

Cost Effective Data Displaying System Based on Raspbian Linux: A Review

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Abstract— Design and realization of a data displaying system based on embedded Raspbian Linux and Raspberry Pi is proposed. For data acquisition and data storage, multitasking operation system Raspbian Linux is preferred. This system designs the software driver programming. The idea of designing and system framework of its embedded server is demonstrated entirely. System with clear display, stable performance, friendly application procedure interface, easy operation, economical and practical use, has a good market and application prospect.

Key words: Raspberrypi, Raspbianlinux, Data Displaying System

I. INTRODUCTION

In Recent years, data displaying technology developed speedily, In many places big screen data displaying system is required. Big screen on the market is connected mostly to PC system, so to transmit data to the LED or LCD screen through protocol as RS232 or RS485. The complete system is supported by the PC software. The data transmission distance is restricted with the rapid development of the embedded technology and network technology, it is possible to solve the problem of data remote display. Embedded operating system is compact, real-time and high stability. Especially its open source code, strong technical support, good scalability and it is support for many other hardware is incomparable. So we choose the embedded uCLinux operating platform and the mature Web technology to design the remote data displaying system[1]. In the recent years, the technologies like WiMAX , IEEE 802.11, 3G and Bluetooth has directed much attention to wireless audio streaming. Nowadays audio streaming via radio waves and Bluetooth has particularly gained momentum. But these technologies have limitations such as, the destination device for the streaming system can't go too far from the audio source and their range cannot exceed 10 meters .These systems are also not secure, as by tuning in to the used frequency level, any intruder can get the streamed feed. In particular, IEEE 802.11 WLAN has become the prevailing technology supporting so many real-time multimedia applications like Voice over Internet Protocol and video conferencing. With data rates in the order of 11 Mbps, which is considerably higher than cellular base stations, WLAN is favored more. This project intend to integrate voice streaming to a remote location through secured channel which will abate the growing need of a secured, low-cost and compact embedded device for voice transmission. The proposed system has features such as feeding recorded audio directly into a remote computer in real-time from the Raspberry Pi. [2]

II. LITERATURE SURVEY

Raspberry pi is a credit- card sized computer .It functions almost like a computer .There are various surveillance systems such as CCTV,camera etc.,These kind of surveillance systems, the person who is stationary and is located in that particular area can only view what is happening in that place .Whereas, here ,even if the user is moving from one place to another,he/she can keep track of what is happening in that particular place. Also another advantage is that it offers privacy on both sides since it is being viewed by only one person .The other major advantage is that it is a simple circuit .the operating system used here is Raspbian OS. Raspbian OS has to be installed so that the image can be transmitted to the smartphone.The functions of the various components are given below:

A. USB Camera:

USB Camera captures the image and sends it to the USB port of the Raspberry Pi board. The camera model used here is USB Camera model 2.0.

B. Raspberry Pi:

Raspberry pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems, military applications, etc.

The various functionalities of the components are given below the various components of Raspberry- Pi is

- SD Card Slot is used to install OS/booting/long term storage .The total memory of the SD card is about 8GB.
- Micro USB Power Port provides 700mA at 5A.
- RCA Video Out is connected to display if HDMI output is not used. It is mainly used to carry audio and video signals. They are otherwise called as A/V jacks.
- Audio out Digital audio is obtained if HDMI is used to obtain stereo audio. Here analogue RCA connection is used.
- Ethernet Port is used to connect to the Internet. It also plays a role in updating, getting new software easier.
- HDMI OUT(High Definition Multimedia Interface) is used with HDTVs and monitors with HDMI input. Also HDMI-HDMI is used here.
- BROADCOM BCM 2835: It is otherwise defined as System on chip .It is a 700 MHz Processor. It has a Video core IV GPU.
- GPIO allows us to control and interact with real world.[3]

To date, exploitation of smart camera technology has been mainly for industrial vision systems, but a crossover is just starting to take place. Camera technology

will begin to enter new applications, for example, in the security and access control markets, in the automotive industry, for collision avoidance, and even – one day – for the toy industry. Even our automobiles may soon be outfitted with miniature eyes. Built into a cruise control system, for instance, such a camera would suddenly alert the driver if it noted a rapidly decelerating vehicle. The cameras could also take the place of the rear view and side-view mirrors, thereby eliminating dangerous blind spots and - in the event of an accident – recording the seconds prior to a collision. Another example would be with intelligent lifts. An office block, with many lifts and floors, may see a lot of people travelling up and down between floors, particularly at high traffic times such as early morning or end of the working day. At the moment, lifts are called by somebody pressing a button and putting in a request for the lift to stop at a particular floor. Connected with smart camera technology, lifts could be routed on demand, working intelligently, stopping only when there was a pre-set number of passengers waiting at a floor – and missing out a floor if too many people were waiting to meet the maximum capacity of the lift. [4]

With evolution of World-Wide Web (WWW), its application areas are increasing day by day. Web access functionality can be embedded in a low cost device which can be widely accessible from remote places through the web browser in a desktop. By using embedded processors such as Advanced RISC Machine (ARM) and linux as the operating system embedded web server can build with low cost, low power consumption, high performance, high reliability and support from large developing community. This paper introduces a solution for implementation of low cost embedded system using ARM1176JZF-S processor and ARM linux operating system which can be accessed remotely, monitored and maintained conveniently.

