

Mobile terminal based on QT notepad program design and implementation

Wenjuan Zhang

School of Computer Science and Technology, Zhoukou Normal University, Zhoukou 466001, China
zhangwenjuan@zknu.edu.cn

Abstract

Recent years as the rapid development of embedded system by using the graphical user interface (GUI) development system application method, had be used by lots of developers. This topic is use the environment of the QT, and study a notepad in the QT, and developing from the notepad to embedded system. In the current era of intelligent end embedded system gradually, embedded has in-depth to all aspects of people's life, the development of the embedded system is in a prosperous stage. This topic is study- ding a daddy-used notepad to lucubrate the embedded system, and can be done an embedded system.

Keywords

The Graphical User Interface; GUI; QT.

1. Introduction

1.1 Purpose and significance of the subject

The research and design of this subject is a mobile terminal notepad software, which belongs to the category of embedded system. An embedded system is a dedicated computer system or chip that centers on applications and places an object inside. This system has very strict requirements for security, practicality, etc. Generally, embedded consists of microprocessor and peripheral equipment and its special operating system, which is used to realize a function with clear purpose and performance. This thesis is about the design of a mobile terminal notepad program, and the design and research of embedded system through the program. The system mainly USES QT platform as the editing environment, USES C++ language to write the program and realizes notepad function. Finally, the program is migrated to the development board through the terminal command [1].

With the rapid development of modern science and technology and the interconnection between computers and the global Internet, today's society has entered a computer-centered society. For such a convenient social life, embedded system plays an important role. Mobile terminal applications, for example, are embedded systems. Secondly, the rapid development of embedded systems has also led to the progress and initiation of many industries. The research on embedded systems is the trend following the development of The Times, and it is also one of the ways for us college students to make a living and start a business in the future.

1.2 Development history and prospect of embedded system

Nowadays, embedded system has a long history. Up to now, embedded system has spread to every aspect of social life, and almost every direction has its good prospect.

Microprocessors emerged in the 1970s and were widely developed and accepted for their innate characteristics, such as low price, small size, and high integration. This kind of microprocessor was first used to embed into the interior of a large object, thus realizing intelligent control, and thus the embedded system was born [2]. Over the years, the demands of embedded applications have changed and affected every aspect of people's lives.

With the gradual popularity of embedded technology, it has penetrated into the field of communication and electronic consumption. Software, integrated circuits and new components are playing an increasingly important role in industrial development [3]. In terms of hardware, there are not only microprocessor chips of major companies, but also various supporting development kits for

learning and research and development. In terms of software, there are also some mature software systems, such as foreign embedded real-time operating systems such as WindRiver, Microsoft, Nuclear, etc., and Chinese embedded system software such as DeltaSystem, the embedded software development platform of keyin company, and Hopen embedded operating system of Chinese academy of sciences [4]. The current hot applications in China's embedded system market include: Android system and external applications, consumer electronics, security and defense, e-commerce, automatic control, intelligent automobile, power system management, etc.

Digital age makes the embedded products have obtained the huge development opportunity and shows good prospects for embedded market, at the same time, it puts forward a new challenge for embedded manufacturers, the future development trend of embedded system are: system engineering, functional diversification, networked, friendly interaction and the kernel to streamline and low power consumption, etc. [5].

2. Notes system overview

2.1 Overview

This project is to write a notepad terminal application software using QT under Linux environment. Then this software is combined with the embedded system development board to study the realization process and principle of the terminal application program to the embedded system. Need to use the Linux operating system as a test environment, and ultimately selecting Fedora14, Qtopia2.2.0, FriendlyARM development board to achieve the study of the embedded system.

2.2 Demand analysis

The notepad to be implemented in this project includes the main functions of creating, deleting records and keeping records. In addition, there is the internal expansion function of notepad: copy, paste, cut and so on.

Secondly, we should study and study the QT compilation environment in depth and detail, and study the implementation of QT graphical user interface. After implementing the above functions, we will have a deep understanding of embedded [6]. Through this course design to achieve a deeper understanding of embedded, it will be easier to accept more in-depth embedded system knowledge in future work and study.

2.3 Introduction to the development platform

QT can be divided into four versions according to different graphics systems: Win32 version, suitable for Windows platform; X11, for various Linux and Unix platforms that use x; The Mac version works for apple's MacOS; Embedded version is suitable for Linux platform with frame buffer [7].

QT's good modularity and repeatability stems from its unique packaging mechanism, which makes it easy for developers to design. Its object orientation, extension and macro have brought great convenience for developers to develop iOS and Android [8]. In addition, the security type of QT used to be callback, but now this type has been replaced by signals/slots, and the result of this change is that the coordination between components becomes very simple [9]. Qtopia is an embedded desktop system with a variety of applications. Qtopia has three versions: mobile phone, electronic product platform and PDA. The mobile version is mainly designed for embedded Linux, and is mainly used for middle and low-end intelligent mobile terminals. Electronic product platforms for application software developers; PDA, a powerful and intelligent platform with a well-defined interface, is a promising version of Qtopia.

Signals and slots are an important feature of QT, which is its inherent toolkit. Linking the instructions received from one trigger point in the graph window to other trigger points or other parts is a common method to use QT to write the graphical interface, namely, signals and slots mentioned above. An instruction received by one trigger point ACTS as a signal, and an operation performed by another trigger point receives the signal is called a slot. This can be used both in the graphical interface and in the program code, and it is very convenient to use the signal and slot mechanism [10].

