

# Network Video Capture and Motion Detection Based On Embedded Linux with GSM Service

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**Abstract:** In this paper, the structure of video capture system based on S3C2440 processor is presented. And the embedded system, video capture, short message service (SMS) alarm, and client video monitor are introduced. Video 4 Linux is used to get the camera video data, which is transferred to the Web Server, and the data is displayed on the client browser. The system can also be connected with mobile phones, using SMS to control alarm equipment. The system can be applied in intelligent anti-theft, intelligent transportation, intelligent home, medical treatment, as well as all kinds of video surveillance systems. Compared with video capture system based on digital signal processor (DSP), this system has the advantages of fewer modules, lower cost, higher intelligence, higher system stability, and higher security.

With the development of Broad Band, computer networks, and image processing technology, video capture has been widely used in image acquisition, security, health care, intelligent community, alarm, transportation and so on. But it also has many problems, such as high cost, low intelligence, poor stability, weak security. In order to solve these problems, S3C2440 microprocessor is adopted in this embedded video Acquisition system which is combined with the Linux operating system. Video capture is realized by the Video 4 Linux.

**Keywords:** S3C2440 microprocessor, Video 4 Linux, GSM, USB camera, Ethernet.

## 1. INTRODUCTION

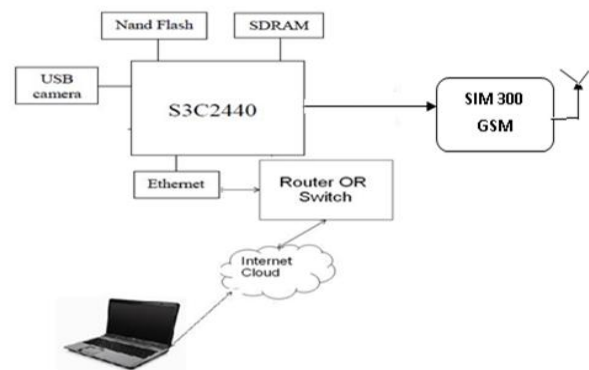
With the development of Broad Band, computer networks, and image processing technology, video capture has been widely used in image acquisition, security, health care, intelligent community, alarm, transportation and so on. But it also has many problems, such as high cost, low intelligence, poor stability, weak security. In order to solve these problems, S3C2440 microprocessor is adopted in this embedded video acquisition system, which is combining with the Linux operating system. Video capture is realized by the Video 4 Linux. The Linux kernel provides programming interfaces and data interface functions API for a variety of devices. And it has the advantages of strong network function, system stability, and high safety. The SMS alarm and control function enable the system to the broader development prospects.

### 1.1 EMBEDDED HARDWARE

The compatibility of this system is vast with the embedded hardware usually of any type having the capable of connectivity for web and also able to have interface with UART. So the

best selected choice for such requirements to gain maximum efficiency is through the ARM hardware devices.

## 2. BLOCK DIAGRAM & HARDWARE MODULES

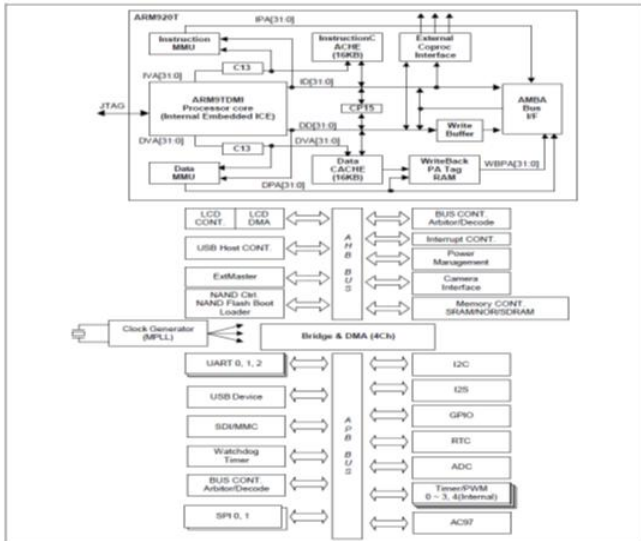


Block diagram

### 2.1 SAMSUNG S3C2440

The S3C2440A is developed with ARM920T core, 0.13um CMOS standard cells and a memory complier. Its low power, simple, elegant and fully static design is particularly suitable

for cost- and power-sensitive applications. It adopts a new bus architecture known as Advanced Micro controller Bus Architecture (AMBA).



The block diagram of S3C2440A

## 2.2 GSM MODULE

GTM 900- wireless module of HUAWEI is used as GSM communication component, which is a wireless module with three frequency bands. It supports AT commands and enhanced AT commands. There are lots of audible function and much data available. So it is a fitted solution for high speed data transport in various applications. AT commands are used in GTM900. GTM900 communicates with outer CPU by UART interface. Its main functions are wireless transmission and receiving, fundamental band processing and audible signal processing and so on. There are forty pins in GTM 900 module, which include power supply, data inputs/outputs, SIM card, audible interface and controlling part. The maximal input voltage amplitude of power supply is 4.8v. 4v is used for power supply in this design. GTM900 can be connected with SIM card and antenna.

