

Industrial Internet Data Collection and Processing Technology Research

Luming Liu¹, Qingq Yang^{1,*}, Zewei Zhu¹

¹ The College of intelligent manufacturing, Wenzhou Polytechnic, Wenzhou 325035, China

* Corresponding author: Qingq Yang (Email: qqyang@wzpt.edu.cn)

Abstract: With the rapid development of the Industrial Internet of Things, data acquisition and processing technology has become a research hotspot. This paper focuses on the industrial Internet data acquisition and processing technology. In view of the current situation and existing problems of industrial Internet data collection technology, such as slow transmission speed, low data quality, poor security, etc., from the three aspects of data transmission, data processing and data security. Specifically, the transmission mode based on the Internet of Things, distributed data processing technology and encryption algorithm and other technical means are adopted to improve the speed and quality of data transmission and ensure the data security. The research results of this paper provide reference and reference for the further development of industrial Internet data acquisition and processing technology, which has certain theoretical and practical significance.

Keywords: Internet of Things, Digitization, Data collection.

1. Introduction

With the continuous development of information technology, the industrial Internet has gradually become an important support for intelligent manufacturing. In the industrial Internet, data collection is one of the key links to realize intelligent manufacturing. It can monitor, optimize and predict various parameters in the production process, so as to improve production efficiency, reduce costs and improve product quality. Data collection technology plays a vital role in intelligent manufacturing, which can help enterprises realize industrial automation, digitalization and intelligent transformation, and improve their competitiveness and market share.

In the industrial Internet, data collection faces many challenges, such as the selection and deployment of data acquisition equipment, data acquisition protocols and standards, data quality control, and data storage and management. How to solve these challenges through reasonable technology selection and scheme design, and realize the efficient, reliability and security of industrial Internet data collection, has become an urgent problem to be solved in the current industrial Internet research.

In order to accurately estimate the technical indicators in the processing process, Hao Yan et al. proposed an estimation method based on the incomplete data of Bayesian network (BN), using the maximum expectation (EM) algorithm to estimate the model parameters[22]. In order to monitor and diagnose cutting tool wear, JA Antonino-Daviu et al proposed a novel non-invasive method that can automatically diagnose tool wear in CNC machine tools under changes of cutting parameters of cutting speed and feed rate[23]. CH Lee Deep learning and sensor fusion are used to estimate tool wear and surface roughness[24]. Jose Luis Garrido-Labrador et al studied that different machine learning algorithms are more effective for processing process optimization in the case of unbalanced datasets[25].

Vita F D et al. have explored how to design an efficient

framework for storing, monitoring, and analyzing IoT data[26]. Zhang Yingfeng et al. proposed the intelligent modeling of the underlying manufacturing resources and its adaptive collaborative optimization system to solve the challenges of the intelligent control, real-time linkage and collaborative optimization of the manufacturing system[27]. Assaqtly M et al. propose an industrial Internet of Things based on private blockchain for tracking materials and products in intelligent manufacturing to manage corresponding production plans[28]. Zhang Jianxiong et al. adopted the data acquisition technology architecture and application scheme of telecom operators based on the industrial Internet of Things to solve the problems of data acquisition and application scenarios[29].

In conclusion, research on industrial Internet of Things focus on fault diagnosis and predictive maintenance of systems under incomplete data sets. There are relatively few studies on data fusion in terms of process, parameter optimization and system architecture, and it does not consider data processing without "clean" data. Therefore, how to systematically and comprehensively extract and build models from multi-source, heterogeneous and incomplete data sets to realize the remote monitoring, preventive maintenance, fault diagnosis and performance optimization analysis has become the only way for the digital transformation of the factory.

2. Study Protocol

This research mainly focuses on industrial Internet data collection, including sensor network technology, data quality control, data security technology, data transmission technology, data processing technology and data standardization technology and other research. This paper focuses on the in-depth study of data transmission, data processing and data security, aiming to improve the efficiency, accuracy and security of industrial Internet data collection, to provide more reliable data support for industrial decision-making, the system scheme is shown in Figure 1.

