The Software Design of Textile CAD Based on ARM

Jiaxi Liu, Yuecun Wang
School of Textiles, Tianjin Polytechnic University, Tianjin, China
Email: liujiaxiya@126.com

Abstract: In this paper, it introduces the system which is based on ARM11 of Guangzhou Tianqian computer Co., Ltd. for processor, Linux for Embedded system and Qt/Embedded for Graphical user interface to us, and the textile CAD software can run in the system. This system is simple, friendly interface, easy to use and highly practical.

Keywords: ARM; Linux; Embedded system; textile CAD; Qt/Embedded

1. Introduction

In recent years, with the development of Science and Technology, Computer, application and popularization of internet technology and breakthroughs in microelectronics technology, the Embedded system is development and growth. The Embedded system is one of Computer Applications, such as Microcontroller, Microprocessor, DSP and ARM. The Embedded system which is centered on Application, based on computer technology and the hardware and software can be cut is strict dedicated computer system which is suitable for functionality, reliability, cost, size and power requirements. The Embedded system is consist of Embedded Microprocessor, Hardware peripherals, Embedded operating system and the user's application.

2. The design of system hardware

2.1. System terminal framework diagram

The system uses the S3C6410XH-66 which is based on ARM11 processor which is made by Guangzhou Tianqian computer Co., Ltd., the ARM11 has Ethernet Chip, SD card slot, Serial ports and so on. The interface of the system is made by Qt/Embedded and the system kernel uses the latest Linux2.6. As shown is Figure 1.

2.2. The main chip S3C6410XH-66

S3C6410XH-66 is made by Samsung, the design of the development board uses the floor plate with the core. The core-board integrated Samsung 533/667M CPU S3C6410, 128M Mobile DDR, 256M Nand Flash and double 4-pin 1.27mm needles. It is a 16/32 bit RISC microprocessor, focus on a variety of functions including 256M Bytes NAND Flash, 2M Bytes Nor Flash, a 100Mbps Ethernet interface, Han Ren RJ45interface, DM9000AE lan chip, AC97 Audio interface, WM9714 chip which is made by Wolf (a headphone audio output, MIC input, LINE IN input), a EEPROM (using I2C protocol), a USB HOST's Interface (has the resumption of the insurance protection devices using external power supply system), a USB 2.0 HS OTG (with mini-USB AB-type interface), two high-speed SD card interface, a SDIO WIFI wireless lan (supports IEEE802.11b/g protocol), two 5-wire serial interface, road 3-wire serial interface (chip using two SP3232EEA, 3-way RS232 output, baud rate up to 115200bps), a LCD interface (includes 4-wire touch screen signal and all the signals of LCD controller, use FPC5.0-SMT-40P connector), a camera interface, a TV OUT interface and a JTAG interface. S3C6410XH-66 provides a comprehensive, universal chip peripherals greatly reduces the system outside of the circuit components in addition to the processor configuration so that it minimizes system cost and meet the requirements of Embedded.

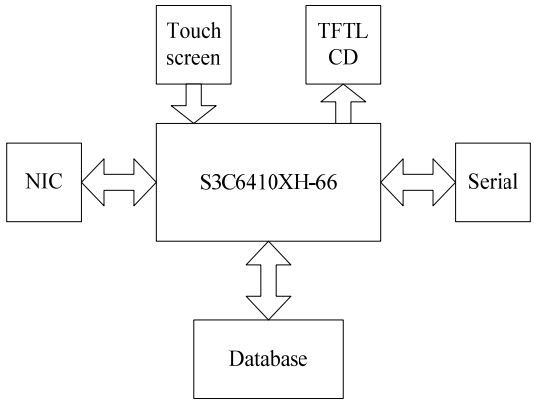

Figure 1 system terminal framework diagram

3. System function

The system includes a fabric design, pattern and fabric color mode simulation and so on.

4. Realization principle

In order to have good interaction with the user we need to design user-friendly graphical interface. The Qt/Embedde d and Mini GUI is the common graphical interface.

Qt/Embedded is based on GUI and Embedded application development kit that can run on multiple Embedded devices, mainly running on Embedded Linux systems,

978-1-935068-40-2

and requires C++ compiler support, and provides a standard API for Embedded application. Qt/Embedded GUI application development is divided into: bottom-driver development and the design and development of human-machine interface application.

