RESEARCH ARTICLE OPEN ACCESS

Arm Based Remote Surveillance and Motion Detection System by Using MJPEG Algorithm

Kandavalli Michael Angelo*, Katakala Karthik **
*(M.Tech Scholar, Department of ECE, GIET, Rajahmundry)
** (Assistant Professor, Department of ECE, GIET College, Rajahmundry

ABSTRACT : This system presents the structure of video capture based on S3C2440 processor and it introduces the embedded system, video capture and motion detection. This embedded web monitoring system takes the powerful ARM9 chip as MPU. In the monitoring site, the system captures the video through the embedded multitask operating system. The digital video has been compressed by the MJPEG algorithm. By the Internet Explorer the users can view the monitor's video directly, by the common Gateway interface, the users who are authorized can also control the camera and observe the motion detection.
Keywords **-** key words in alphabetical order, separated by comma

I. 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, transportation etc. But the DSP processor 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 combing with the Linux operating system. Video capture is realized by the Video 4 Linux. This system presents the structure of video capture based on S3C2440 processor and it introduces the embedded system, video capture and motion detection. 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 be applied in intelligent anti-theft, intelligent transportation, intelligent home, medical treatment, as well as all kinds of video surveillance systems.

II. THE MAIN FUNCTIONS

The system with the camera installed at the scene obtained from the original video. Through the encoder the video becomes the digital signals from simulation and this is compressed into MJPEG data[3]. The data is converted into streaming format through the streaming media server and is real-time transmitted to the network from the Ethernet interface. By the browser the monitoring module obtained from MJPEG video data directly and can watch the live video and observe the motion detection. The user can also control the remote camera and set the system configuration [4].

This system has the bandwidth adaptive function. It can achieve the best audio and video quality by adaptively adjusting the encoding speed.

III. THE HARDWARE DESIGN

A. The structure of hardware

This design chooses a 32 bit S3C2440X which is the ARM920T core [5.9]. the microprocessor integrates the abundant resources, such as LCD controller, interrupt control, USB slave, NAND controller, USB host, UART, SPI, Power control, GPIO, RTC,TIMER/PWM, ADC. The microprocessor S3C2410X is the center of the control and data processing. It controls the video acquisition and compression. The USB camera is the data acquisition unit.

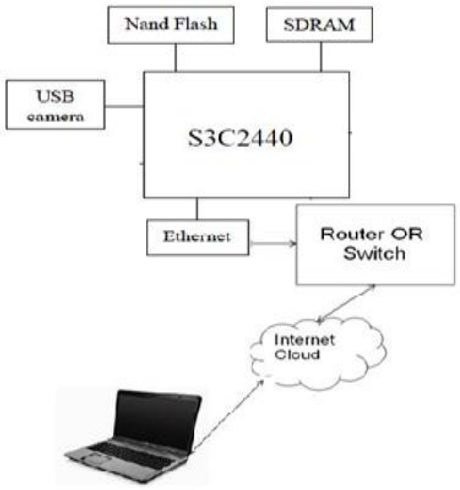

Figure 1: The structure of Hardware

IV. VIDEO ACQUISITION MODULE

The video acquisition module is the core design and realization of the network camera. It captures the scene through the embedded Linux operating system V4L(video4linux) and imaging device drivers. V4L is the basis of image process in Linux system. It consists of a set of APIs supporting image equipments in Linux kernel. In cooperation with proper video card and card drivers V4L can acquire images, AM/FM wireless broadcast, CODEC, channel change. At present V4L is mainly used in the image streaming system and embedded video system. Its application is wide spread, such as remote teaching, remote medical treatment, video conference, video monitor, video telephone, etc. V4L is a 2-layer structure, that top layer for V4L driver and the lower layer for the image device drivers.

In the Linux operating system an external device is handled as device files. Therefore the operation becomes the operation of device files. Video files are in /dev/ directory, usually for video0. The camera connected to the video acquisition terminal through USB, V4L APIs are called in a program. The read operation for the device file video0 can realize the data acquisition.

The important data structures are as follows:

1) Video_Window

```
struct video_window
{_u32 x,y;                  /*Position of windows*/
 _u32 flags;
_u32 width,height;      /*Its size*/
_u32 chromakey;
struct video_clip*clips;    /*Set only*/
int clipcount;
}
```

2) Video_Capability

```
Struct video_capability
{ char name[32];
int maxwidth;
int minwidth;
int maxheight;
int minheight;
int type;
int channels;
int audio;
};
```

3) Video_Channel

```
struct  video_channel
{ _u32 flags;
 _u32 type;
_u16 norm;
int channel;
int tuners;
char  name[32];
}
```

4) Video_Picture

```
struct  video_picture
{  _u16 brightness;
 _u16 hue;
_u16 color;
_u16 contrast;
_u16 whitness;
_u16 depth;
_u16 palette;
}
```

*5)*Video_Audio

```
struct video_audio
{  int audio;
Char names[16];
_u16 bass,treble;
_u16 mode;
_u16 volume;
_u16 balance;
_u16 step;
_u32 flags;
}
```

6)Video_Mmap

```
struct video_mmap
{ int height,width;
unsigned int frame;
unsigned int format;
}
```

7)Video_Mbuf

```
struct video_mbuf
{ int size;
  int frames;
  int offsets[VIDEO_MAX_FRAM];}
```

V. VIDEO COMPRESSION MODULE

The increasing demand to incorporate video data into telecommunications services, the corporate environment, the entertainment industry, and even at home has made digital video technology a necessity. A problem, however, is that still image and digital video data rates are very large, typically in the range of 150Mbits/sec. Data rates of this magnitude would consume a lot of the bandwidth, storage and computing resources **i**n the typical personal computer. For this reason, Video Compression standards have been develop to eliminate picture redundancy, allowing video information to be transmitted and stored in a compact and efficient manner.

