

Design of Machine Structure and Control System Based on Embedded Linux Console Terminal Driver

Di Xu^{1, a, *}, Ming Chen^{2, b}, Xuanping Mou^{3, c}

¹Mechanical manufacturing and automation, Zhejiang Sci-Tech University, Zhejiang 318020, China

²Accounting, Beijing Technology and Business University, Zhejiang 318020, China

³Accounting, National Open University, Zhejiang 318020, China

^aemail: 5614311349@qq.com, ^bemail: 158518628585@163.com, ^cemail: 1573101163@qq.com

*Corresponding Author

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Abstract: With the continuous development of information technology and numerical control technology, the network management of numerical control industry has become inevitable. Aiming at the problem that there is no remote monitoring platform for some old machine tools, the design and implementation scheme of remote monitoring system for CNC machine tools based on embedded Linux is proposed. The LCD driver is tested and validated on the experimental platform of distribution transformer monitoring terminal. The results show that the terminal can not only provide basic personal information management and telephone call management functions, but also realize network functions such as browser, email and MSN Messenger, making the telephone a convenient and practical intelligent information terminal.

1. Introduction

Since its initial public release in 1991, the scope of application of Linux has become more widespread [1]. The early CNC machine tool monitoring mainly relied on the staff to monitor the machine in front of the machine, including checking the working status of the machine, inputting control commands, program code, etc. When the machine fails, it can take immediate measures for maintenance [2]. As a new generation of display device, LCD can display characters, Chinese characters and graphics, and has many advantages such as low power consumption, small size, light weight and ultra-thin, which can meet the increasingly improved performance of human-machine interface of distribution transformer monitoring terminal system. Request [3]. On the other hand, the telephone line is the most convenient means of network access. In order to ensure the health needs of urban residents and reflect the superiority of socialism, the State Council issued a series of relevant policies, which emphasized the importance of speeding up the construction of primary health care institutions in health clinics and increasing their modern medical equipment and instruments. The financial tsunami also aggravated the pain of economic transformation and upgrading in the Pearl River Delta and Yangtze River Delta, but also accelerated the national agenda of deepening reform and transformation and upgrading [4]. It can be seen that in the development process of Linux, terminal equipment undertakes the function of information exchange between the system and the outside world, and plays an important role in the system development. However, the main difference between the kernels used in embedded systems and those used on workstations or servers is the configuration used to build the kernels [5].

Linux is often used to refer to terms such as the Linux kernel, Linux system or Linux distribution suite. This kind of monitoring method has high requirements for staff. Firstly, staff should have a special understanding of machine tools, especially when there is a fault, they should be able to make quick and accurate judgments, and there is a large demand for professionals [6]. At present, the design of transformer monitoring terminal system in the market is mostly based on embedded

technology. The hardware adopts ARM processor with high cost performance and the software adopts embedded Linux operating system. This makes the transformer monitoring terminal have the advantages of high precision data processing and strong data management [7]. Whether it is traditional dial-up access, ISDN access and ADSL access, it is a very popular telephone interface [8]. According to the data surveyed by the China Medical Device Association, the penetration rate of medical monitors in China is constantly increasing. At the same time, the Chinese government is also increasing investment in medical and health construction at all levels, and the number of medical devices in medical and health institutions will increase substantially, thus promoting the rapid development of the medical monitoring equipment market [9]. With the successive introduction of a series of positive measures and the acceleration of the transformation and upgrading of the manufacturing industry, it is imperative for equipment manufacturers to use their own automation technology to arm the “self” technology, and the market demand for energy-saving and environmental protection related products will be greatly increased [10].

2. Methodology

With the rapid development of all aspects of small towns and rural areas in China, the construction of water supply systems has also been greatly improved, but the infrastructure of small towns in different regions is very different, and the development is very uneven. In a Linux system, a terminal is a character device that includes a console, a serial port, and a pseudo terminal type 3 device terminal. At present, the MSP430 series of single-chip microcomputers produced by the company are used in the market. These single-chip microcomputers have the advantages of low power consumption, reduced instruction set and rich addressing modes, and some low-power op amps and analog switches. Such components can effectively achieve the low power consumption requirements of portable terminals. The intelligent telephone information terminal based on embedded Linux system proposed in this paper combines computing function with telephone function organically. In addition to managing basic personal information (such as phone number, email address, photos), it can also provide telephone incoming and outgoing management. The interface provides a method to process images on hardware devices. With the rapid development of information technology, CNC technology is also facing new challenges. In addition, some machine tools with dangerous working environment, such as high temperature working environment, high speed cutting, will cause physical hazards to workers, and the noise environment in the workshop is also a major threat to health.

