Research on the Application of Embedded Computer Technology

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Abstract: With the rapid development of network communication technology, embedded computer technology is gradually applied to engineering design and scientific research in various industries. Embedded microprocessors, hardware devices and processing systems with high reliability and high specificity have been widely used in various projects. As China enters a critical period of Industry 4.0, the application of embedded computer technology is bound to be widely used in the industrial development of China as a tool to improve the performance of certain equipment or systems. Based on the above background, this paper briefly analyzes the use classification and composition of embedded system technology, and then studies the development methods in the system development, hoping to provide reference for beginners.

1. Introduction

Embedded computer technology has already occupied an important position in various industries, and as a core part of the current development of Industry 4.0, embedded system has become a basic part of high-end industries. The Embedded computer is the product of a deeper convergence of industries behind integrated electronic systems, and a fixed program pattern that cannot be modified after being programmed. With the rapid development of China's industry, embedded system is bound to become the focus of China's future industrial development, with broad prospects for Development

2. Classification and constitution of embedded computer.

2.1. The classification of embedded computers

The embedded computer is only a computer equipment used for special requirements and purposes.It is a device that is set up to meet one or some special functions. This is just a computer system characteristic that is used to satisfy a specific function determines the diversity of its structure.At the moment, there are two main applications.

First, single-chip application mode.The single chip model is mainly for the realization of the traditional industrial system intelligence and the establishment of the embedded system.The system is mainly through 8-bit micro controller-based electronic system design,and the system's software and hardware is more casual to meet specific needs. In general, there is a lack of detailed engineering design, which is mainly applied to electronic systems.

Second, the chip processor application mode. With the rapid development of computer technology, the computing power of processors has been rapidly improved. And the use of embedded system is becoming more versatile, and is increasingly meeting people's needs for life, business, multimedia, and more.

2.2. The composition of embedded computer

The embedded computer technology consists of embedded system, which mainly includes processor, bus, interface, hardware structure, software technology and so on.

First, the processor.In order to improve the computing power and convenience of the computer, it is directly related to the choice of processor type. Currently, the main applications are Intel 8080, 80826, Pentium series processors.The series of processing in the embedded system and processing power has a good effect. So, we make the processor the core of the system.

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Second, the bus. In the embedded computer is directly related to the processing speed of the whole system, and the embedded system can effectively improve the speed of data transmission through bus technology. Therefore, the bus technology has an important role in the embedded system.

Third, the interface. Embedded computer chips or single chip processor must be mixed in the interface to connect the peripheral equipment. At the same time, it needs D / A, a / D, 1553, communication synchronization and other special interface. These general-purpose interfaces are primarily used for external connections to the processor, while special-purpose interfaces are primarily used for specific ports that perform a particular function. Therefore, the embedded system must have an interface, otherwise the system will not be functional.

Fourth, the hardware structure. The structure of the embedded computer must be embedded in one or more devices. Therefore, we must design the system to minimize its size and weight. At the same time, because of its embedded function, in most cases we also want to reduce its power consumption. Therefore, its hardware structure must form a smaller kernel hierarchy to ensure the accuracy of the device. through the program command settings.

Fifth, application software development. Compared with the general purpose computer, the embedded computer has a single function because of its simple structure. Therefore, we must design and develop the application software to realize the specific function of the device.

The embedded computer system structure is shown in figure 1.

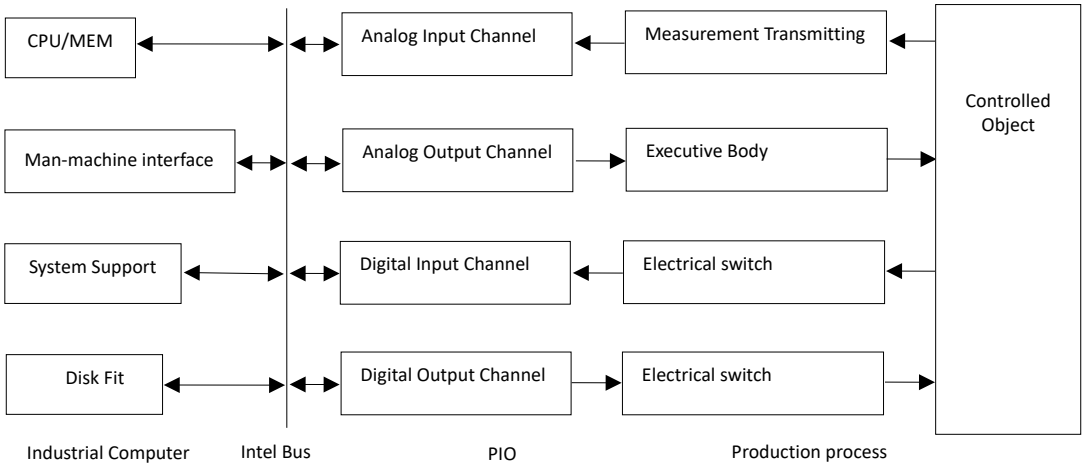


Figure 1 general embedded system structure

3. Theory of embedded computer system development.

3.1. Difficulties in embedded software development

Embedded computer system in our daily life can be seen everywhere, it has become an integral part of our lives. For embedded system products, the efficiency of software development and its quality are the key factors that directly affect the performance of the device. In the long-term software development, the quality, efficiency and integration of the system are the key factors. With the demand for quality of life and productivity, real time systems have become an important factor in embedded system development. The difficulties of embedded system are threefold:

First, the effective integration of software and hardware. We must take the compatibility of hardware into full consideration when designing software, and we must consider the function of the system and the type of interface and extended interface when selecting the hardware.

