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ScienceDirect

Procedia Computer Science 166 (2020) 165–169

Procedia Computer Science

www.elsevier.com/locate/procedia

3rd International Conference on Mechatronics and Intelligent Robotics (ICMIR-2019)

A Smart Ammunition Library Management System Based on Raspberry Pie

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Abstract.

Based on the requirements of the ammunition management system, this paper designs and implements a raspberry-based intelligent ammunition library management system, which realizes the collection of environmental information and surveillance video images through the mobile app client. Camera modules, sensors and other devices pass through the serial port. Connected to the MCU, after the Raspberry Pi collects the information, it sends the data to the specified IP address and port through the SOCKET thread in the form of data stream. The mobile client (APP) also receives the data sent by the Raspberry Pi through the SOCKET thread. And display the collected data. Through actual tests, it shows that the design meets the expected requirements.

Keywords: Raspberry Pi, temperature and humidity sensor, mobile client, real-time monitoring.

1 Introduction

Resources such as weapons and oil often have certain requirements for the storage environment, such as environmental humidity and temperature. At present, the application aspects in this part of the market mainly focus on the manual timing and shift inspection records on the spot, which will greatly occupy the staff's energy, consume manpower and material resources, and waste costs. The product of this project is the intelligent ammunition warehouse security system, which can realize the automatic detection and management of warehouse intelligence, and transmit the warehouse environment parameters and monitoring video to the mobile phone client in real time through sensors to realize monitoring and monitoring, and realize photographing, alarm and other corresponding

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1877-0509
10.1016/j.procs.2020.02.041

Function, greatly improve the efficiency of warehouse management personnel and warehouse security. The system can be applied to the armory, strategic oil depot, sea-ship ship weapons warehouse, etc., and is of great significance to the military and civilian warehouses.

2 Raspberry Pie

Microcontrollers are ideal for controlling I/O interfaces and processing signals quickly. However, their CPU processing power, RAM and software functions are relatively weak. The Raspberry Pi is a single-chip computer that integrates the I/O functions of a personal computer and a single-chip microcomputer. Raspberry Pi's I/O speed is not as fast as that of a single-chip computer, but it does not function as a mainstream PC, but it provides a very powerful platform that allows users to create complex computer programs that can be easily accessed using common languages such as Python, Java, and C++. Interact with hardware.

The Raspberry Pi is not a special computer. Instead, it is also a member of the Single Computer (SBC) family. Each SBC has different attributes and functions. The first version of the Raspberry Pi—model 1a—uses a single-core ARM processor, 256MB of RAM, a USB port, composite video output, HDMI output, and no networking capabilities. The newer model is the Raspberry Pi 3 model B, which includes a quad-core processor, 1GB RAM, four USB ports, Ethernet, built-in Wi-Fi, and a 40-pin pin for controlling external circuitry.

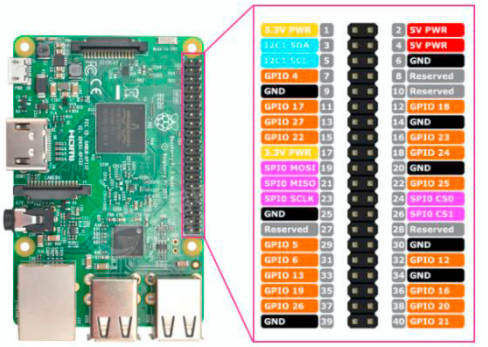

Figure. 1 Raspberry Pi interface

3 System Design

3.1 Scientific Knowledge

The system uses the Raspberry Pi as a hardware development system. The Raspberry Pi is a low-cost, credit card-sized microcomputer that is based on a Linux system and uses an SD card as a "hard disk." The Raspberry Pi has the ability to interact with the outside world and is widely used in some digital device projects, with powerful computing performance and ease of use of open source hardware.

The client APP needs to be proficient in the application of the UI component, the socket thread and its principle, the basic operation of the Linux system, the programming ability of python and java, and the basic process of understanding the compression and decoding of the video. In terms of hardware, you need to be familiar with the basic knowledge and remoteness of microcontrollers and sensors. At the same time, you need to understand the window remote control linux system. In order to realize the network connection, you need to implement the data transmission and reception with the network debugging assistant.

The mobile app client realizes the collection of environmental information and monitoring video images. The camera module, sensor and other devices are connected to the single-chip microcomputer through the serial port. After the Raspberry Pi collects the information, the data is sent to the specified IP through the SOCKET thread in the form of data stream. Address and port, the mobile client (APP) also receives the data sent by the Raspberry Pi through the SOCKET thread, and displays the collected data.

3.2 Design Process

1, to the Raspberry Pi installation system, after the basic configuration, the realization of the use of putty remote control of the Raspberry Pi on the windows system.

2. Select the DHT11 temperature and humidity sensor to collect temperature and humidity information. Since the reading of DHT11 needs to follow a specific signal protocol, we use the Adafruit DHT library for convenience. Call the python program in the Adafruit DHT library.