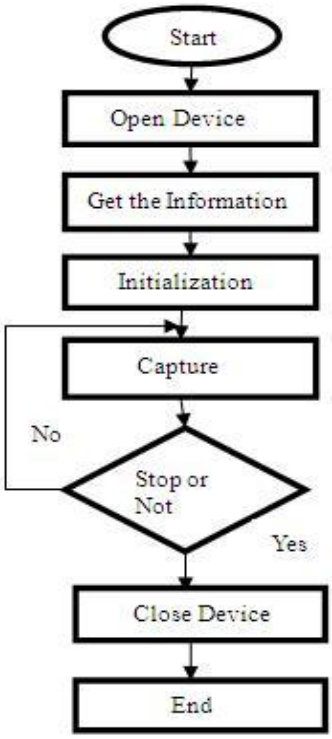

Figure 2.V4L Capture Flow

VI. VIDEO COMPRESSION STANDARDS

Discrete Cosine Transform (DCT) based compression algorithms and international standards were developed to alleviate storage and bandwidth limitations imposed by digital still image and motion video applications.

Today there are three DCT-based standards that are widely used and accepted worldwide:

1. JPEG (Joint Photographic Experts Group)
2. H.261 (Video codec for audiovisual services)
3. MPEG (Motion Picture Experts Group)

Each of these standards is well suited for particular applications: JPEG for still image compression, H.261 for video conferencing, and MPEG for high-quality, multimedia systems.

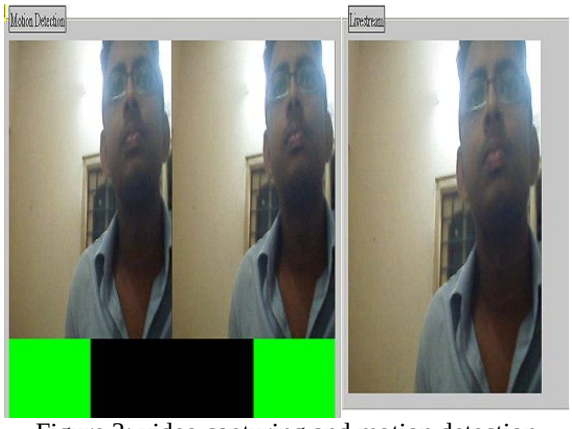
Figure 3: video capturing and motion detection

VII. REMOTE MONITOR CLIENT

A. *Web Server*

Resources are usually limited in the embedded systems. There are the lightweight Web Servers, such as HTTPD, THTTPD, boa, etc. The Boa Web Server is used in this design. This server is open-source and can support CGI.

Its main process is as follows;

5) Download the latest package from www.boa.org and unzipped into the relevant directory;
6) Set the default SERVER_ROOT path in the top of the defines.h file in the boa/src directory;
7) Choose the cross-compiling tools. In boa directory make the boa configuration by./ configure – host = i686 – pc – Linux – gnu – target = arm – Linux;
8) Generate the executable file boa in src/ directory after the execution of maker;
9) Configuration of the boa.conf files. Here set the socket of boa, server root directory, log files, html,CGL, the attribute temp directory, etc.

B. *Common Gateway Interface*

CGL (common gateway interface) is the interaction standard between the external applications and WWW server. According to the CGL standard, the external program can handle the input data from the client browser and the interaction between the client and the server, realize the dynamic web technology. In this system, when the user sends the control commands to the network camera through the browser, the server starts up the CGL module and then the CGL module will transmit the command. At last the camera will execute the action.

C. *Internet Explorer Browser*

In this system the web page main function is to show the remote dynamic video. The standard html pages can only display the words and pictures, so real time video can not be watched through the window added in the standard html pages. The method to solve the problem is to embed the real time video monitor software into html pages. Here we make use of the standard control ActiveX-Vg Player Object so that more people can watch the real time video

VIII. Conclusion

This project presents an embedded network camera design based on ARM S3C2440 and Linux system. This camera system can accomplish the acquisition, the compression and the display of video data. This system is a complete solution integrating with web server and CGI. Because the system adopts with the high performance embedded processors to process the main control, compressing and web processing it is simple, inexpensive, stable and widespread.

Reference

[1] Lain bate, Steve liu, Real-Time Embedded system[j].computing and Control Engineering journal, 2002.
[2] Bruce Powel Douglas, Real-Time design patterns[j].Embedded systems Conference papers, San Francisco, 2001.
[3] http://www.chinaitpower.com/A200508/2005-08-02/182012 html.
[4] http://www.garmin.com/products/gps35
[5] http://www.alldatasheet.com
[6] http://www.youtube.com
[7] Scott Maxwell.linux core kernel commentary[j].cariolis 2000.
[8] Judy democker, three reasons why Linux will trounce the embedded Market[j].Ibm developer works: linux, 2001
[9] Rosenberg J, Sculzrine H,"An RTP pay load format for generic forward error Correction ".RFC2733, December 1999.
[10] ITU-T Recommendation H.263 Advanced video coding for generic audio Visual services, 2003