Study on Intelligent Decision Architecture of Online Data Acquisition and Analysis System

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1. Introduction

With the intensification of global competition in the manufacturing industry, it has become an urgent need for manufacturing enterprises to effectively improve production efficiency and product quality and reduce production costs. However, in traditional discrete manufacturing enterprises, the characteristics with large variety and quantity of products, long processing routes, and more manual intervention in the production process, as well as experience based adjustments to process parameters, have led to the problems such as frequent uncertain disturbances, frequent changes in production tasks and plan adjustments, and lagging adjustments in the processing process due to a lack of scientific analysis. That's, the existing adjustment mode based on manual and experience cannot meet the dynamic production requirements, and it is difficult to meet the current demand for refined and efficient production. With the development of the new generation of technological revolution, the intelligent manufacturing has become an important development trend of the current manufacturing industry, and data has become the core of the intelligent transformation in the manufacturing industry. It has become the focus of industry and academia to analyze and mine the data generated in the workshop production process, obtain the hidden rules and assist in analysis and decision-making, so as to guide and optimize the production process, as well as an effective way to solve the aforementioned problems in traditional discrete manufacturing. Furthermore, many research has been conducted on production control, quality management, and equipment operation and maintenance in the workshop with data analysis and decision-making techniques, and many academic achievements have been made. Therefore, an architecture based on online data acquisition and analysis around the control of workshop production will be established so as to provide technical reference for effectively improving the production capacity and control efficiency of the workshop , and further forming an engineering manufacturing platform.

2. Architecture

The overall architecture of manufacturing data analysis and intelligent decision support technology is shown in Figure 1, including data layer, analysis layer, decision layer and application layer, and the logical flow obtained is shown in Figure 2.