3. Call the python program in the Raspberry Pi to read the information collected by the sensor connected to the specified pin number. At the same time, write the python script program that sends the data to the socket, and the calling program sends the collected information to the specified server.

4. Download the mjpg software and start the script to enable the Raspberry Pi camera function to display the collected data stream on the specified server.

5, write the basic functions of the app graphical interface, to achieve basic functions such as screenshots, alarms, interface jumps.

6. Write an app socket thread to receive the data collected by the microcontroller and display it.

7. After obtaining the video from the server, write the compression and decompression code of the mjpg video to realize the playback of the APP video interface.

4 System Implementation

4.1 Hardware Part

The reading of the DHT11 needs to be done in accordance with a specific signal protocol, in order to facilitate the use of the Adafruit DHT library.

```
sudo apt-get update
sudo apt-get install build-essential python-dev
```

Then get the Adafruit library from GitHub:In the Adafruit library, then run the python program
Python AdafruitDHT.py 11 17
The results are as follows:

```
pi@raspberrypi:~ $ cd Adafruit_Python_DHT
pi@raspberrypi:~/Adafruit_Python_DHT $ cd examples
pi@raspberrypi:~/Adafruit_Python_DHT/examples $ python AdafruitDHT.py 11 17
Temp=26.0*  Humidity=51.0%
```

At this point, our temperature and humidity data has been successfully collected.

4.2 Hardware Part

For the camera, we chose the official Raspberry Pi camera. First install the camera module and update the latest kernel, GPU firmware and applications, so I won't go into details here.

There are several steps to take the MJPEGde video transmission solution in the Raspberry Pi:

1, installation aids

```
sudo apt-get install libjpeg8-dev
sudo apt-get install cmake
```

2. Unzip the master, zip

```
unzip master,zip
```

3. Edit the source file

```
Cd mjpg-streamer-master/mjpg-streamer-experimental/plugins/input_raspicam
nano input_raspicam.c
```

4. Compile the mjpg software, create the startup script for mjpg, and execute the startup script for mjpg (start mjpg) On the web page we can see the following video capture screen.

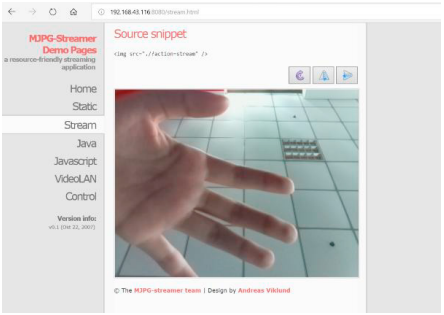

Figure.2 video capture screen

Thus, the video of the MCU is collected.

4.3 Interaction Between Software and Hardware

Use Putty to realize the interaction between the window system and the Linux system (used by the Raspberry Pi). When the Raspberry Pi collects the temperature and humidity information, it sends the data through the socket. After printing the results, as shown below.

```
pi@raspberrypi:~/Adafruit_Python_DHT/examples $ sudo nano AdafruitDHT.py
pi@raspberrypi:~/Adafruit_Python_DHT/examples $ python AdafruitDHT.py 11 17
Temp=25.0*  Humidity=58.0%
Starting socket: UDP...
Sending package to 192.168.43.196:8080...
58
25
58
```

After the client APP starts the thread, the data stream in the socket is read out and displayed on the interface, thus completing the interaction between the software and the hardware.

4.4 Temperature and Humidity Detection and Situation Analysis

When the button "click to get data" is clicked, the system automatically starts the SOCKET thread to receive the data from the single-chip microcomputer and displays it. When the temperature is higher than 30 degrees, the situation analysis column will display the result: the temperature is too high, when it is lower than At 30 o'clock, the current environment is normal.

The Android client can set a fixed alarm call, such as an attendant call, etc. When the alarm button is clicked, the APP automatically jumps to the call interface.When the monitor button is clicked, the APP automatically jumps to the monitoring interface.When clicking to play the surveillance video, the APP automatically plays the camera to capture the video screen.

Figure.3 temperature monitoring interface and video surveillance

Click the detection button to automatically jump to the detection interface.

Script points: The connection script between the software and hardware of the system is written in python language, and the data packet is sent to the mobile client APP. The hardware implementation is written in python language, and the function control is all written by SSH instruction.

5 Summary

The system uses the Raspberry Pi as a hardware development system. The Raspberry Pi is a low-cost, credit card-sized microcomputer that is based on a Linux system and uses an SD card as a "hard disk." The Raspberry Pi has the ability to interact with the outside world and is widely used in some digital device projects, with powerful computing performance and ease of use of open source hardware.

In the processing of video, MJPEG video compression scheme, the project uses a high-performance compression algorithm to provide a low CPU consumption video transmission solution for embedded devices, which is very powerful and can send high quality pictures. Generate a full animated video with clear quality. Breaking the traditional manual timed duty warehouse management mode, liberating a large number of human and material resources, low cost, high efficiency, and realizing modern warehouse management mode. The system can be applied to armory, strategic oil depot, surface warship weapons warehouse, etc. It has great versatility for military and civilian warehouses; system maintenance is convenient and can be used for a long time.

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