

# The characteristics of artificial intelligence model description language and its research direction

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**Abstract.** As an important branch of the development of computer science, artificial intelligence not only belongs to the basic component of computer science and technology research, but also has been widely used in computer engineering. As the basic environment for the research of artificial intelligence system, it is the focus of Chinese researchers to deeply explore the intelligent model and describe the characteristics and future development direction of language. Therefore, after understanding the development trend of artificial intelligence and intelligent language, this paper mainly studies how to use modeling elements in UML to describe infrastructure, cooperation model, information model and behavior model in business models, and describes language and algorithm generation according to intelligent models oriented to multi-objective problems, providing an effective basis for artificial intelligence language research in the new era.

**Keywords:** Artificial intelligence; Intelligent model; Description language; Multi-objective problem; Business model.

## 1. Introduce

In the mid-1950s, McCarthy proposed the concept of "artificial intelligence" at a conference attended by experts from different disciplines such as mathematics, computer science, psychology, and biology, and its development has been mainly divided into four stages: First of all, from 1956 to the early 1960s, mainly solve intellectual problems, compile chess programs, use computer technology to verify some mathematical theorems; Secondly, in the 1960s, he mainly studied machine translation, natural language understanding, automatic question answering, and used computers to realize scene analysis and obtained preliminary experimental results. Thirdly, in the 1970s, the principle of artificial intelligence was applied to other fields, and a practical expert system was established after absorbing the knowledge of experts in the field. Whether it was machine translation or robot research, breakthroughs were made, and in the 1980s, it entered the stage of knowledge-centered development. It will put forward a large number of high-quality expert systems from different fields, mainly studying knowledge representation, uncertainty reasoning, machine learning, cognitive models, etc., and put forward the basic concepts of neural network models. Artificial intelligence language is the basic content of the research in the field of artificial intelligence, and all users must use computer language to complete various operations. In theoretical research, machine language is usually called the first generation, assembly language is the second generation, and ALGOL, COBOL, FORTRAN and other languages are the third generation. From the perspective of overall development, the third generation of languages has

lasted longer, but with the full popularity of computer technology applications, the fourth generation of language products that appeared in the late 1970s were first proposed and actively promoted by J.Martin. According to the definition proposed by the researchers, according to the type of application generation, it is divided into integrated personal computer tools, query language, image language, decision support, etc.[1-3]

After years of intense debate and technical research, researchers have acquired a great deal of theoretical knowledge in the field of artificial intelligence, and believe that an expanded science of intelligence will emerge, with different modes of understanding and advantages and disadvantages. With the rise and application of large-scale artificial intelligence systems, scholars from various countries have put forward two viewpoints for and against whether large-scale pre-trained language models can understand language. This research not only has academic characteristics, but also has a profound impact on future technological development and social construction. After the machine and the new understanding model are proposed in the field of artificial intelligence, it will continue to enrich the cognitive theory and research results of human beings. Therefore, in the face of large-scale statistical models, scholars in various countries should continue to develop new scientific methods to truly reveal different forms of intelligent understanding and detailed mechanisms, and accurately identify their advantages and disadvantages. And ultimately learn how to integrate this truly diverse set of cognitive patterns. Therefore, this paper mainly studies the description language of common business models, and then introduces knowledge engineering technology into the modeling and analysis of multi-objective problems, and puts forward the corresponding intelligent model description language and algorithm generation method.[4-6]

## 2. Methods

### 2.1 Process model

According to the analysis of process engineering theory, all business processes can be studied and described from five aspects: process, infrastructure, collaboration, information and behavior, so a good business process modeling language must be described comprehensively from these aspects. When studying the business model and process dynamic evaluation system with process engineering theory as the core, some scholars proposed that visual process modeling language VPML can be developed and designed. Because infrastructure model, cooperation model, information model and behavior model will show the internal details of the system from a lower level of abstraction, there is a big gap in the details of different fields, and the current model does not have an effective and universal description language, and can only briefly describe part of the content. Therefore, scholars use object-oriented modeling methods for reference when studying these problems, because this method has unique advantages in describing the internal details of the system. Whether it is local structure or local behavior, it has formed a relatively mature description language, such as the standard modeling language UML. As the basic content of business model, process model should be effectively combined with process model when UML is applied to describe all models, as shown in Figure 1 below:

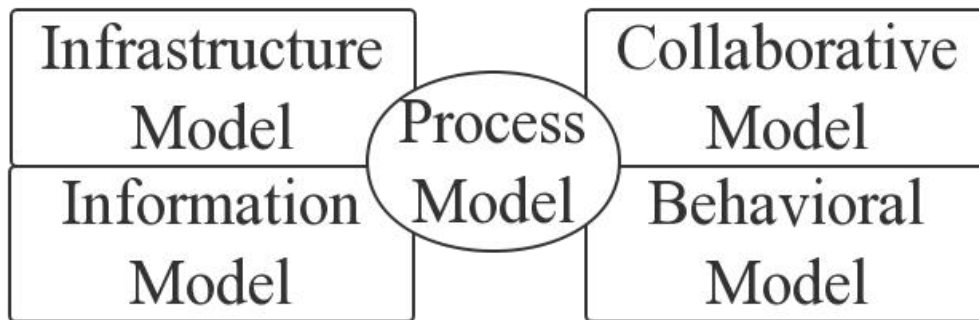


Figure 1 Description language framework based on process model

## 2.2 Infrastructure model

This model is mainly used to describe the organization of the enterprise, owning resources and the relationship between them, so as to visually present the collection of supporting resources in the business process. Therefore, the infrastructure model is also divided into two parts: on the one hand, the resource model. Since the resource model refers to the detailed description of the resource types owned by the enterprise and their interrelationships, the description language allows the modeler to customize other resource types and resource attributes. On the other hand, the organizational model. Simply put, an organizational model refers to the sum of an enterprise and its subordinate organizations, which can be described using all the resource instances that make up this part. According to the definition and analysis of the infrastructure model, it can be seen that the types of resources in the resource model correspond to the resource objects in real life and have certain attributes, behaviors and relationships, while the organization in the combination model corresponds to the enterprise and its subordinate units, which is essentially a means to divide resources. Thus, the concept of classes and packages in extended UML can be used to describe resource types and organizations.[7-9]

## 2.3 Collaborative model

This model is proposed based on the infrastructure model, which not only describes the communication and cooperation relationship within the enterprise, but also describes the cooperation relationship and communication channel between the enterprise and other enterprises. Therefore, this model design is also divided into two contents: one is the interaction model, which is mainly used to describe the interaction relationship between the internal organization and the external organization. From the perspective of practical description, the interaction model can be regarded as the mapping and extension of the process model on the organizational model. The other is the communication model, which is mainly used to describe the process of information collection and information transmission, including not only the communication relationship between the internal organization of the enterprise, but also the communication relationship between all two resource objects in the organizational model, and the communication between the enterprise or the internal organization of the enterprise and the external organization.

## 2.4 Information Model

The information model is mainly used to describe all the data information and product information in the business process model and the relationship between them. Generally,

information models are also divided into two types: one refers to the product composition model, which mainly describes the various products produced and consumed in the business process, as well as the interaction and product evolution process. In general, the product has attributes such as quality, use, source, type, etc. Some attributes can support the data retrieval function during process simulation or production monitoring. Meanwhile, modelers can customize other attributes for the product according to requirements to provide the required product data information. The other is the index data model, which is mainly used to describe the data needed to be managed and processed in process simulation and process operation and their relationships. These data have a number of attributes such as type, name, and value.

### 2.5 Behavior model

Behavior model is mainly used to quantitatively describe enterprise behavior, which exists in the other four models. It can not only directly control and coordinate all the work of business process management, but also quantify business process and quantitative calculation. Since the behavioral model mainly exists in other models, the behavior or operation of extended classes or objects defined by other models can be used to describe the behavioral model. The authors can define various operations to describe the behavioral details that cannot be described by other models, and can also use interactive forms to describe the management mode of the system.[10-13]

## 3. Result analysis

According to the description language of the business model studied in this paper, taking the formal description of the multi-objective decision model as an example, the knowledge engineering technology is applied to the modeling and analysis of the multi-objective problem, and finally an intelligent model description language and algorithm generation method are proposed. Using the modeling tool operation shown in Figure 2 below, the model description language (MDL) can not only provide a good interface for user problem symbolization, but also realize internal transformation, recognition translation and other operations. The model operation command (MOO) can not only complete the routine maintenance of the model, but also assist the modeling analysis of system users.

