

Discussion on Intelligent Evaluation Method of Equipment Support Capability Based on Confidence Rule Base

Jiangfeng Qiang^{1, a}, Sicong Ou¹, Guiming Chen²

¹ Rocket Army Engineering University, Xi'an710000, China;

² Armed Police Wuhan Detachment, Wu'han430000, China.

^a lz52199@126.com

Abstract

Artificial intelligence technology is a research hotspot in the field of science and technology. With the evolution of war form and the development of equipment, artificial intelligence technology needs to be gradually applied to the field of equipment system research. The generation of combat capability needs not only excellent equipment, but also efficient and timely equipment support. In the face of some problems existing in the evaluation of equipment support capability, an intelligent evaluation model of equipment support capability is designed based on the expert system based on the confidence rule base, so as to realize the intelligent evaluation of equipment support capability, and provide beneficial reference and method reference for improving the efficiency of evaluation of military support capability and reducing the support cost.

Keywords

Confidence rule base; expert system; supportability; evidential reasoning; intelligence.

1. Introduction

With the development of science and technology and the evolution of warfare, intelligent equipment systems are more and more widely used in combat. The generation of combat capability not only depends on the combat system, but also requires a supporting and feasible equipment support system. While the equipment system is becoming more and more complex, equipment support has an increasing impact on the combat effectiveness of equipment. Countries around the world are spending more and more on equipment support, and research on equipment support is increasingly attracting experts in related fields. The attention of scholars [1]. The equipment support capability evaluation research is an important part of the support capability building evaluation. It can use scientific and effective evaluation methods to discover the problems existing in the support capability construction, and analyze various factors that affect the equipment support capability. The layout of this chapter provides theoretical guidance and method support. At present, relevant personnel at home and abroad have published a wealth of research results through the research on the comprehensive evaluation of equipment support capabilities, mainly including multivariate statistical theory, multi-attribute method, interdisciplinary evaluation method and data mining method [2]. Although relatively abundant equipment support capability assessment theories have been formed, there are still many problems in the application of these theories in the face of constantly developing and changing equipment support forms and constantly updated equipment systems. When the amount of data is large, the data information is incomplete or even there is uncertainty, these theories and methods still have limitations [3]. The evaluation of equipment support capability based on expert system is a hot research issue. The application of expert system intelligent evaluation can realize the comprehensive analysis of qualitative, quantitative and semi-quantitative evaluation opinions, so as to obtain relatively scientific and

objective evaluation conclusions of equipment support capability. Aiming at the problem of equipment support capability evaluation, this paper proposes an intelligent evaluation method based on the confidence rule base expert system, and explores and solves the uncertainty problem faced by the equipment support capability evaluation.

1.1. Application of Intelligent Technology in War Section Headings

For future wars, the cross flow of battlefield information, personnel, materials, equipment and other elements makes the battlefield information nonlinear, complex and uncertain, and there are many difficulties in the establishment of battlefield models [4]. In order to improve the performance of the command and control system, the traditional command and control system may become very complicated, and at the same time, the maintenance cost of the system is increased, and the reliability of the system is reduced. In addition, only relying on human decision-making and thinking can no longer meet the needs of information warfare, and it is necessary to establish a complete auxiliary decision-making system with the help of advanced information technology. Faced with the above problems, the application of artificial intelligence technology is imperative. Artificial intelligence technology can realize the intelligent auxiliary decision-making and combined scheduling of the command and control system, thereby ensuring its efficiency and reliability. Through artificial intelligence dispatch and command, it can not only shorten the response time of combat forces in the fog of war, but also reduce the support cost of the command and control system. The application of expert systems to develop combat simulation support systems can combine decision-making rules with simulations, thereby providing command decision-making bodies with auxiliary decision-making or evaluating alternatives. At present, the strategic evaluation system of the US military RAND Corporation and the "Eagle" combat model have been used in actual combat [5].

