EMBEDDED WEB TECHNOLOGY IN TRAFFIC MONITORING SYSTEM

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Abstract--- With rapid economic development and transportation has increasingly become an important component in the national economy and daily life. So it is necessary to build a modern intelligent traffic control system in order to resolve the traffic congestion on roads and reduce accidents. It contains embedded Linux operating system, design of embedded web server, transplantation of database and implementing method of main functions. Remote monitoring is realize to monitoring traffic conditions, traffic control, information published and communication of traffic data by using combining embedded web server (EWS) technology with Internet. The results specify that the intelligent traffic control technology based on embedded web technology can accomplish the integration of a wide range of information collection and it breaks through the established traffic monitoring technology for designing traffic monitoring system.
Keywords--- embedded web technology, traffic monitoring System, Zigbee, and Sensors

I. INTRODUCTION

Intelligent traffic for solving urban traffic management has become the people's consensus such as advanced and sophisticated video surveillance system as an important component of intelligent transportation for image acquisition, on-site snapshot, after taking of evidence and other important tasks. This paper presents method that combines embedded WEB technology with Internet to implement remote traffic monitoring through Web Server applications solidified in embedded ARM processor.

II. EWS SYSTEM ARCHITECTURE

EWS system is calm of embedded web server hardware & software system and traffic monitoring system, as shown in Figure 1. Consists of two main components: an embedded Web server and bus controller. The controller part is for area of traffic monitoring to design, and each control point is identified corresponding to the embedded WEB server (EWS). Web server can be imagined like a special kind of a file server. The central function unit to get access on an embedded system via Web browser is the Web server. Such Web servers bring the desired HTML page and pictures over the worldwide Internet or a local network to the Web browser. A TCP/IP protocol stack which is based on sophisticated and established standards– manages the entire communication. Web server (HTTP server) and browser (HTTP client) make TCP/IP applications. At present, the traffic management monitoring and controlling systems are based on the IPC as a host computer, and deploy dedicated monitoring configuration software. This method is very costly, inefficient, and also troublesome for the system to update, also required specialized training for management employee, and limited by space-time and geography. Moreover, some information cannot be shared for public in order services. With the increase of the Internet technology, embedded Web technology goes into the ordinary at present.CGI script and Web server support the program running on an embedded device. The managers can control and monitor situations of traffic through the Web browsers.

A.EWS Hardware System

EWS hardware system includes an embedded ARM processor, Zigbee, GSM, Web cam, RFID, 4panel LEDS, MAX232, stepper motor, application system components and bus controller. The controller is IC 18452. The processor is Raspberry pi ARM 11 that is suitable for quite poor working environment, supports uCLinux operating system, runs faster than 8-bit and 16-bit processor[1].

B.EWS Software System

EWS software system includes HTTP engine, TCP / IP protocol, CGI script, virtual file system, configuration module, security module, application interface module, embedded operating system, embedded application, controlling module, interface driver, embedded SQLite database. CGI (Common Gateway Interface) design is the most important in EWS software system[2]. It defines the standard between Web server and CGI script. CGI is programmed by C language .It is embedded with Html script.

When CGI is executed, some special ports can be operated and the results are displayed in the browsers. The special operation is that , the send some information to a Web server from the client, and put the received information into environment variables, after that, go to start the specified CGI script in order to accomplish specific task, and CGI script obtains the required information from the environment variable and then it decode to some serial port. Then, dispatch commands concerned to monitoring module on-site, and then return the output to browsers through Web server [3, 4].The output is with HTML format. Its workflow is as shown in Figure 2.