Second, the time sequence of the system is fully taken into account when designing the software. When designing software, engineers must consider the problem of communication and simultaneous transmission of information, which is a key issue for embedded system operating in a given environment.

Third, system information security and operability. Embedded system systems are widely used in

the military and aerospace industries, where information security and data recovery operability are critical. Therefore, engineers must ensure the information security and data recovery operability of the embedded system.

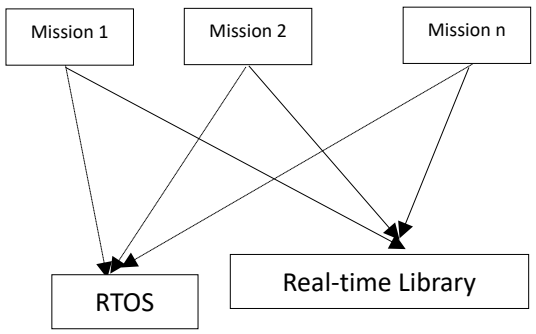
3.2 Methodology of embedded computer software development

3.2.1 Methodology of Structured Software Development

Structured software development methodology, which is the main development methodology of the embedded system. Embedded system is also the most widely used and mature software development method in the world. Engineers tend to use two different types of software development methods, single-task and multi-task, depending on the needs of the equipment. The single task program mainly takes the main program or interrupt subroutine as the scheduling module, and takes other processing as the event processing module. This allows the program to call the module automatically when the device meets the set program value. Therefore, the single-task program needs the corresponding language real-time library to meet the system operation, and its structure is more simple than other design methods. The multi-task model, on the other hand, uses different tasks as the basic unit to complete the program running module, so it needs the support of RTOS and running real-time library. The structured software development methodology model is shown in figure 2.

Main program loop module (or interrupted program):

```
while (1)
{
Deal with Event (cond 1)
}
Deal with Event (Event_ Typ cond 1)
{
//Call event handler 1deal with cond 1;
}
```



Legend:

Call the RTOS task communication module

Calling a programming language to run a real-time library of functional modules

a. Single task structuring b. Multitasking structuring

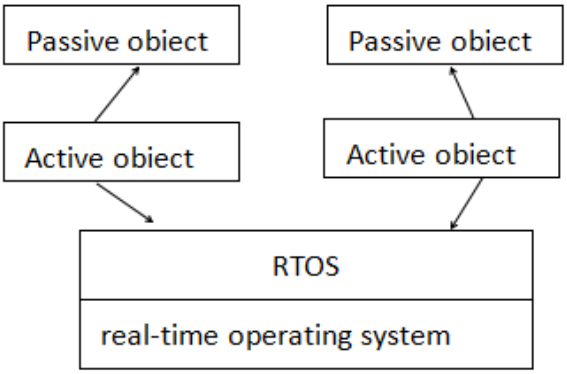
Fig 2

3.2.2 Method of object-oriented software development

Although the structured software development method is the most widely used, it has great defects in high-complexity and large-scale software development. The software development method is relatively poor in system scalability and maintainability. Therefore, when designing more complex systems, engineers often choose the object-oriented development method. The object-oriented software development methodology model is shown in figure 3.

3.2.3 Methodology of component-based software development.

Component is an opaque functional entity that can be produced, acquired, and deployed separately. They can interact with each other through interfaces to form a functional system. Component-based software development method first considers the function of component and its interface function, and these functions will become an important method to improve the quality and efficiency of software development. Through the component-based approach, engineers can directly apply the integration program to the device. The component-based Software Development Flowchart is shown in figure 4.



legend:

Call the RTOS task communication module

Calling a programming language to run a real-time library of functional modules

Figure 3: Object-oriented software development method model diagram

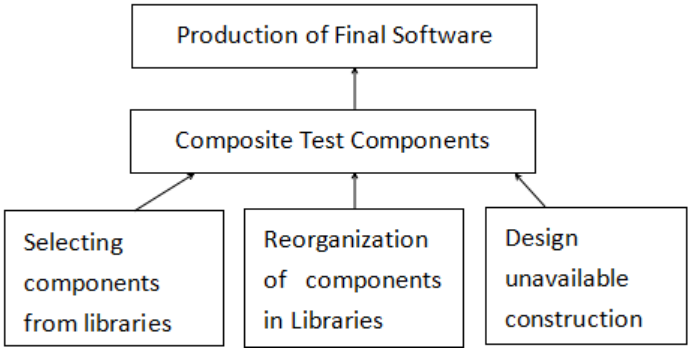


Figure 4: Component Software Development Flow Chart

4. Conclusion

The application of embedded system technology will certainly be used as a tool to improve the performance of some equipment or systems, and embedded system has become a basic component of high-end industries as China enters a critical period of Industry 4.0. Although China has made considerable progress in the embedded system, there are still some problems. Our country still needs to deepen the study of embedded system, and our industry will gradually expand its competitiveness.

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