A web server can be embedded into a device which can be accessed remotely from a web browser. This embedded system can serve the web documents on request by a client from other system. Such type of a web server is called as Embedded Web Server(EWS). It consist of ARM processor that contains internet software which suite for monitoring, controlling and remotely access the system.

1) Raspberry Pi:

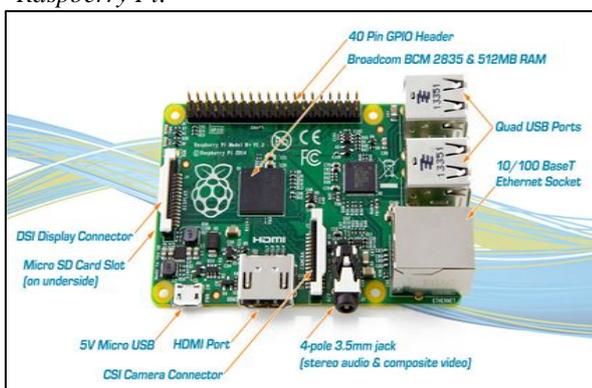


Fig. 1: Raspberry Pi

The Raspberry Pi is low cost ARM based palm-size computer. The Raspberry Pi microprocessor ARM1176JZF-S which is a member of ARM11 family and has ARMv6 architecture. It is build around a BCM2835 broadcom processor. ARM processor operates at 700 MHz & it has

512 MB RAM. It consumes 5V electricity at 1A current due to which power consumption of raspberry pi is less. It has many peripherals such as USB port, 10/100 ethernet, GPIO, HDMI & composite video outputs and SD card slot. SD card slot is used to connect the SD card which consist of raspberry linux operating system.

2) Ethernet:

Ethernet is the computer networking technology which allows computers to communicate and share resources over the internet. Ethernet was standardized as IEEE 802.3. it is one of the most widely implemented LAN standard originally developed by Xerox. Different Ethernet networks also connect to a router that provides access to the internet.

Different software's were used to implement the embedded web server, these are mentioned below: 1. Raspbian

3) Wheezy:

Raspbian wheezy is an open source operating system based on debian optimized for the raspberry pi hardware. It is linux kernel based operating system which uses on the light weight ARMv6 instruction set that a typical Broadcom processor understand.

4) Apache2:

It is also known as "Apache HTTP Server" which allows the online distribution of website service using Hyper Text Transfer Protocol (HTTP). It is widely popular web server for different operating systems such as Linux, Unix, Windows, Solaris, Mac OS X, Novell NetWare, OS/2 etc. Apache2 version was used in this project for creating web server.

5) PHP5:

Hypertext preprocessor (PHP) is a server- side scripting language designed for web development. PHP is basically used for developing web based software applications and also to manage database, dynamic content, session tracking, even build entire e-commerce sites. PHP5 version was used in this paper.[5]

Our proposed system performed according to our expectations. We have implemented it on Raspberry Pi to make it more cost effective. The whole system is simulated on Proteus based environment and results were comprehensively accurate and resembles to that of the survey of boilers that was conducted by our team. Apart from the work described here, many different software tools are used to construct these types of sensor which are either costly or unavailable for small industry applications. Our proposed sensor can easily be implemented and use for the monitoring solutions.[6]

Monitoring conditions inside the laboratory and controls the parameters through web page. Build an embedded web server to implement the data of sensor network and video images to achieve remote monitoring and controlling which is based on ARM11 architecture. It develops a laboratory intelligent monitoring system with S3C6410 microprocessor as its major controller, elaborating the complex points of the development of the GUI applications based on Qt / Embedded and Linux drivers for various types of sensors.[7]

Raspberry Pi and its web interface to store files that have been sent from remote sources and view these files on the projector. Once Raspberry Pi has been set up and is ready to be used like a normal computer, applications can be installed thereby enabling to view all the Portable Document

Files (PDF) and power-point presentations. The next is to use a remote control to control these applications. Controlling of Raspberry Pi can be achieved using a smart phone which almost everyone carries today. Some readily available applications on the Google Play Store include NetIO and XBMC server allowing creation of customized remote control to control Raspberry Pi. The Raspberry Pi has a HDMI port and an Ethernet slot along with IEEE 802.11g. This facilitates uploading files and presentations from local as well as remote destinations to the Raspberry Pi.[8]

The network video surveillance system mainly consists of video capture system based on Raspberry pi, Ethernet interfaces for wired and wireless internet accesses, Fire sensor, PIR sensor and Global system for mobile communication module. This capturing and alerting system is a real time system based on RT Raspbian. GSM module is interfaced for alerting the controlling person from the client. Live video can be viewed in the sharing network from the IP of the pi: 8080. The video also recorded for the given duration when the sensors interfaced with the PI is sensed and it is stored in the memory of the RT RASPBERRY PI.

