Design of Intelligent Data Acquisition Platform for Wireless Monitoring of Rotating Machinery based on ARM

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Abstract: Rotating machinery is the most extensive type of machinery in the industry, which is the key equipment in many industries. Therefore, once the rotating machinery fails, it will cause huge economic losses, which requires us to monitor and diagnose the equipment status. Therefore, the rotating mechanical equipment must have an intelligent data acquisition system, which can collect the state of mechanical operation. Through real-time information collection, the rotating machinery can be monitored and diagnosed in real time, which will reduce the accident shutdown rate and maintenance costs. Therefore, the rotating machinery can reduce the production cost, which will avoid rabbit accidents and ensure the safety of production. Arm is an embedded computer system, which can be used for intelligent data collection flexibly. Firstly, this paper analyzes the application of embedded system in the rotating machinery monitoring system. Then, the hardware scheme and software of the system are designed.

1. Introduction

Mechanical transmission equipment is an important part of mechanical system, which needs the development of precision, automation and systematization of mechanical system. Therefore, we must ensure the safety and reliability of the mechanical system, which will require the information collection of ARM microcontroller. Through real-time information collection, rotating machinery can monitor and diagnose equipment in real time, which will reduce the accident shutdown rate and maintenance costs. With the rapid development of ARM embedded technology, we can monitor and reform the traditional rotating machinery, which will improve the accuracy and reliability of the monitoring system. The embedded system based on ARM microcontroller will monitor the mechanical transmission equipment more professionally. ARM microcontroller has many advantages, such as small size, low power consumption, high efficiency and so on, which will be more convenient for personalized configuration. Through the strain sensor and temperature sensor, we will monitor the transmission equipment, which will obtain the operation status of the transmission equipment.

2. Application of Embedded System in Rotating Machinery Monitoring System

2.1 Embedded monitoring system

Rotating mechanical equipment is a complex mechanical system, which can reflect a variety of operating states of the unit, such as rotor speed, radial vibration, axial displacement, switching signal, bearing temperature, internal lubricating oil temperature, pressure, flow and other parameters. These running state signals will change with time, which needs to build a powerful front-end data acquisition system. Through the acquisition system, we can adapt to and collect a variety of signals. However, most of the rotating machinery has a bad working environment, which will put forward higher requirements for the stability of the acquisition system. Therefore, based on the cost and operation characteristics, we often choose ARM embedded system, which will flexibly meet the requirements of multi signal acquisition. At the same time, ARM embedded system has
high reliability, which is an important requirement of front-end data acquisition and transmission. In recent years, with the development of arm's new electronic integrated chip technology, embedded system has a good performance in computing power, which can ensure the on-site calculation and analysis of state data. Embedded system technology has a very broad application prospect, and its application fields can include the following aspects, such as industrial control, traffic management and environmental detection, information appliances and home intelligent management system, POS network, etc.

2.2 Wireless sensor network technology

Wireless sensor network is an independent intelligent system based on wireless sensor network, which mainly involves multi-disciplinary comprehensive technology, such as MEMS, computer technology, communication, automatic control, artificial intelligence, etc. MEMS lays the foundation for the design and implementation of on-chip system, which makes sensor integration. As a result, wireless sensors are gradually developing towards miniaturization, low cost and multi-function. In terms of communication mode, a variety of wireless communication technologies are also developing rapidly, such as radio, infrared, sound, etc., which provides a variety of options for communication between micro sensors.

3. Design of Wireless Monitoring Data Acquisition based on ARM

3.1 Hardware design of the system

![Block diagram of the whole system](image)

Typical embedded system is mainly used in specific background, which is mainly based on embedded microprocessor. Through the configuration of signal acquisition circuit, data and program memory, I / O equipment, communication module, power management module, we can complete the hardware design. Embedded system is a special computing device customized for a specific application background, which needs to ensure the normal operation of the device. Therefore, the overall structure of the system is shown in Figure 1.

3.2 Overall hardware design

The wireless monitoring system of mechanical equipment can adopt separate control method, which can be divided into two parts, including data collector and data receiver. The data collector is mainly based on lpc1768, which can collect the internal operation data of the machine, as shown in Figure 2. The data receiver mainly takes S3C2440 as the core, which can install the embedded Linux system, as shown in Figure 3.
3.3 Design of wireless transceiver circuit

CC1101 chip has integrated the basic functional components of RF transceiver. Therefore, we only need to add a small number of external components, which will ensure that the wireless transceiver circuit of CC1101 works normally. The schematic diagram of wireless transceiver circuit is shown in Figure 4.

4. Data Collector Software

The main task of data collector is to collect temperature and strain signals regularly. Through the interaction between the wireless transceiver module and the data receiver, the system will execute the command of the data receiver. The program flow chart is shown in Figure 5.
Conclusions

Fault diagnosis of rotating machinery is an important part of modern enterprise management. Rotating machinery fault data acquisition system is advanced, which has very obvious features in the aspect of functional engineering. This method can easily obtain all kinds of characteristics of rotating machinery, which is very practical for measuring the characteristics of rotating machinery.

References