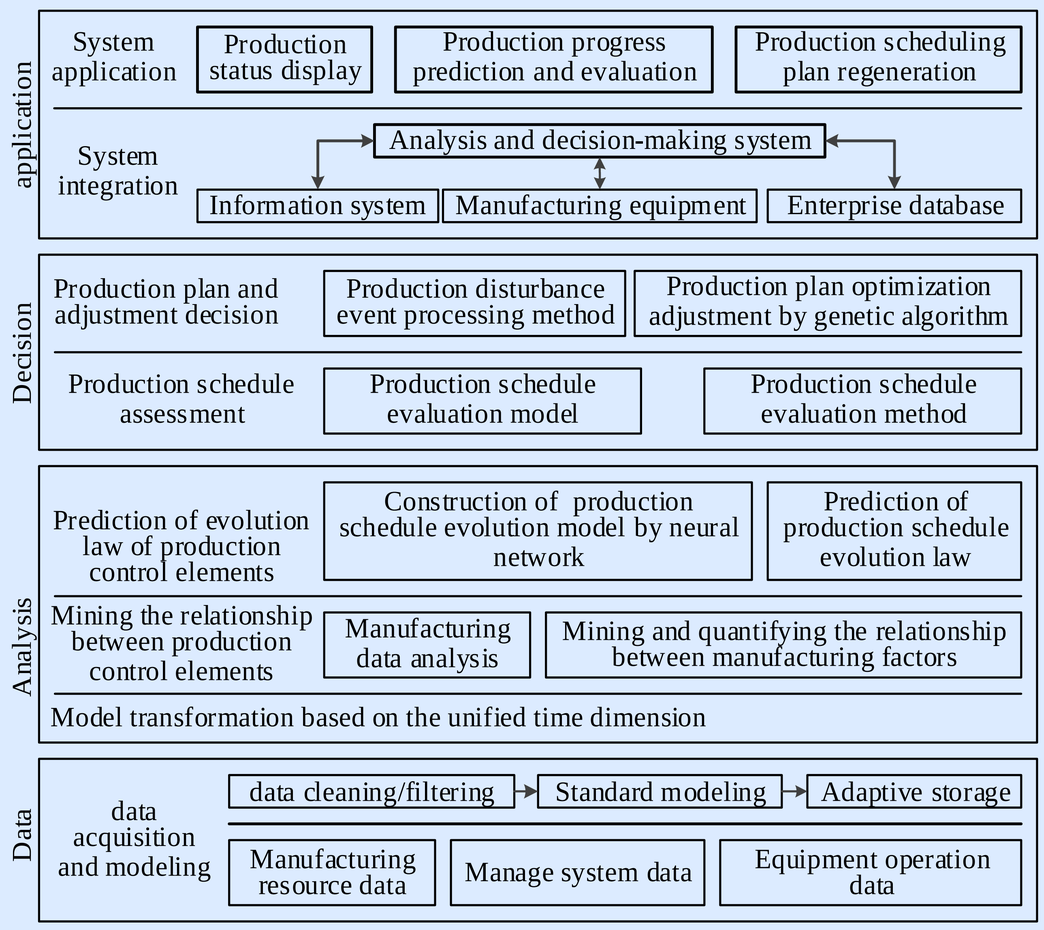

Fig.1 Overall architecture diagram.

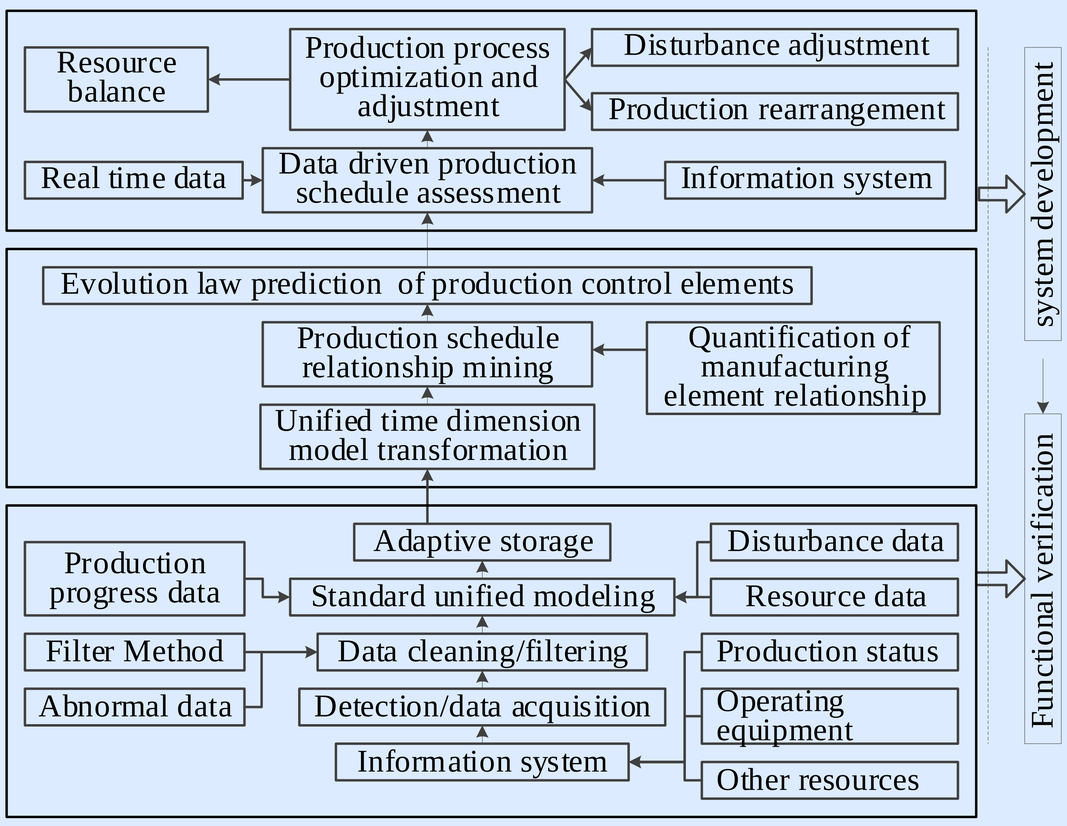

Fig.2 Operation logic flow.