The whole embedded Linux operating system is composed of four parts: device driver, Linux system kernel, file system and application program. The framework of the system is shown in Figure 1.

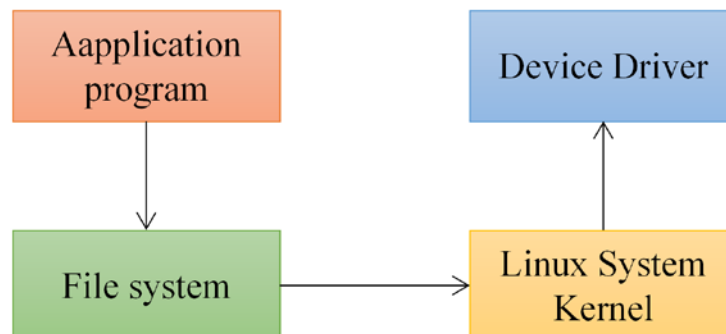


Fig.1. Composition Table of Embedded Linux System

With the continuous development of science and technology and numerical control technology, machine tool monitoring technology far away from dangerous working areas has emerged. However, the distance of monitoring host computer can not reach remote, and generally a monitoring host only monitors one machine tool, and can not complete the unified management of multiple machine tools. Because the kernel is constantly updating, a numbering scheme must be used to distinguish

between specific releases. The significance of monitoring and controlling CNC machine tools in network environment is to expand the scope of operator's control over the operating objects and improve the convenience of managers to master the operation of processing equipment. It is conducive to the sharing of manufacturing resources, and achieves the purpose of fully improving the utilization rate of NC equipment. The TFT is a FET structure, and its gate current is small. The increase in the number of rows and columns of the LCD does not increase the driving voltage, so the TFT-LCD can be made into a high-resolution display. When the TFT is turned on, the source and drain resistances are small. When the TFT is turned off, the source and drain resistances are large and approximate to an open circuit. At present, China's telecom industry is experiencing a transition from voice services to data services. Lagging terminals cannot effectively support this transition, so various telephone terminals with enhanced functions and data services have appeared on the market. Making the phone an intelligent and versatile personal information terminal is a new strategy for major telecom operators and communication equipment manufacturers.

EXT2 is the standard file system for Linux and the most successful file system to date. The EXT3 file system is an open source log file system that inherits the features of the EXT2 file system and can be called the upgraded version of the EXT2 file system. Therefore, the characteristics of the main file system of the embedded system are compared, as shown in Table 1.

Table 1 Comparison of file system features

File system	Can be written	Permanent	Compressed
JFFS2	Yes	Yes	Yes
EXT3 on NFTL	Yes	Yes	No
EXT2 on RAM disk	Yes	Yes	No

3. Result Analysis and Discussion

Power consumption is a key factor that must be paid attention to in the design of portable terminals. The heat generated by chips that dissipate too much heat can easily cause temperature drift of ECG signals. Selecting low-power components and properly setting the component layout can reduce the ECG signal error caused by temperature drift, prevent the portable terminal from overheating and bring the discomfort to the ward, and extend the terminal's battery life. China's rural population has a large base and a large proportion of the rural population. Due to the improvement of various aspects of people's lives, the rural people have new requirements for water quantity, water quality and water pressure, and no longer meet the situation of water in a few days a week. As various computer technologies gradually enter people's daily life and work, there will be many embedded systems in the living environment. The systems connect through the Internet and form an organic whole. Therefore, an industrial field control device based on LCD touch screen terminal and PLC controller is proposed. This control device has the advantages of low cost, small size, low power consumption and easy installation. It is very suitable for water pressure control in small towns and villages. More importantly, by accessing the Internet, it can also achieve basic network functions such as browser, e-mail and MSN Messenger. And it can expand any function by rapidly developing various application software. In Linux system, device drivers are loaded in two ways: one is to compile them into the kernel as part of the functional modules of the operating system, that is, static loading.