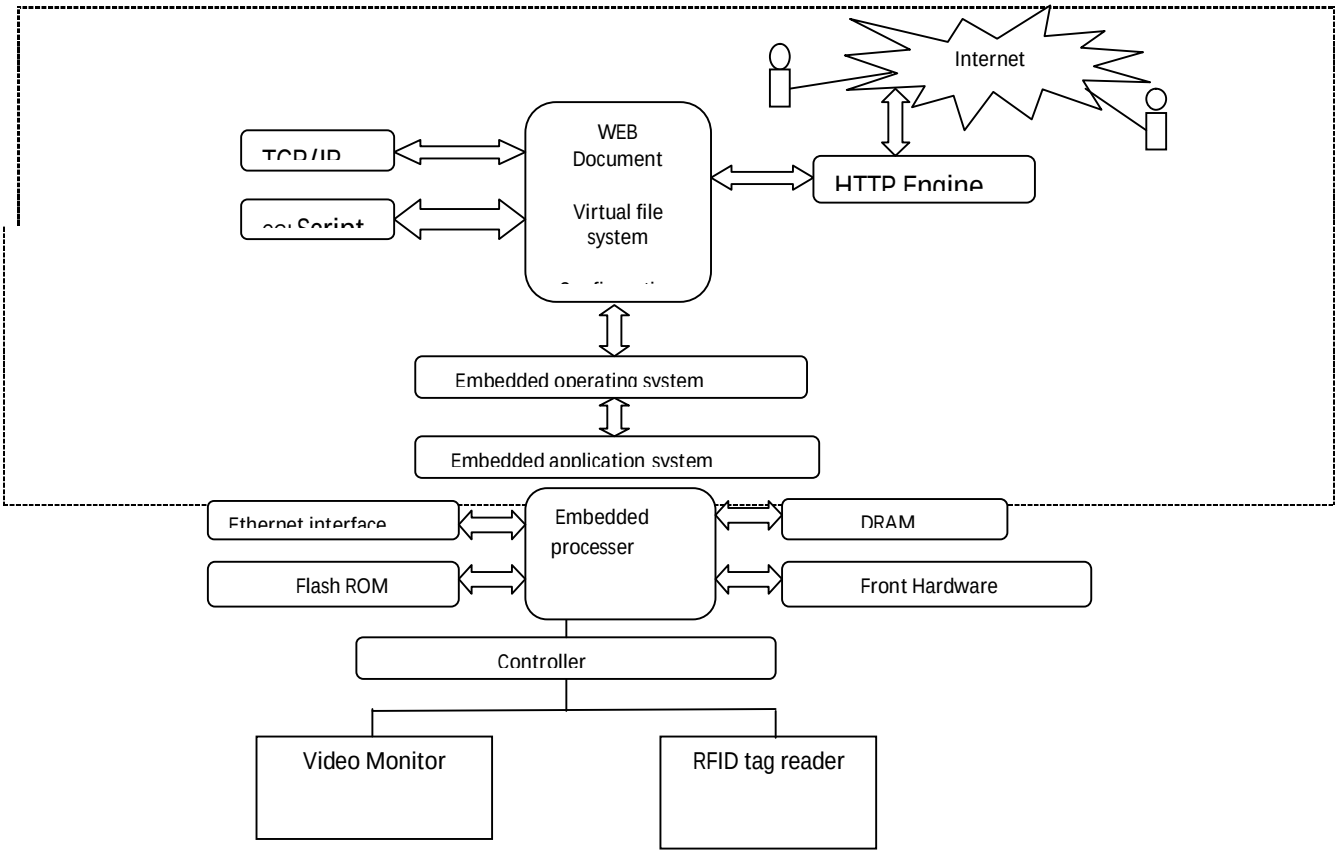

Fig1. System composition

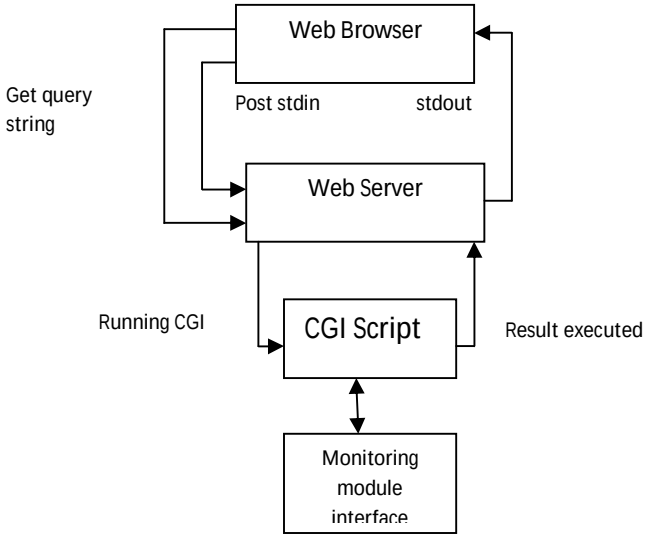

Figure2. CGI workflow

Design of EWS Operating System

The selection of the operating system is necessary in the EWS design. uClinux operating system is selected according to the actual needs of the system as well as its stability and reliability. uClinux is a stem of Linux--- Micro-Control-Linux. It is mainly meant at non-MMU processor and ropes multi-task with a complete TCP / IP protocol stacks as well as multiple network protocols. uClinux also supports a variety of file systems. Linux 2.4.20 is selected for trimming & transplanting its kernel and devices drivers, configuring uCLinux and processor and for patching the compiler as well as building the cross-compiler environment. It also retains serial console and common tools & commands. The kernel is compressed into FLASH, and extract it into RAM to run with file system with ROM, and executable file format with flat as well as run-time library uCLibc with simplified. Typical drivers include the console terminal, serial devices, and block device drivers with file system. Module technology dynamically loaded in uCLinux is used for drivers in developing and debugging which makes drivers compiled into the kernel, boots directly to load. It also supports uCLibc DLL [5].

SQLite Database Design

There is requirement of storing monitoring data stored in a database. Embedded database SQLite can be more easily used in embedded systems. Although SQLite is a lightweight relational database. It also supports multiple tables and indexes, views, triggers and a series of user interfaces and drivers.

Monitoring System

Monitoring system includes web cameras, RFID video surveillance devices, controller and etc. The traffic information from the monitoring equipments is transmitted to the EWS through the controller. Then displayed in browsers through the EWS to implement traffic management for monitoring and controlling [6, 7].