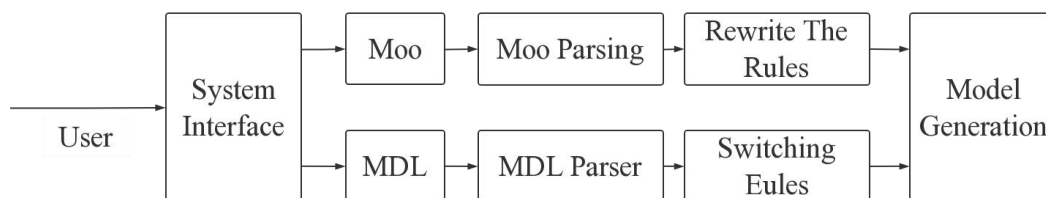


Figure 2 Model modeling tools

According to the modeling process shown in Figure 3 below, an MDL should provide a good interface for problem symbolization, and can accurately identify the four contents of the target number, decision variables, model parameters, and functional relations in the problem description, and finally form a complete multi-objective model. In the model description language studied in this paper, the modeling process based on MDL is mainly divided into two parts, one is multi-objective model recognition, the other is heuristic modeling. If the user already has a clear understanding of MOP, then the MDL based on grammar 1 and grammar 2 can be used for

modeling; If the user does not have a complete concept of the mathematical relationship of the problem, then the heuristic MDL based on grammar 3 can be used for modeling analysis.