As shown in Figure 2. In the case of an operating system, the device driver architecture is defined by the corresponding operating system. The driver must be designed according to the corresponding architecture, so that the device driver can be well integrated into the core of the operating system.

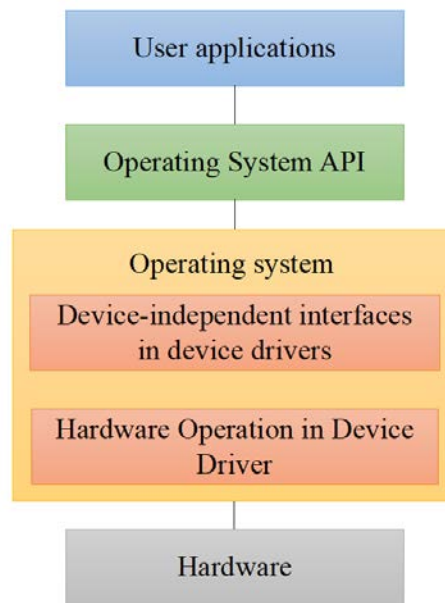


Fig.2. The relationship between hardware, device drivers, operating systems and Applications

At present, many small towns and countryside water plants have very single type of water supply equipment, and their dispatching is not flexible, which results in a waste of resources. More small water plants, due to the unreasonable allocation of pumps, have the same water supply volume and pressure during the day and at night, resulting in a large amount of waste of resources and energy. On the whole, the water supply system in many small towns is insufficient, the water quality is poor and the water pressure is low, which can not keep up with the people's living and production needs, and seriously restricts the development of local economy and the improvement of urbanization level. Therefore, the National Medium and Long Term Science and Technology Development Plan has clearly pointed out that industrial automation technology is one of the most important technologies in modern equipment manufacturing industry in the 21st century. Linux uses a hierarchy to facilitate the development of Framebuffer programs. It provides a system call interface for the upper layer of user space, and can also provide a driver interface for the underlying specific hardware. The underlying hardware driver needs to register with the kernel with this interface. The embedded industry has developed rapidly and its application fields have been expanding. When it is combined with network technology, multimedia technology and industrial control technology, it has also exploded with strong vitality, showing a vigorous upward trend. Therefore, the application of industrial automation technology to achieve measurement, control, optimization and decision-making in the industrial production process is an important means for enterprises to achieve "multiple, fast, good, and provincial" and enhance the competitiveness of the enterprise market. Although it does not have obvious boundaries with character devices, block devices pass through the system's fast buffering, while character devices do not pass through the system's fast buffering. The advantage of dynamic loading is to greatly simplify the development process, so that the development of driver module can be independent of the Linux kernel, program errors will not affect the normal operation of the system.

4. Conclusions

The Linux kernel has good support for terminal devices. For pseudo terminals and console terminals, the kernel already has good drivers. As a typical application object of numerical control technology - CNC machine tools, its high degree of automation, high speed and high precision will inevitably put forward higher requirements for CNC machine tools and related equipment and devices. This paper provides a design and implementation of intelligent information terminal based on embedded Linux. Through the transplantation and improvement of ARM Linux, driver adjustment, QT/Embedded and desktop system integration, a large number of application

development, making intelligent information The terminal becomes a practical telephone terminal. However, with the rapid development of various industrial control technologies at home and abroad, as well as the demand for industrial control terminals in the domestic market, embedded industrial control terminals are not only applied to water pressure control in waterworks, but also to industrial control, medical treatment, military, natural exploration and other aspects. Embedded industrial control equipment can not only be in close contact with users, but also provide a very friendly user interface, which is very simple and convenient to operate. With the increasing automation level of power system, the user's requirement for the man-machine interface of distribution transformer monitoring terminal system is becoming higher and higher. But after all, the embedded field is a multi-disciplinary field, and the operation, control and real-time monitoring of CNC machine tools is also a very complex process. Therefore, the monitoring system based on embedded CNC machine tools still has a lot of work to be further studied and developed.

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