systems, such as the intelligent problem solvers in Linear Algebra.

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