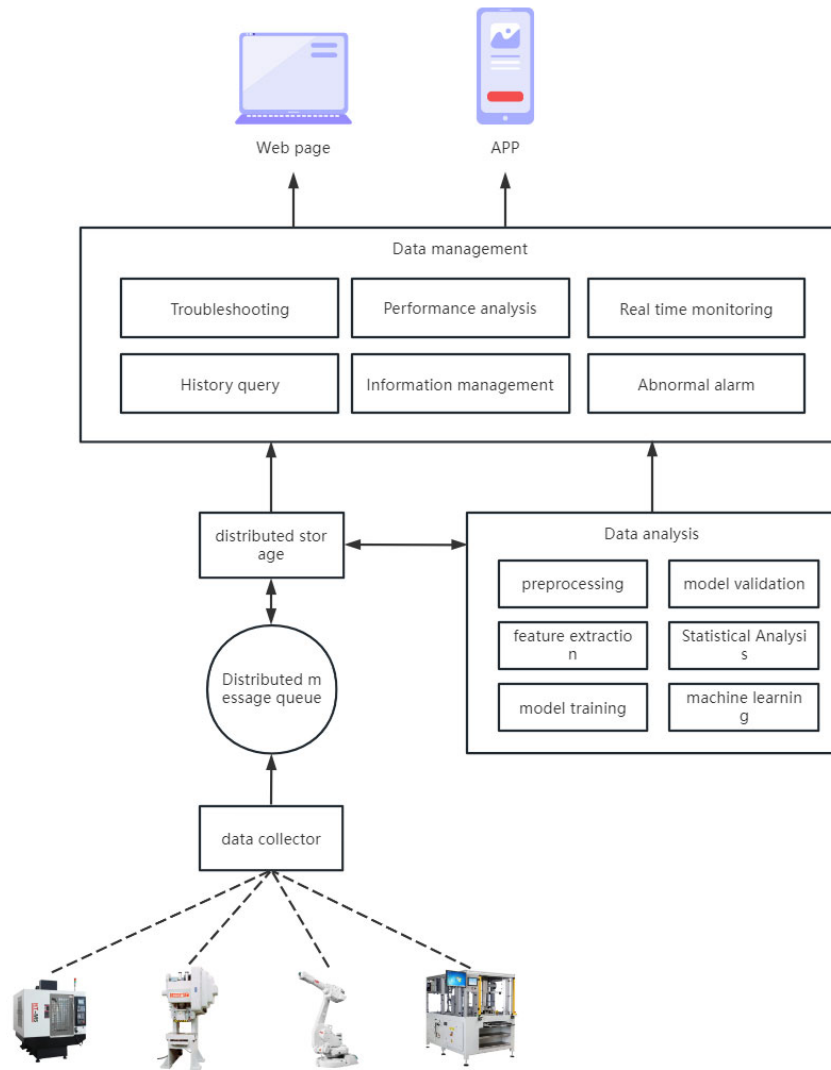


Figure 1. System framework

3. Data Transmission

In the industrial Internet data collection, data transmission is a crucial part, its stability, timeliness and accuracy directly affect the effect of data collection and the quality of decisions. Therefore, how to solve the problem of data transmission is one of the important research contents in the industrial Internet data collection. Various problems of data collection are solved from the following aspects:

(1) The appropriate transmission protocol: in the process of data transmission, the appropriate transmission protocol can effectively improve the stability and efficiency of data transmission. According to different transmission scenarios and requirements, different transmission protocols can be selected, such as MQTT, HTTP, TCP, etc.

(2) Improve the stability of the transmission network: in order to ensure the stability of data transmission, it is necessary to improve the stability of the transmission network and reduce the interruption and data loss in the transmission process. This can be achieved through the optimization of network topology, the adjustment of network bandwidth, and the monitoring and repair of network faults.

(3) Using data compression technology: in the process of data transmission, the size of the data will have an impact on the transmission speed and stability. Therefore, the data

compression technology can be used to compress the data and then transmit it to improve the transmission efficiency and stability.

