Research on Course of Integrating Android Development and Embedded Software

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Abstract. At present, embedded technology professional Android application development courses and embedded software development courses are independent. Two courses linked less, cannot meet the requirements of enterprises. This paper combines the Android application development course with the traditional embedded software development courses. The design of training content based on intelligent car and Android smart device. Android smart device control intelligent car, students through training to achieve the purpose of combining two courses. Embedded system major students can meet the requirements of enterprises.

Introduction

With the increase in the number of Android intelligent devices and the wide range of applications, the establishment of Android courses increased. Curriculum is mainly based on Android SDK application development. Embedded technology should be set up of Android courses to deal with the development, but the Android application development course is mainly UI interface development, not suited to the characteristics of embedded software and hardware combination.

Part of the college set up embedded professional courses using either traditional hardware control courses such as ARM platform related courses, embedded Linux related courses, or open Android application development courses. At present, there is no college to set up the combined course of embedded and Android, this paper designs a combination of Android and embedded training courses to improve students' professional ability.

Combined Android and Embedded System Course Design

General Curriculum Design

This course is designed to teach students to develop Android smart device software linking to embedded device software. Embedded device design an intelligent car embodies the function of embedded software. Android smart device control intelligent car, intelligent car can collect environmental parameters to Android smart equipment. At the same time the smart car mounted camera, camera data transmission through the network to the Android smart device display.

Through Android the button above the UI can be based on video camera smart car manipulation. Intelligent car collection through the environmental sensor real-time acquisition of various environmental parameters. These parameters are transmitted to the intelligent car central control module through the IIC module. Finally, the intelligent car central control module is passed to the Android smart handheld device control module through the Wi-Fi module, so as to realize the real-time acquisition and trend analysis of environmental information. The whole process is shown in Figure 1.
According to the teaching objectives, the intelligent function of Android intelligent control device is divided into the following modules, including the intelligent car side of the environment sensor detection module, sensor data management module, real-time network data communication module and Android smart device display control module.

1. The realization of environmental sensor detection module

Environmental sensors installed in the smart car can collect the environment temperature and humidity information. In this module, the integrated value of each sensor is obtained from the driver software by the way of continuous loop. Intelligent car through the temperature and humidity of the traditional numerical processing obtains the desired results. For example, the temperature and humidity sensor, driver software through a combination of 0 and 1 respectively to binary obtain temperature and humidity acquisition, 8 for obtaining high humidity and low temperature data of 8 bits of data, finally through the numerical correction of temperature and humidity to get results.

2. Implementation of sensor data management module

In this system, all the client links will be managed by the sensor data management module, which is also the link management module of Android intelligent device. After the temperature and humidity data are obtained by the sensor, the data is sent to the Android intelligent device of each link. When the Android intelligent device sends a smart car control command, the module sends the received control data to the smart car control module through the serial port.

3. Implementation of Socket thread pool module

The thread pool is a multithreaded process that adds tasks to the queue and then automatically starts the task after the thread is created. Thread pool threads are running in the background. Each thread uses the default stack size to run with the default priority. If a thread is idle, the thread pool will be inserted into another helper thread to keep all the processors busy. If all thread pool threads are always busy, and the queue contains threads that suspend jobs, the thread pool creates a secondary thread after a period of time. The number of threads that never exceed the maximum value exceeds the maximum value of the thread can queue. These threads will not start until the other thread is completed.

Android smart devices and smart car has three connecting data transmission channel. One is the Android intelligent device control car command channel. Another is the intelligent car to the Android smart device sensor data channel. The last one is the smart car video data sent to Android smart devices. These channels are managed using the Socket thread pool module.

4. Real time video monitoring module
Because the system uses the camera for real-time video surveillance needs to support a variety of platforms for data display, in this module we use the more mature open source video software MJPG-Stream. From the smart car to Android smart devices to complete cross platform real-time video surveillance.

(5) Android intelligent device display module

Before starting the application, there will be 3 seconds of LOGO page, Android application to initialize the network communication to establish the three channel. After entering the application, can be divided into two functional areas. The first function is the main operating interface, the user needs to control the movement of the smart car and camera direction. Intelligent car direction is divided into four directions, the camera is about 180 degrees rotation. Reset button allows the camera to return to the initial position of the steering gear. Click on the white button or select the data in the settings to observe, you can enter the detailed data analysis interface. The dynamic line chart is used to show the change of environmental parameters.

LoginActivity is to load a start image when the application starts. MainCarActivity is display and function of the main operating interface. Intelligent car can send commands to obtain video and sensor data, as well as a number of other features loaded options. Click Select ImageButton to get more options and settings. DataActivity main realization of detailed data chart analysis. Through the main panel options to enter this Activity can see the data curve, more detailed display of data changes. The class chart is shown in Figure 2.

The Socketbroadcast class is a singleton instance of a thread class interface. The main function is to connect to the network, to achieve data receiving and instruction sent request. As the full application of the data interface socketbroadcast through the socket method and intelligent car wireless communication module for data exchange.

Summary

Through the above practice students can master Android applications and embedded software development technology and processes. The result is shown in Figure 3. At the same time this practice has the following characteristics:

1. Vivid and intuitive introduction of cases to stimulate students' interest in learning, students have a sense of achievement in the short term.
2. The combination of teaching content and case, so that students understand and learn from the rational and perceptual level of case teaching content.
3. The implementation phase of the case by the students to think and discuss the development of their own design, and then make them strictly enforce the strengthening of student planning and practical ability.

Figure 3. The Result Chart.

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References