3. Key supporting function

The key supporting function mainly includes manufacturing data detection and acquisition, data analysis for production control, production process optimization decision-making, and the logical flow of functions as data analysis, process optimization decision-making are shown as Figure 3.

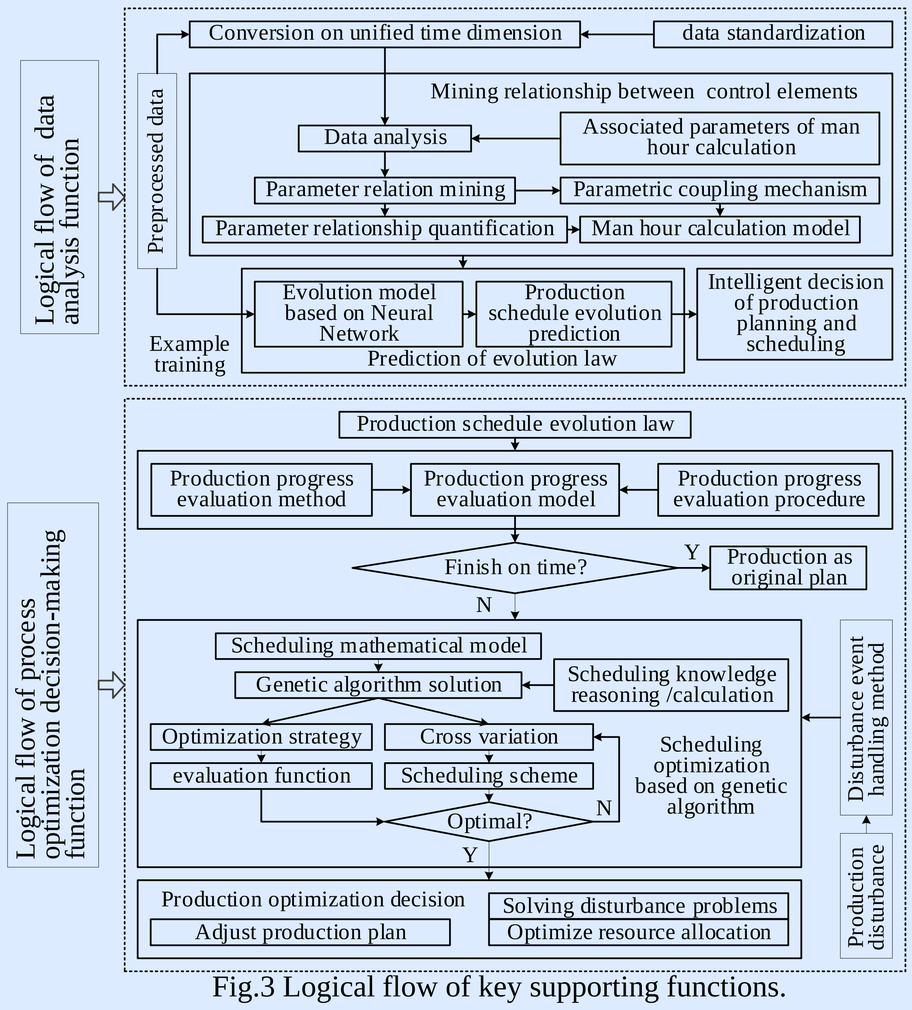

Fig.3 Logical flow of key supporting functions.

4. System development and function verification

The manufacturing data analysis and intelligent decision platform is designed and developed, and the interface is shown in Figure 4, as well as the tested result of the function such as production schedule prediction and evaluation, and production rescheduling.