(4) Data caching and retransmission mechanism: in the process of data transmission, transmission interruption and other problems may occur. In order to avoid data loss, the data caching and retransmission mechanism can be adopted to temporarily exist the data locally and wait for the network recovery before transmission, so as to ensure the integrity and accuracy of the data.

In conclusion, we propose a variety of design solutions such as Internet of Things transmission mode, network topology structure optimization, data compression technology and cache technology to solve the problem of slow data transmission speed of industrial Internet. These schemes can complement each other, improve the speed and quality of data transmission, and meet the needs of different scenarios.

4. Data Processing

In the industrial Internet data collection, data processing is a very important link, which directly affects the value of data and the quality of decision-making. Therefore, how to solve the problem of data processing is one of the important research contents in the industrial Internet data collection,

which can be developed from the following aspects:

(1) Data cleaning: in the process of industrial Internet data collection, due to various reasons, the collected data may have some noise, abnormal values, etc. It is necessary to remove these interference factors through data cleaning to ensure the accuracy and integrity of the data.

(2) Data mining: The amount of data collected by the industrial Internet is usually very large. How to extract valuable information and knowledge is an important problem. Data mining techniques, including clustering, classification, and association rule mining methods, can be used to analyze and mine the data and extract useful information and knowledge.

(3) Data visualization: The data collected by the industrial Internet is usually complex and multi-dimensional data. How to present these data in an intuitive way for people to understand and make decisions is an important problem. Data visualization technology can be used to display the data in figures, figures and other ways to improve the readability and interpretability of the data.

(4) Data modeling: By modeling the collected data, the nature and laws of the data can be better understood, and then predictions and decisions can be made. Machine learning, deep learning and other technologies can be used to model and train the data to improve the ability of data analysis and prediction.

(5) Data integration: In the industrial Internet, the data usually comes from different data sources and systems. How to integrate these data to build a complete view of the data is an important problem. Data integration technologies, including ETL, data synchronization and other methods, can be adopted to integrate different data sources to improve the availability and sharing of data.

The data display is shown in Figure 2.



Figure 2. Data display

5. Data Security

In the industrial Internet data collection, the data security issue is a very important issue. The data collected in the industrial Internet often involves the core business and confidential information of the enterprise. Once leaked or attacked, it will bring serious losses and risks to the enterprise. Therefore, it is very important to solve the industrial Internet data security problem, which can be developed from the following aspects:

(1) Data encryption: the data encryption technology is adopted to encrypt the data collected in the industrial Internet to protect the confidentiality and integrity of the data. Encryption technology includes symmetric encryption and asymmetric encryption, etc., which can choose the appropriate encryption algorithm and key length according to

different requirements to improve the security of data.

(2) Access control: Use access control technology to access control the data collected in the industrial Internet to ensure that only authorized users can access the data. Access control technologies include identity authentication, authority management, etc. Different access control strategies can be set according to different requirements to improve the security of data.

(3) Data backup and recovery: The data backup and recovery technology is adopted to regularly backup the data collected in the industrial Internet to ensure that the data will not be lost due to equipment failure, network failure and other reasons. At the same time, when the data is lost or attacked, the data recovery technology can be used to restore the backup data to ensure the integrity and availability of the data.

(4) Safety monitoring and alarm: the use of safety monitoring and alarm technology, real-time monitoring of the data collected in the industrial Internet, once the security loopholes or abnormal behavior is found, immediately alarm and processing, to ensure the security and reliability of the data. Security monitoring and alarm technology include intrusion detection, vulnerability scanning, log analysis, etc., which can comprehensively use a variety of technical means to improve the security of data.

6. Conclusion

To solve the problem of industrial Internet data processing, we need to comprehensively use a variety of technical means to improve the value of data and the quality of decision-making, and realize the intelligence and digitalization of industrial Internet. Adopt comprehensive security measures to protect the security and reliability of the data collected in the industrial Internet.

From the three aspects of data transmission, data processing and data security, this paper adopts the transmission mode based on the Internet of Things, distributed data processing technology and encryption algorithm and other technical means to improve the speed and quality of data transmission and ensure the data security.

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