The Application of Data Mining Technology in the Breakdown Maintenance of Warship Equipment

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Abstract. Along with the development of the Navy, warship equipment breakdown maintenance and support become more difficult. Data mining technology was developed to solve the problems in warship equipment breakdown maintenance. The paper adopts the algorithm of fuzzy association rule, establishes the framework of equipment data mining system, analyses the fault causes, creates the fault phenomenon database, equipment fault database, and fault path database. The research is valuable for increasing the samples of fault and maintenance parts automatically and improving the lack of slow and inaccuracy of fault samples location.

Keywords: data mining technology, warship equipment, breakdown maintenance.

1 Introduction

Navy must have three capabilities in the modern naval combat missions. Firstly, Navy has the combat capability of inshore defense and offshore offense and defense to guarantee the security of the national territory, territorial waters and exclusive marine economic zones. Secondly, Navy has the combat capability of safeguarding the national marine rights and interests with ability of the control of air and sea, to guarantee the security of maritime economic transport channel and marine resource development project. Thirdly, Navy has the function of strategic deterrence at sea and maritime strategy to combat mobile base, and has the ability to maintain the country's overall interests and the strategic position. For promoting the three great abilities, we must develop a corresponding development of weapons and equipment. Because of modern equipment have high technical content, higher requirements for maintenance personnel, maintenance time and maintenance techniques have been put forward. And due to the particularity of surface warships’ combat zone, a greater difficulty of maintenance of equipment will be increased. This paper adopts the data mining technology to construct an open platform for increasing the samples of the fault and maintenance parts automatically, and solve the problem that fault samples location are not quick and accurate enough.
2 The Structural Framework of Data Mining System of Some Certain Equipment

There are several techniques used in the equipment breakdown maintenance, such as the fault tree coding technology, data mining technology, intelligent diagnosis of expert system technology and equipment fault data preprocessing technology [1-3]. This paper takes certain warship equipment as an example and discusses the data mining technology in the application of breakdown maintenance of warship equipment. The system uses the association rules technology to build the data mining system of equipment. The structural framework of the conceptual model can be designed by the user query interface, query collaborative machine, database management module, knowledge base management module, management module of the model base, pre-processing module of knowledge discovery base, knowledge evaluation module and the conclusion and interpretation modules. The system structure is shown in Figure 1.

Fig. 1. The structural framework of data mining system of some certain equipment

3 The Algorithm of Fuzzy Association Rule Based on Tree

3.1 The Process of Data Mining

Data mining system usually consists of four parts: data preparation module, the pattern mining module, the results of expression and users interaction modules. Among them the user interaction runs through the whole process of data mining [4]. The entire data mining process is divided into the following steps, such as: 1) Understanding problems; 2) Data collection and filtering; 3) Data selection and transformation; 4) Data mining Model assessment; 5) Model assessment; 6) Knowledge representation.