4.1. Bottom-driven development

Textile CAD software based on Qt/Embedded interactive interface requires not only a powerful graphics engine on the LCD to support, but also of some of the input/output devices to interact with the system user-friendly. Because of different underlying of the hardware and software platforms is different, in order to make devices and device drivers for input/output engine with good support, we need exploit the specific driver for the specific platform. Qt/Embedded has a good input/output driver interface (such as a mouse device driver, LCD driver, serial driver, etc.), so the human-computer interface has the level of clarity and the steps to understand in the bottom-driver interface.

Qt/Embedded in events related to user input signals, is based on the underlying interface to call upon the input device, usually through reading and writing files on the device to achieve. Qt/Embedded input device is divided into the mouse and keyboard class category. Input/output device drivers of basic have been encapsulated in the Qt/Embedded library and formed the corresponding device driver interface, such as a mouse, keyboard, serial, parallel driver, etc..

Textile CAD system of Embedded mainly uses the I/O device is a touch screen to operate on the man-machine interface and inputs relevant data. To establish device file nodes under the touch screen and load the device driver modules into the Embedded Linux kernel, the application can read and write files on device to realize the operation of the equipment.

4.2. Development of human-machine interface application

Man-machine interface design process the application. As shown is Figure 2.

1) Built form

QtDesign is a design tool of visual user interface. QtDesign will start a Qt component contains many visual interface and use C++ language under bin directory. When open QtDesigner-File/new, we can build a new component (such as Form) and select Widgets dialog, the graphical interface contains a dialog box and the main window which can placed the menu, tool bar and other child widgets.

2) The mapping signal and slots

Tool kit use the previous callback and message mapping mechanism easy to collapse, not robust and supported by QtDesign designer signals and slots mechanism provides a communication mechanism between objects so that GUI application on the user's action may be able to make quick response. When the user clicks on a menu item or toolbar button, the application will execute the corresponding code.

3) Generte header and implementation files

After the above we should save the file is an XML language text after the interface design form.ui. According to the form.ui and form.cpp we can use the uic tool to input in the Qt's bin directory:

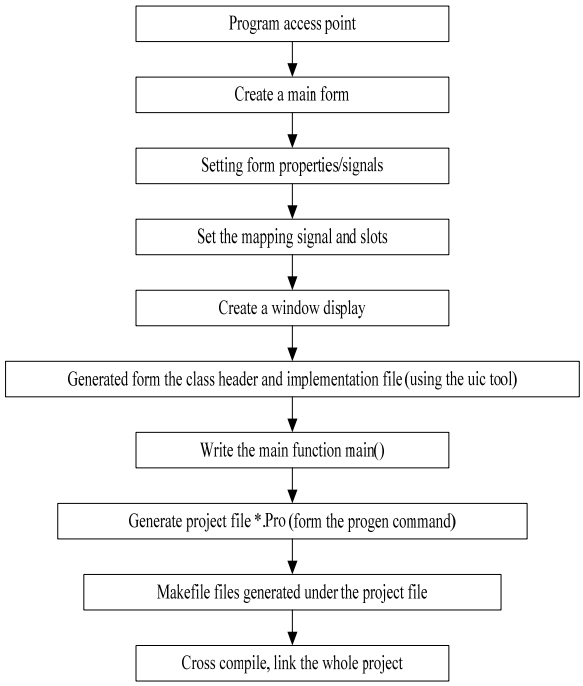

Figure 2 Man-machine interface design process the application

uic – o form.h form.ui
uic – o form.cpp – implform.h form.ui

We can see the code just generated from the generated file by form.cpp and vi. Form.h.