1.2. The application of artificial intelligence in equipment

At present, the main research direction of artificial intelligence is to simulate human thinking structure, human language and human vision [6]. Intelligent equipment can automatically identify targets and make intelligent decisions like humans, thus playing an important role in system operations and coordinated operations. The current equipment intelligence mainly includes intelligent perception, intelligent decision-making and intelligent feedback. Intelligent perception is realized through pattern recognition technology, applying optical non-contact sensing devices to automatically receive and interpret real scenes to obtain system control information. In actual combat applications, the pattern recognition system collects the dynamic video information of the target and uses neural network technology and machine vision hardware to discover potential threats and provide reference information for target strikes. Intelligent decision-making is realized through an expert system, which can use professional knowledge and experience in a specific field, combined with reasoning technology to simulate and solve problems that can generally only be solved by experts. The expert knowledge and experience are described by mathematical models and a knowledge base is established. With the help of the automatic reasoning technology of artificial intelligence, the threats existing in the battlefield environment can be determined, and the real-time assessment of the battlefield situation can be realized. Intelligent feedback is realized through motion control technology, including single or group motion control technology. Motion control technology is mainly used in the autonomous movement and decision-making of robots. Through learning algorithms, robots can perform combat tasks in complex battlefield environments.

2. Intelligent evaluation method of equipment support capability based on confidence rule base

Confidence rule base is a kind of expert system based on evidence theory and based on the assumption of complete set and single set. The belief rule base method combines professional knowledge, historical information and expert experience in the field, and applies reasoning technology to simulate and solve problems that can only be solved by experts under normal circumstances. It is widely used in the fields of behavior prediction and pattern recognition [7]. The current equipment support capability evaluation has problems such as difficult modeling, strong uncertainty, and complex and diverse data types, and the general evaluation methods are difficult to meet the requirements. Apply the confidence rule base method to the evaluation of equipment support capability, use expert experience and historical information, establish an evaluation model with mathematical methods, fill and improve the database and knowledge base, and use artificial intelligence reasoning technology to realize the evaluation of the equipment support capability of combat troops, which can meet the needs of At present, the demand for diverse evaluation opinions improves the credibility and intelligence of complex system evaluation.

The evaluation model is implemented on the basis of the confidence rule base evaluation expert system:

Step 1: According to the equipment support capability evaluation index system, collect the initial expert evaluation opinions as the input information of the expert system, and then classify them quantitatively and qualitatively and save them in the comprehensive database;

Step 2: The reasoning engine performs inference and calculation on the two types of evaluation indicators according to the rules in the confidence rule base and the initial evaluation opinions in the comprehensive database, and classifies the evaluation results into the comprehensive database;

Step 3: The reasoning engine then performs inference calculation on the result classification of the evaluation of the two types of evaluation factors in the comprehensive database, obtains the evaluation results of the two classifications, and stores them in the comprehensive database again;

The fourth step: the inference engine comprehensively integrates the results of the two classification evaluations to obtain the final evaluation conclusion.

3. The Significance and Development Trend of Intelligent Evaluation

Large depth, three-dimensional, informatization, intensive and comprehensive fire support and rapid maneuvering have become prominent features of future battlefields. Under the new combat thinking and combat style, the equipment performance must be further improved to meet the needs of future development. The application of artificial intelligence technology to the evaluation of equipment support capability can adapt to the future "fast, accurate and efficient" operational needs, enabling equipment support to intelligently detect and track targets, and greatly improve the timeliness, objectivity and accuracy of equipment support capability evaluation. sex. The development of artificial intelligence not only depends on strong economic strength, the development of massive processing capabilities of computer technology, the deployment of a large number of intelligent hardware, but also benefits from decades of tracking research and experience accumulation. The joint logistics support force must keep up with the pace of the times, strengthen intelligent research on military supplies, equipment, vehicles, medical support, etc., and deeply apply artificial intelligence to actual combat training and support by type, level and scale. , so as to truly realize the intelligence of security.

References

- [1] Zhang Jiabo. Design and implementation of equipment support capability evaluation system [D]. Jilin University, 2017.
- [2] Shuai Yong, Song Tailiang, Wang Jianping, Shen Hong, Zhan Wenbin. Review of Equipment Support Capability Evaluation Methods [J]. Computer Measurement and Control, 2016, 24(03): 1-3+7.
- [3] China National Standardization Management Committee. Specifications of Crane Design (China Standardization Press, China 2008), p. 16-19.
- [4] Wu Ganze. The relationship between artificial intelligence and future warfare [J]. National Defense Science and Technology Industry, 2019(05):55-56.
- [5] Yang Tingting, Liu Zhong, Zhu Xianqiang, Jin Jincai. A Semantic Modeling Method of Operational System in Operational Planning [J]. Journal of Command and Control, 2017, 3(04): 340-349.
- [6] Zhang Shen, Ji Zili, Wang Wenhua. The US military accelerates the development of intelligent equipment [J]. National Defense Science and Technology Industry, 2019(08): 56-59.