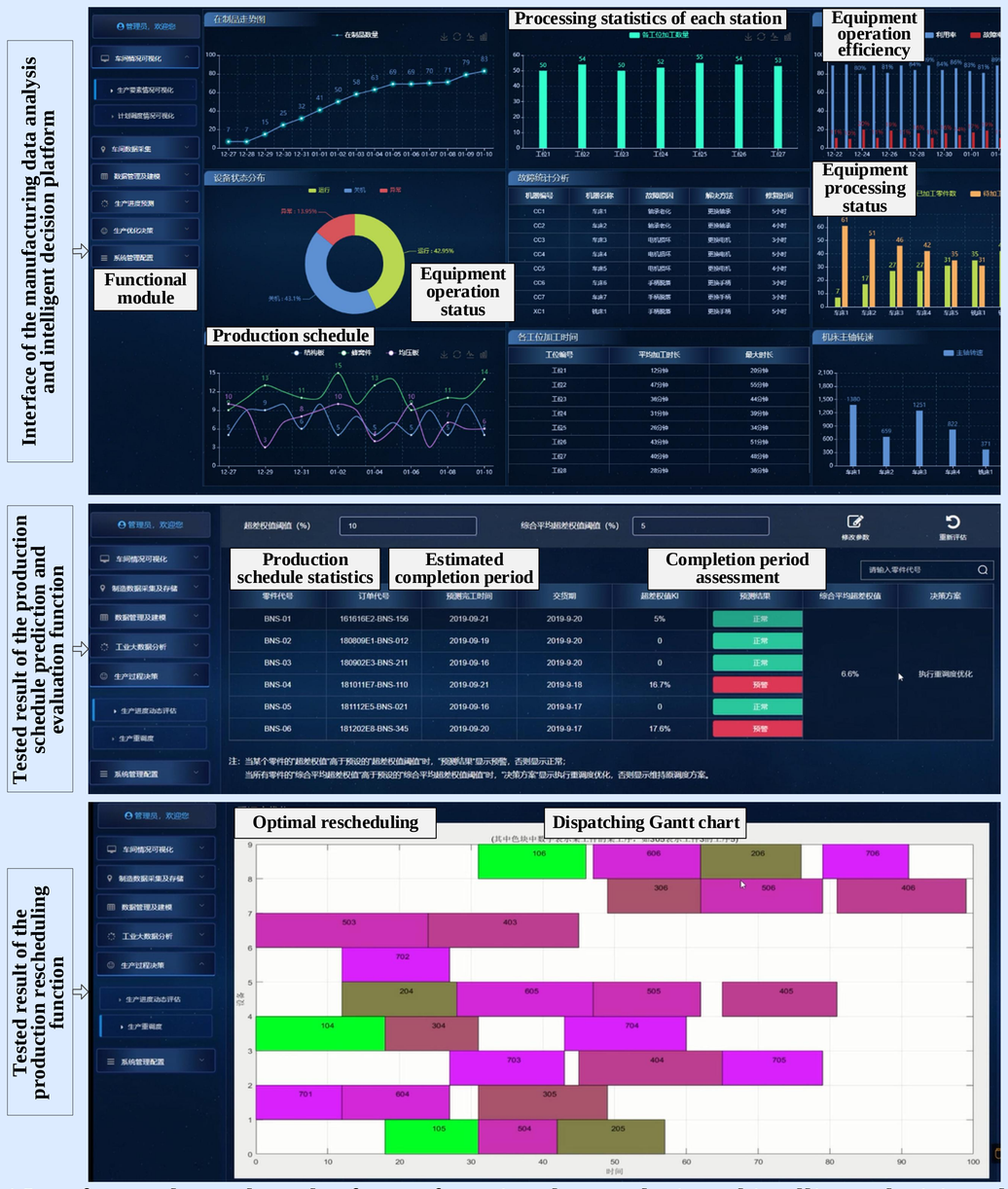

Fig.4 Interface and tested result of manufacturing data analysis and intelligent decision platform.

5. Conclusions

The development of intelligent manufacturing has become an important force to promote industrial transformation and upgrading. Among them, production control based on data analysis is the core of intelligent manufacturing. Focusing on the urgent need of traditional discrete manufacturing industry to effectively improve manufacturing capacity and manufacturing efficiency, A prototype system was constructed to validate the architecture of the system, and the functionality of production schedule prediction and evaluation, and rescheduling are tested so as to prove the feasibility of system operation and the availability of functions, which can provide software foundation and technical support for further improving the calculation accuracy and efficiency of the system and forming a universal and engineering software system in the future.