## 2.3 USB CAMERA

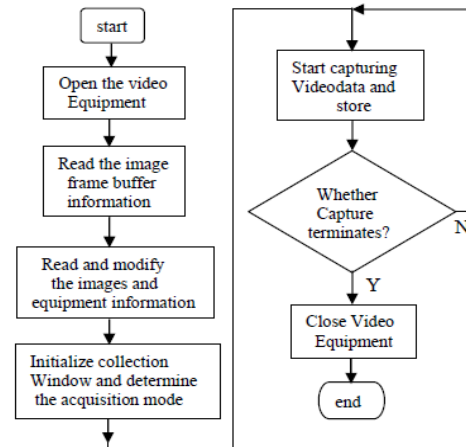
Mini2440 has two USB interfaces one is USB host and other is USB slave interface. Using USB host interface we can connect external USB devices like pen drives, USB keyboard, and USB compliant mouse and USB cameras. The Linux kernel supports UVC(USB video device class) based cameras. UVC) is a USB device class that describes devices capable of streaming video like webcams, digital camcorders, transponders, analog video converters, television tuners, and still-image cameras. Here we use Logitech web camera which is UVC based so that there is no requirement for drivers needed to capture images from the camera

## 3. IMPLEMENTATION

Make sure the arm-linux-gcc-4.4.3 cross compile tool chain is correctly installed and PATH variable is set to the cross compiler tool chain. In this first we write code for capturing frames from the USB camera then the captured frames will be stored in a file. We write a server socket program for configuring our board as web server which listens on port number 8080 and serves html requests for the video and performing client requested operations. Then we write socket program for client which sends requests and receives data from the server. Then we write HTML code for web page interface.

### 3.1 Capturing frames from the USB camera

In Linux systems, external devices are managed by equipmental document. And the user application can see some system to call interface functions, and a device driver program includes many interface functions, so application can open, close, read and write such an operation of devices. Video 4 Linux provides a range of programming and data interface functions for a variety of devices in Linux. Equipment can be opened, captured, read and turned off by calling these functions. When an application operates the device file, Linux kernel will access interface functions provided by the driver program through the file operations structure. Video Capture flowchart is shown in Figure



capturing video from the V4L device

### 3.2 Sending frames through Ethernet:

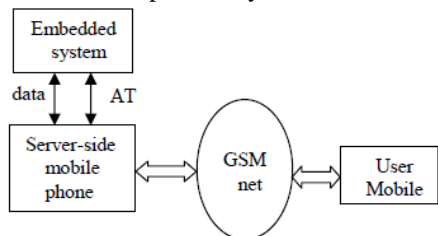
The server listens on the port 8080 for connection requests. When a client request a connection it binds the clients IP and establishes the connection with the client.

First the server side program checks what client wants. When it finds the string "stream", it sends jpg frames through the Ethernet port. When server clicks on button "sms", it checks the command and send sms request to the processor and the processor sends AT commands to SIM300 GSM modem to send SMS to the given mobile number.

### 3.3 Short message Service

The system integrates SMS alarm and monitoring components, and makes the mobile phone to bind to it. When alarm signal is detected by the system, it will notice the user of the mobile phone in the form of text messages. Then the user sends text messages to control and manage the abnormal event. The SMS completes the SMS alarm and data transmission, remotely monitoring and controlling equipments through Global System for Mobile Communications (GSM) of wireless communication modules. GSM is an abbreviation of global system for mobile communications, and GSM has the function of a wireless communications. In general, many phones have a GSM network module. It is associated with the operating system through a serial port, supporting GSM07.07 of the AT commands and using the AT instructions to realize SMS transceiver, alarm and query. It is the most mature mobile communication system. In this system, when video abnormal changes or exceeds the threshold of setting appears, the camera will automatically capture the new image data and send it to the PC, and the PC will transport an abnormal information of "discover a new image" to server-side mobile phone in the system through the serial port, then this cell phone will convert the information into a format of text messages so as to send to

the user mobile phone. System structure is shown in Figure



Structure of GSM network

It is need to use the SMS protocol description unit (PDU) encoding and serial communication class libraries for communication between systems and mobile phones, and the realization of SMS receiving and sending requires AT commands.

At the other side the central data base system receives this information compares the database for the sufficient details and amount. If the details are matched and sufficient amount is found then the successful information is sent to the corresponding toll gate station via ZigBee. If there are any errors like tag detection, not enough balance then the central station will send the appropriate command data to corresponding station.

If the data from central station is successful then the toll gate is opened and remaining account balance is displayed on the PC after which the gate is closed automatically.

#### 4. RESULTS

When the camera is inserted the device will be shown in “/dev/video0” on the development board root file system. Connect the board using UART cable from UART0 to PC COM port. Now configure IP address for the mini2440 board in the terminal by typing the following command.

```
#ifconfig eth0 10.0.0.166 netmask 255.0.0.0
```

Connect the board to network using Ethernet cable using RJ45 connector. Now at client side open the web browser and type the following IP address in address bar.

```
10.0.0.166:8080/video_capture.html
```

Now we can see the following output on the browser on the client side. We can see the video at the development board and a button for sending short message service. When we click that button browser sends the request to the board, it checks for the command type and performs the requested operation.

- 10.0.0.132.8080/motiondetection.html
- No object is present



- Object is present



#### 5. CONCLUSION

The structure of video capture system based on S3C2440 processor is presented. And the embedded system, video capture, short message service (SMS) alarm, and client video monitor are introduced. Video 4 Linux is used to get the camera video data, which is transferred to the Web Server, and the data is displayed on the client browser or on client. The system can also be connected with mobile phones, using SMS to control alarm equipment. The system can be applied in intelligent anti-theft, intelligent transportation, intelligent home, medical treatment, as well as all kinds of video surveillance systems. Compared with video capture system based on digital signal processor (DSP), this system has the advantages of fewer modules, lower cost, higher intelligence, higher system stability, and higher security.

#### 6. FUTURE SCOPE

The project can be extended to MMS (multi-media message service) through which we can send captured images directly to the mobile device of the corresponding client user. Authentication of the user clients can be improved by providing user name and password. Ethernet service can be implemented in high degree. Extended to the domain of face detection and face recognition.

#### 7. REFERENCES

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