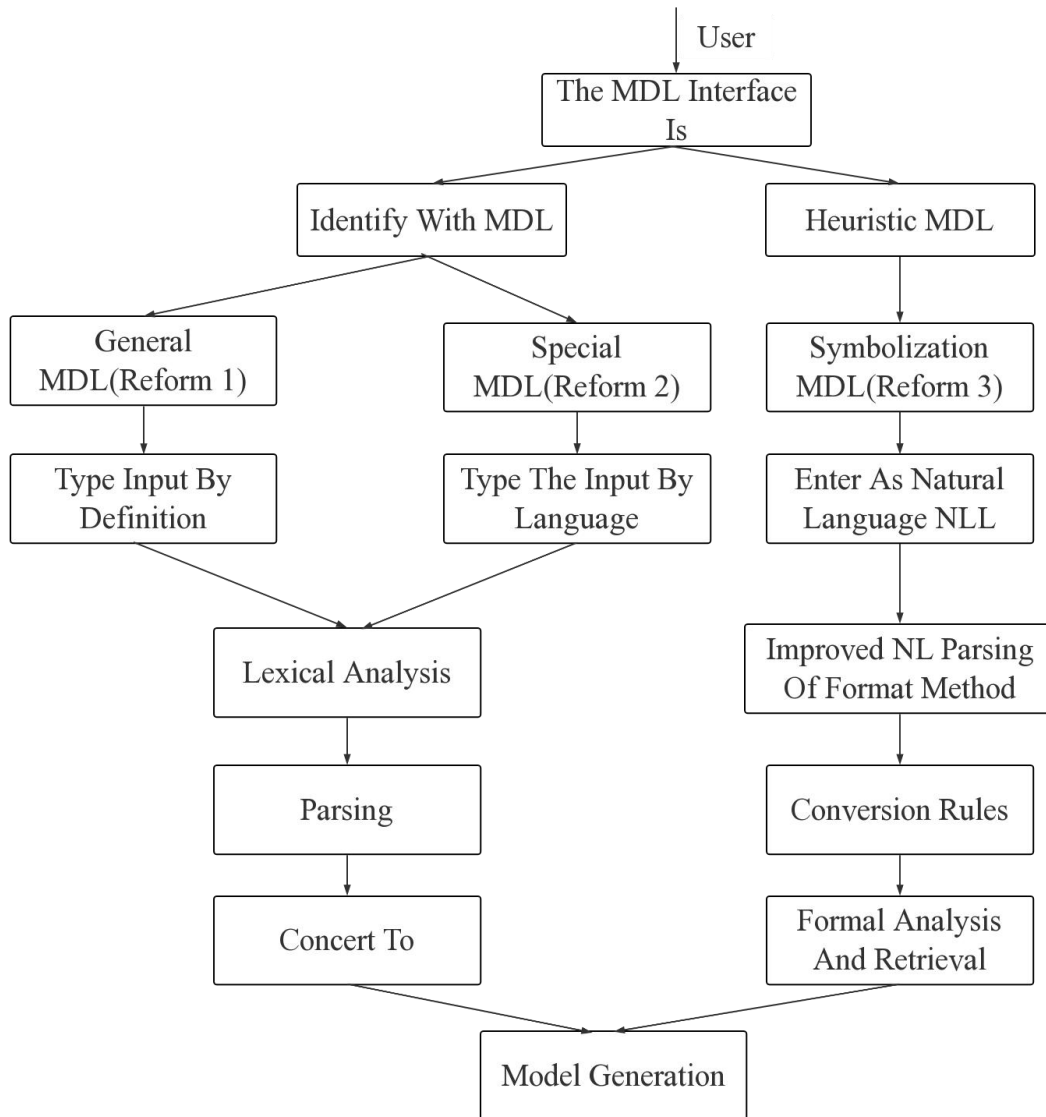


Figure 3 Modeling flowchart based on MDL

According to the above content, the model can be managed with three-level and low-order structure, and the modeling knowledge sub-library can be constructed, which includes pattern recognition rules, model matching rules, operation command interpretation and so on. In order to ensure that the model can carry out effective system maintenance and various operations, it is necessary to develop various operation commands, including model operation and environment commands. In the existing decision support system, in order to further improve the efficiency and quality of operation management of the system, this paper also proposes an algorithm generation support method with engineering as the core. The specific contents are as follows: First, the decomposed MOP solving algorithm provides the basis for algorithm generation; Secondly, on the basis of decomposition, the common modules are extracted and the engineering dictionary is built in the method library. Thirdly, the input and output characteristics of each project are established, as shown in Figure 4 below:

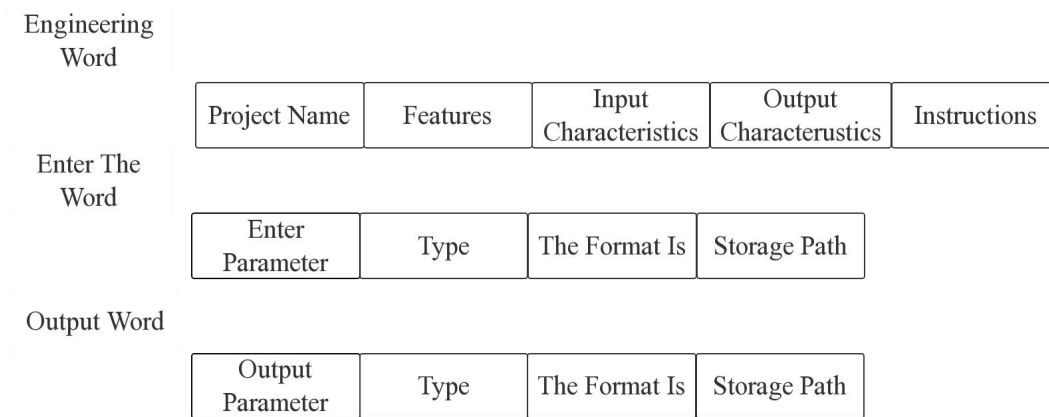


Figure 4 Input and output of the project

Finally, integration rules and engineering rules are established and model-driven for all users. The final algorithm generation process is shown in Figure 5 below:

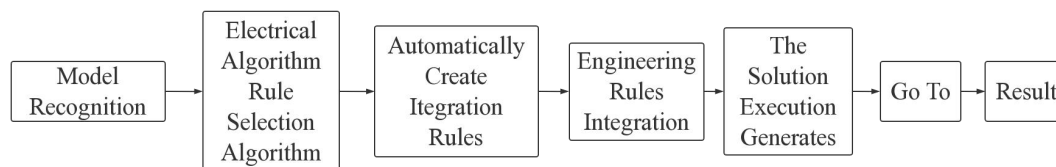


Figure 5 Flowchart generated by the algorithm

From the perspective of practical application, in the face of various changes in the model, the system can generate corresponding application algorithms, and select an intelligent foundation management structure similar to the model library when managing the method library, effectively avoiding the occurrence of repeated generation phenomenon. Therefore, the application research of intelligent model description language has strong adaptability.[14-15]

## Conclusion

To sum up, according to the business model description language mastered in this paper, Chinese researchers should continue to explore artificial intelligence model description language in the future, and correctly view the complexity of practical problems and the limitations of modeling methods. Only in this way can we master more valuable theoretical technologies and accelerate the development of model description language in the field of artificial intelligence in China.

## References

- [1] Yan Wang . Discussion on effective teaching Strategies of art in primary schools from the perspective of Life [J]. Questions and Research: Teaching Forum, 2019(19):1.
- [2] Zheng Liu Shuzheng Zhou Yiting Zhao Mingna Lu. Traffic Technology and Management, 2021, 000(016):P.1-2. (in Chinese)
- [3]Yile Shi , Wenzhong Yang ,Huixiang Du , Lihua Wang , Wang Ting, Li Shanshan. An overview of image description based on deep learning [J]. Acta Electronica Sinica, 2021, 049(010):2048-2060.
- [4] Eliza Strickland.DALL-E2's error reveals the limitations of artificial intelligence [J]. Science and Technology Review, 2022(8):3.

- [5] Xiaowei Jin , Ma Shujin Lai ,Hui Li . Physical enhanced Deep Learning modeling and simulation of flow field [J]. Chinese Journal of Mechanics, 2021(010):053.
- [6] Hengxi Zhang ,Haoran Chen , Kaixin Jiang , Jiaying Li , Jianye Yao . Automatic conversion of C-like algorithm to C language program based on neural network model [J]. Information and Computer, 2022, 34(14):76-78.
- [7] Wenwen Li. Translation Practice Report on Artificial Intelligence Shaping a Better Tomorrow under the guidance of Catford's Translation and Transformation Theory [D]. China University of Mining and Technology,2022.
- [8] Xiaoqing Liu. Conceptual Origin of symbolic artificial Intelligence: An Analysis based on Hobbes' mechanical materialism [J]. Journal of Beijing Normal University: Social Science Edition, 2022(5):146-152.
- [9] Junwen Wang, Zhuangzhi Ye . Review on the application of artificial intelligence technology in the field of TCM diagnosis [J]. World Science and Technology-Modernization of TCM, 2022(002):024.
- [10] Honglei Yu, Lingyong Cao , Yiqian Qu , et al. Knowledge Atlas construction and knowledge discovery of prescription for diabetes mellitus [J]. Journal of Zhejiang Chinese Medicine University, 2022(002):046.
- [11] Xiaoning Liu , Xi Ma , Hang Zeng , Yanhua Hu . Big data, cloud computing audit technology innovation research [J]. Agricultural Accounting of China, 2022 (8): 46-49.
- [12]Wenjun Lu . Research on the modernization of English ecological teaching model in artificial intelligence environment [J]. New Silk Road: First Ten Days, 2021, 000(001):P.1-2.
- [13]Yan Wan , Minghui Zhang , Jinping Gao.Research on China's AI-related policies based on text analysis [J]. Science and Technology Information Development and Economy, 2021, 006(012):54-63.
- [14] Chen Huang, Lai Wang . Construction of Big Data sharing platform for automated sales business model based on artificial intelligence technology [J]. China Science and Technology Journal Database Industry A, 2021(1):3.
- [15] Junhua Wang . Speech Recognition System and Application Analysis based on Artificial Intelligence [J]. Chinese Science and Technology Journal Database (full-text) Engineering Technology, 2021(4):2.