III. WORKING METHODOLOGY

Overall system is partitioned into two major design units. First unit is arm unit and another is signal unit. Signal unit is used for controlling purpose and ARM unit is used for monitoring purpose. This can be extended to meet the required demands. Here using web browser, we can control and monitor the traffic conditions.

A. ARM Unit

ARM unit is designed for monitoring the traffic conditions. It includes hardware ARM 11, Web cam, stepper motor, IC 4052 and GSM. Figure 3 shows the lock diagram of ARM unit.Web cam is connected to stepper motor for rotating purpose. This is done for video monitoring. IC 4052 is switching IC and MAX 232 voltage driver. All information which is collected by signal unit and arm unit is send to the web browser.

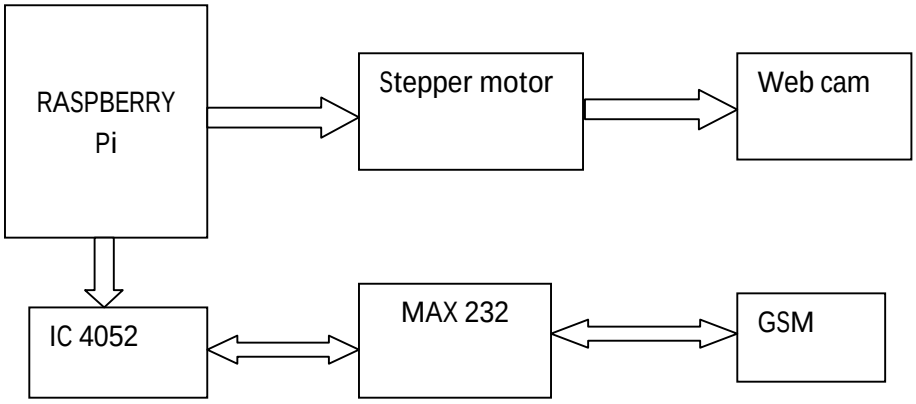

Figure 3.ARM Unit

Signal Unit

Signal unit is designed for controlling purpose. It consists PIC 18F452, LED Panel, LCD Display, RFID reader, MAX232 and Zigbee module. Figure 4 shows the block diagram of signal unit. The traffic managers take the decisions also according to provided with these data and manages on the traffic situation. For example, when a vehicle runs the red light, the RFID detects the vehicle through the tags; its detector is triggered, when both conditions are matching, an image of the vehicle, with the relevant monitoring information is taken as illegal driving.

A ZigBee module has been chosen for communication between controller and ARM11. This selection is done because ZigBee has low power consumption and enough data rate for the intended application. This module is a replacement of serial cable connection.

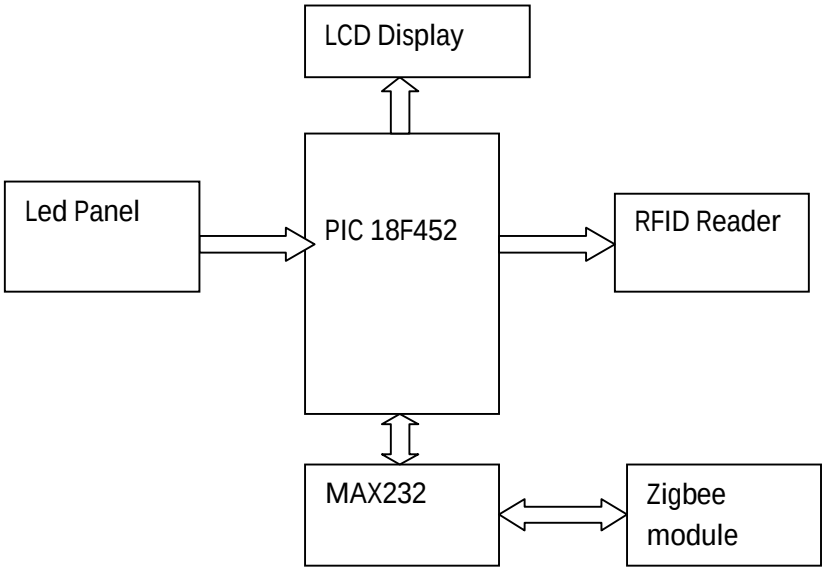

Figure 4. Signal Unit

IV. APPLICATION

At present, the traffic management monitoring systems are based on the IPC as a host computer, and deploy dedicated monitoring configuration software cannot be shared for public information. This method is costly, inefficient, and troublesome for the system to update. In this Project, This project mainly used for monitoring and Control via web browser.

V. CONCLUSION

The traffic monitoring system based on embedded Web technology possesses low power consumption, High integration, real-time efficiency, and easy scalability. Also, it is able to effectively manage the increasing complexity of system resources, and makes some hardware virtualization. When this project idea implementated commercially will result efficient monitoring and control using embedded web technology. Tests were carried out to determine system performance and as the result suggest were quite satisfactory. The experimental result shows that a sustained near- real-time system can be setup with the web browser. It easily makes the system flexibly to be assembled, replaced, and upgraded. Therefore important savings in investment and an increase of benefits are for the traffic monitoring system based on embedded Web technology.

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