Multi-Agent based Production Management Decision System Modelling for the Textile Enterprise

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ABSTRACT

To extract useful information from massive production processing data, firstly, production process and business workflow of the textile processing were analyzed, and the complex relationship and high dimensional feature of the stored data were studied. Secondly, a production management structure model based on multi-Agent was proposed by using the Multi-agent technology, relationship model, fuzz C means clustering algorithm (FCM) and expert system. And then, the rationality of the model was introduced, working principle, data computation process and message communication of multiple agents were elaborated, and finally a textile production process management system was designed. As verified by the application, the system the author proposed is superior to the existing textile production management system, and its functions strengthen the interactivity role both the user and the system, meet the requirements of the production management, intelligent decision and personalized service, and realize the heterogeneous integration among the different databases.

KEYWORDS

Decision System Modeling, Multiple Agent, Production Management, Textile Enterprise

1. INTRODUCTION

For the textile enterprise in China, how to improve production management level and to win core competitiveness, which will become primary issue need to be resolved (Mei, 2008a; 2008b, Guzaitis, Verikas, 2006; Kuo & Lee, 2003). In some developed countries, such as Switzerland, Germany and Japan (Kuo & Lee, 2003; Wu & Xia, 2004), they have adopted the advanced techniques to improve the level of production management, i.e. the monitoring method in textile printing and dyeing (El-Molla, 2007; Peng, Ma, Lin et al., 2015), flaw detection in woven textiles, etc. (Heyse, Buyle, Beccarelli, 2016; Hanbay, Talu, Özgüven, 2016), and developed many advanced production management systems, such as electronic textile system, and simulation environment for electronic textiles(Wainwright, 2016). The documents show that these techniques and systems have been successfully applied to production management process, and have basically realized the informatics of production management and intelligence of decision analysis.

In China, for the textile enterprises, due to low concentration degree, backward technology, and behindhand resources utilization, it brought the difficulty in information construction respects, and seriously affect the informatics development of production management. So, aiming at the difficulties of the current information construction, some countermeasures have put forward to the textile enterprise. Furthermore, in production management aspects, the existing information systems are e-commerce (Wang, Wong, Yu, 2013), management information system (Wang, Chen, Yang et al.,

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2016), enterprise resource planning (Shen, Chen, Wang, 2016), production monitoring system (Yang, Chiesura, Vervust et al., 2016), etc. Although above systems have played a key role in the information development of the textile enterprise, and boosted the informatics of the production management, most of them are still single systems or DOS system, in the meantime, they cannot achieve the sharing and network management of production data, and provide real-time and accurate production decision data for production managers, as well as make a accurately implementation of the entire production scheduling and control. Hence, it is necessary for the textile enterprise to develop a production process management system, which either can improve production management level, or can realize quick response of decision-making (Zlot, Stentz, 2006.) Thus, according to the actual requirements of production management, we proposed a system model based on multi-Agent, developed a production process management system, which integrates the functions of production management and decision analysis, and made the system realize the sharing of production management data in the LAN.

2. SYSTEM NETWORK STRUCTURE

The network structure of the system mainly includes three parts: one is production process management system located in the information center of the enterprise, another is the monitoring system or information management system, and the other is machine monitors in all the workshops. In this structure, the information center is the main station of system, it is responsible for the mill-level production scheduling and distribution, production cost statistics, profit analysis and production quality tracking management. Meanwhile, in accordance with the communication protocol, production process management system sends the order or request for the appropriate monitoring system, the aim is to realize data exchange and communication with all the monitoring systems, and to achieve the seamless integration with ERP system in the LAN.

The monitoring server in all the workshops was believed as the monitor station respectively, it had two functions, one is to collect production data from all the monitors, manage some production technology information, add production operation parameters, statistic and analyze production decision-making data, generate and print all kinds of statements, as well as to provide timely the production statistic and analysis data for the managers by means of machine distribution map, data list, curve or statement (Pati, Oundhakar, Sheth et al., 2004). The other is to receive the production plan and order-related parameters from the main station, analyze and deal with these commands, and then distribute them to the appropriate group, seat or machine according to the first-come first-serve principle.

The monitor was primarily used to collect, process, compute and store production data of the machine object, to receive a variety of commands from the monitoring system according to communication protocol, and to send back production data to the monitor station. The network structure is shown in Figure 1.

3. MODELING OF THE SYSTEM

3.1. Modeling of the System Function based on Multi-Agent

During the designing process of the production process management structure model, to achieve the diversification management of production data, we make Agent be partitioned into six parts, which include system management Agent, execution Agent, user Agent, object management Agent, man-machine interface Agent and data interface Agent. Of which, system management Agent plays a key role in the coordination, management and communication aspects, in the meantime to control and distribute user object, system operating parameters, and system security. Man-machine interface Agent mainly represents human-computer interaction operations, and provides basic services for the user. Data interface Agent is mainly responsible for various system data operations, and external data import and export operations, as well as many data report printing operations, etc. Object management
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