4) Write the main function

Qt application contains a main function is the entry point of the application and the preparation of the framework are as follow:

```
#include < qapp lication. h >
#include " form. h"
int main ( int argc, char * * argv)
{
App lication app ( argc, argv) ;
QWSDecoration * deco = new QWSDecoration ( ) ;
app. qwsSetDecoration ( deco) ;
app. setStyle ( new Style) ;
QApp lication app ( argc, argv) ;
Form * form = new Form;
app. setMainWidget ( form ) ;
```

```
form - > connectDeco ( deco) ;
form - > setFixedSize (320, 240) ;
form - > resize ( 200, 200 ) ;
form - > show ( ) ;
app. connect ( &app, SIGNAL ( lastWindowClosed ( ) ) ,
&app, SLOT( quit ( ) ) );
 int result = app. exec ( ) ;
delete form;
delete deco;
return result;
}
```

5) Generate the project and build the Makefile
Applications usually correspond to a project file, then the progen generate a test pro of project which is handled by a special tool (tmake or qmake), last you can generate a Makefile file.

5. System software design

As shown is Figure 3. Firstly we turn on the S3C6410XH-66, secondly read Uboot program from NorFlash, thirdly initialize some of the hardware, then run the kernel Linux Kernel, after that run the file system, finally, add some drivers. After system startup, you can run the main program of textile CAD software and the main interface appears, finally the user can click the button to select the appropriate function.

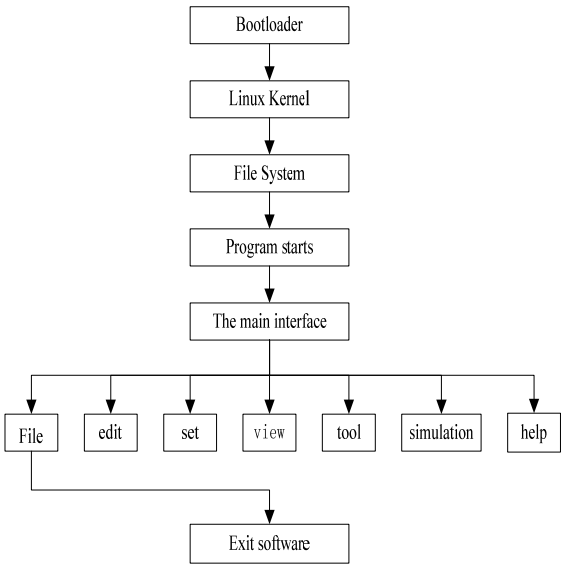

Figure 3 System software design

6. System migration and testing

In the PC, we should install the vmware virtual machine and install the Redhat5 system in the virtual machine. Through the above steps, we can transplant and test the soft of textile CAD.

7. Conclusion

Embedded technology is closely integrated with the practice of technology, if we want to master it, we should use the theoretical knowledge into practice. Through the development of this system, we mastered the Embedded hardware design, Bootloader, Embedded Linux operating system, Linux driver development and QT GUI development.

This ARM-based textile CAD software not only can be used in student's experiments, can also be used in industrial field with good practical. Because to the limited of ARM hardware condition, this system has some disadvantages, such as no database support, so we will join the function in the future.

8. Acknowledgment

Special thanks to the library of Tianjin Polytechnic University for providing the Embedded information.

References

[1] Xiaodong yang, Yuangen Mi, "The design and implementation of Embeddeed ordering system based on ARM", Network Security, pp. 39–41, October 2010.
[2] Hong Lu, "Simple discussion on the development tendency of embeded system", China Construction Education, vol.10, No.10, pp.51–54, October 2006.
[3] Jiangfeng He and Wenbiao Wu, "Development of Qt/Embedded Graphical Interface Based on ARM920T Embedded Linux System", Electronic Engneer, vol.33, No.7, pp. 46–48, July 2007.
[4] Yang Liu, "Application of Qt/Embedded and embedded Linux in intelligent monitoring system", Journal of Computer Applications, vol.30, pp. 289–291, June 2010.
[5] Zhouguo Chen and Shengyin Wang, "Implementation of remote monitoring and controlling GUI application based on Linux QT", Communications Technology, vol.42, No.12, pp. 234–236, 2009.
[6] Hongjian Zhang, Zhengming Li and Tianhong Pan, "Design og embedded chemistry analyzer man-machine inteface based on QT/Embedded", Machinery Design & Manufacture, pp. 4–6, October 2009.
[7] Yong Wang and shuai mao, "Design for automatic control system of temperature and humidity in a communications center based on ARM", Journal of Chongqing University of Technology, vol.24, No.7, pp. 97–99, July 2010.