Once RGB web camera is connected through master USB interface to Raspberry pi, make COM port settings in the hyper terminal window and after that dump '/bin' file into RASPBERRY PI board, one has to set the following IP address: 192.168.0.200 Subnet mask: 255.255.255.0 Gateway: 192.168.1.1 After these settings the captured video will be displayed on the Display of the RASPBERRY PI board. Later if one enters 192.168.0.100 in the internet explorer browser address bar, gets the camera captured real time video on the networked systems supported by Ethernet controller. Later if any abnormal situation arises at the client, one can send message through short message service with the help of GSM module.[9]

Traffic flow monitoring and analysis has been active research and engineering topic for more than two decades. Main information acquired from traffic flow monitoring includes: traffic volume, vehicle type identification (bike, car, light van, truck) and vehicle speed. Traffic volume data is used for a variety of purposes including historical trend analysis, forecasting, planning for future infrastructure improvements and expansions. Whereas transport remains the largest producer of CO emissions in EU, traffic monitoring becomes important also from the environmental point of view. Also the World Health Organization has officially decreed that inhaling diesel fumes can cause lung cancer and puts diesel plumes in the same category as arsenic, strontium-90 and neutron radiation. This has given traffic monitoring significant importance. Other traffic data parameters, such as speed and vehicle classification, are becoming more important as a measure of traffic safety and roadway pavement use. Recent traffic flow analysis systems are able to perform vehicle number plate recognition which can provide information about main ways of traffic flow through cities and can help to optimize road infrastructure. Collecting this data can be done using a variety of different technologies.

Traffic detection technology methods scoring biggest interest in this area includes: Doppler radar (measures the relative velocity of an object moving through its target range), magnetometer sensors (detects vehicles

based on the disruption of the Earth's magnetic field by metal vehicles), video camera (processes images using sophisticated computer algorithms), side-fire radar (side-fire beams placed along a roadway reflect back to the sensor to detect vehicles), pneumatic tubes (transmits information to a counting device after a pulse is created when vehicles drive over a tube). With the advent of powerful single board computers like: O LinuXino, Galileo, Panda Board, Raspberry Pi, Odroid and others it is possible to design reliable, low-cost traffic monitoring system. Low-power consumption of these boards ensures possibility to operate from car battery for an extended period of time often more than one week. This paper introduces low-cost non-intrusive option that can collect traffic data based on Raspberry Pi. We have chosen this board for its easy and powerful HD camera handling, good performance to power consumption ratio affordable price and wide community [10].

III. TECHNOLOGY BENEFITS

- 1) System with clear display: Data displaying system with clear clear display system will get .Because of compact, real-time and high stable Linux operating system.
- 2) Stable performance: Cost effective Data displaying system is using Rasbian linux operating platform and mature web technology .So stable performance we can get.
- 3) Easy operation: Functionality of Raspberry Pi board is easy to understand.
- 4) Economical and practical use: Cost effective data displaying system is economical and Used in day today life .
- 5) Good market and application prospect: I can develop a system which can be used as Security Systems Surveillance Systems, Traffic control, Remote plant monitoring.

IV. APPLICATIONS

The following cost effective data displaying system applications are considered in the home automation and as commercial applications.

- 1) Remote Data Displaying system based on uclinux which provide remote data transmission without any constraints on distance.[1]
- 2) Fully-functional embedded device which is able to stream or transmit voice in real-time over WI-FI (IEEE 802.11) with an acceptable audio quality.[2]
- 3) Design and implementation of Smart surveillance monitoring system using Raspberry pi and PIR sensor for mobile devices.Home security system captures information and transmits it via a 3G Dongle to a Smart phone using web application.[3]
- 4) Embedded Image Capturing using Raspberry Pi system (EICSRS).This system enough to run the image capturing, recognition algorithm.[4]
- 5) Open laboratory monitoring and controlling system (OLMCS) which is used to implement a monitoring and controlling system using arm intelligent monitoring and Controlling Center .[7]
- 6) Data system captures video, shares among networked systems and also alerts the controlling

person with short message service alarm as required by the client.[9]

- 7) This technology is used in Traffic monitoring system. The low-cost non-intrusive sensory that can collect traffic data based on Raspberry Pi single board computer. [10]

V. CONCLUSIONS

In this paper the various application of Raspberry pi is reviewed. Also discussed that by using open source linux operating system the system has stable performance, convenient use and it is very economical and practical.

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