The past for the connection between the code and the object parts, need to pass an argument by using correlation function pointer to the target object parts, which requires that the callback function code and an object components related to implementation, this approach tends to appear the phenomenon of a system crash, the disadvantages of the traditional way of connection has certain limitations [11] and development. Now, the QT signal and slot mechanism are adopted. The window of QT will excite the signal after the event occurs. The developer needs to create a slot, connect to the object widget, and connect the slot to the signal by calling related functions.

The embedded hardware development board used in the experiment is the FriendlyARM FriendlyARM P43, Mini2440[12]. In addition to the basic self-starting hardware, there are interfaces for connecting to PC, such as 100M Ethernet rj-45 interface, USB Host, I2C bus, JTAG interface and so on. JTAG interface is used to burn and write BootLoader for development board, which is an important interface for studying embedded development board. The development board is designed with NOR/NAND Flash switch at the time of delivery. When the switch hits NOR Flas, the BIOS setting interface will be activated when the switch is started. When the switch hits NAND Flash, open the switch development board and the switch will start normally. The serial port RS232 is used to connect the USB of PC, which can be used to operate the development board with remote control in PC terminal or as the channel to transmit data.

3. Embedded system migration

3.1 System migration overview

B/S The implementation for program burn is in the VMware virtual machine. The system used in the experiment is Qtopia under Fedora14 to realize the development and design of the program. Since we can edit the program independently in the virtual machine, and use the super terminal or SecureCRT to realize the control operation of the development board in the physical machine, the above two operations can be completed independently and without interference, which brings convenience to the implementation of the program. In addition, the external environment of the development board used in this program is Linux, which corresponds to this.

An embedded system that contains both BootLoader, kernel boot parameters, kernel images, and solid-state storage devices with file system images, such as Nand Flash for the development board used in this project.

From a software perspective, an embedded system, in turn, follows the file system (system commands and applications), the Linux kernel (embedded specific kernels), and the boot loader (firmware boot and BootLoader). This project requires preparation before transplanting notepad.

3.2 Establish the experimental environment

(1) What needs to be done is to transplant u-boot. U - the Boot is commonly referred to as the BootLoader, is to load a pattern of the whole system start, in the experiment chooses the superboot, because supervivi the kernel after decompression, CRC check error, the system is hang up directly. Specific operation:

(2) Although the kernel is large, it is not troublesome to compile. Using the command `cp config_mini2440_P43. Ocnfig` command, you can configure the file `config_P43` under superadministrator authority in Fedora. The command `make menuconfig` is then used to call up the configuration kernel interface. Type the `make zImage` command to start compiling the kernel. Compiling the kernel is similar to installing software, and choosing a line of files for installation is like a file system. The completed kernel will generate the image file `zImage` under the `arch/arm/boot` directory. (3) transplantation of Linux kernel can be carried out by using a convenient method, namely MiniTools. It is relatively simple to use this software to burn the kernel, switch to NOR Flash, select the Linux image and root file system. See figure 6.

(4) Complete the migration of Linux kernel, and then enter the construction of development environment. Install Fedora14 on Linux. Next, add a user, create a login password, set the network adapter to "Bridge", and set up a Shared Windows folder and cross-compile environment. This is

because the instruction set of development board ARM is different from the CPU instruction set of PC, and the method is adopted to avoid frequent switch Settings during development.

3.3 Writing of notepad program

(1) Perform Desinger and write the program. So let's go ahead and create the.UI interface file. The operation interface of the graphical interface design program under Qt Desinger is similar to Qt Creator.

(2) In the terminal command, enter the main file directory of the program and rewrite the notepad program code with vi editor: vi main.cpp. Also use vi editor to write.h header files, as well as.cpp source files, and finally write.pro engineering files.

(3) Under the program source directory, compile (or cross-compile).cpp,.h,.pro files using the./build command in the current directory, and finally generate the executable files that need to be migrated to the development board.

(4) Production of. Desktop files. This file is used to connect to the development board desktop and executable file after the program is written to the development board. Desktop was written with fixed format commands and will not be studied in detail here. Take the file in a finished embedded application and modify it.

(5) Will be compiled executable file, and. The desktop file download and desktop icon to the right path of development board (desktop ICONS. Download the PNG to development board/ opt/ Qtopia/ pics directory, Download the desktop to/opt/ Qtopia/ apps/ applications/ directory, download executable file to/opt/ Qtopia/bin/directory). The download method can be copied to the development board via SD card and moved to the correct directory with terminal commands on the development board. The serial port can also be sent to the development board via the SecureCRT. The second method is more convenient. On the CRT terminal, the command rz can be used directly to send the files on the PC to the development board. Finally, give the executable file permission: chmod +x ***, restart the development board, and test the system.

4. Summary and outlook

This program design and implement notepad basic functions and several extended functions, can meet the test requirements. Compared with the current popular mobile terminal notepad program, this program has many deficiencies, but as an embedded system research has been able to meet the requirements. The development of embedded system is increasing day by day. Learning and studying embedded system can not only exercise our professional ability, but also lay a good foundation for future work. For college students who are about to enter the society, it is a rare opportunity to study embedded systems.

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