

DESIGN AND IMPLEMENTATION OF MOBILE MONITORING AND CONTROLLING OF REMOTE AREAS USING RASPBERRY PI

K. Santosh Kumar¹, J. Pranitha Reddy²

¹ Associate Professor, ² P.G Scholar, Department of E.C.E,
Marri Laxman Reddy Institute of Technology & Management, Hyderabad, (India)

ABSTRACT

This paper focuses on design and implementation of mobile monitor and controlling of remote areas using Raspberry pi .Here Raspberry pi which is ARM11 SoC development board acts as the platform to which interfaces modules and monitor controlling modules are interfaced .The Interface module is the hardware interface to Raspberry pi like web camera ,motors ,lights and sensor units are connected and monitor and controlling unit the mechanism through which the hardware the remote area is monitored from web camera and controlled through hardware from a web browser.

Keywords: ARM11,Raspberry p1, SOC.

I INTRODUCTION

In the present days Security system is expensive and mandatory for all classes of the society from Personal homes to Industrial which is also involving human's life risk at ATM centers. So our Project is to develop End-to-end cost efficient Security System which includes Both Monitoring and controlling system which can be developed or deployed scaling from home to Industries.



Fig1. Snap Shot of Output

II DESIGN CONSIDERATIONS

In order to develop a mobile monitoring and controlling system there are several ways one can achieve that they are through GSM, Bluetooth, PLC & SCADA...Etc. But none of them makes a complete real time cost efficient and portable design .so we decided to develop this model through IOT (Internet of Things) where each and every device unit of the system is controlled and coordinated through Internet.

The next major step is selecting of platform ,even though there are a wide variety of boards like Adrino, Beagle , Panda boards and so on none of the is as robust and flexible ARM11 SoC as Raspberry pi has.

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. We want to see the Raspberry Pi being used by kids all over the world to learn to program and understand how computers work.

Not only the platform should support for deploying a web server, controlling hardware devices, streaming live video through web interface .We found out that no other development board other than raspberry pi can handle all these requirements in the vicinity of our project .Apart from all the above Raspberry pi has a great user community which helped in solving our problems but also supporting.



Fig 2 : Raspberry Pi

III SYSTEM STRUCTURE

The design of mobile monitoring and controlling remote areas is divided in to three modules

1. Interface module
2. System module
3. Monitoring module

Where each module has its own functionality and identification

3.1 Interface module

This module contains further three sub modules.

Sub-module 1: camera module: This acts as eye of the system through which a remote user can monitor the status of the system and through web streaming the video captured by camera module the user can monitor system visually instead of depending on data for this module a Logitech c170 usb web camera device is used. We used a package call motion to handle the web camera live streaming. Motion, a software motion detector, is a free, open source CCTV software application developed for Linux .It can monitor video signal from one or more cameras and is able to detect if a significant part of the picture has changed saving away video when it detects that motion is occurring (it can also do time lapse videos, et al.).

The program is written in C and is made for Linux (exploiting video4linux interface). Motion is a command line based tool whose output can be either jpeg, netpbm files or mpeg video sequences. It is strictly command line driven and can run as a daemon with a rather small footprint and low CPU usage. It is operated mainly via config files, though the end video streams can be viewed from a web browser. It can also call to user configurable "triggers" when certain events occur.

Sub-module 2: Application control module: This module is the hardware module of the system all the hardware units which are acting as interfaces of the system are added. This module can handle both AC and DC operated devices, we used a Zero watt bulb as AC component and DC motor fan is used to show the operation of DC device.

Sub-module 3: Sensor sub modules: This module used demonstrate the system capability of handling real time interrupts. Here a pair of IR sensors are used as obstacle detection units. If an obstacle is obtained at any end of the interrupt sensor the web camera focuses on that particular direction. To stream from where the obstacle is obtained.

3.2 System module

The system module contains 2 sub modules

Sub-module 1: Main module

This is the heart of the project on which every other module works. This module is the response of any switching actions that has to take place on hardware or this is the job of ARM11 SoC so this module is the processing unit for all other interfaces of the system.

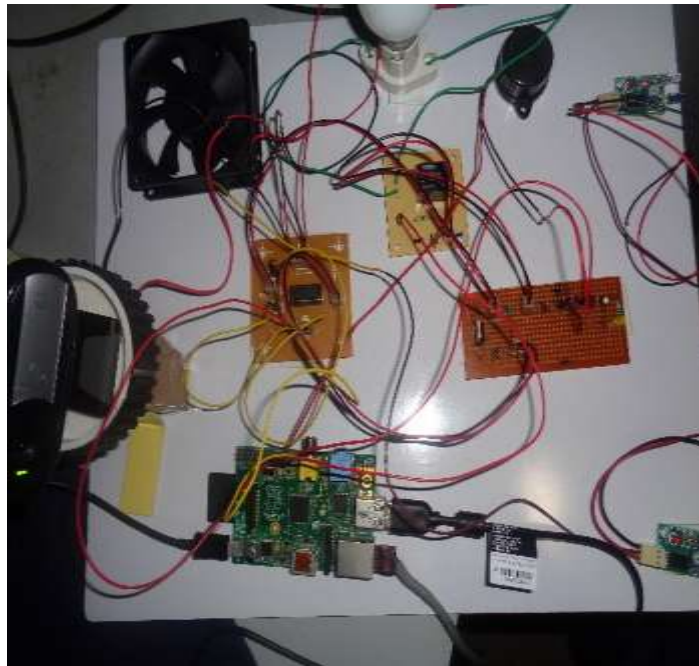


Fig3. System Design

Sub module 2:- Webserver module:

This is the module on which is responsible for updating the status of the hardware of the system an apache web server is deployed in this module on top of which the web camera module streams live video of the remote area and a web page for status of the interface unit .

The Apache HTTP Server, colloquially called Apache, is the world's most widely-used Web server software. Originally based on the NCSA HTTP server, development of Apache began in early 1995 after work on the NCSA code stalled. Apache played a key role in the initial growth of the World Wide Web, quickly overtaking NCSA HTTP as the dominant HTTP server, and has remained the most popular HTTP server, it became the first Web server software to serve more than 100 million Web sites.

Apache is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation. Most commonly used on a Unix-like system, the software is available for a wide variety of operating systems, including UNIX, FreeBSD, Linux, Solaris, Novell NetWare, OS X, Microsoft Windows, OS/2, TPF, OpenVMS and ComStation. Released under the Apache License, Apache is open-source software

3.3 Monitoring & Controlling module

This is the module through which user monitors and controls the rest of the modules .This is typically a web page on any standard web browser.

IV BLOCK DIAGRAM

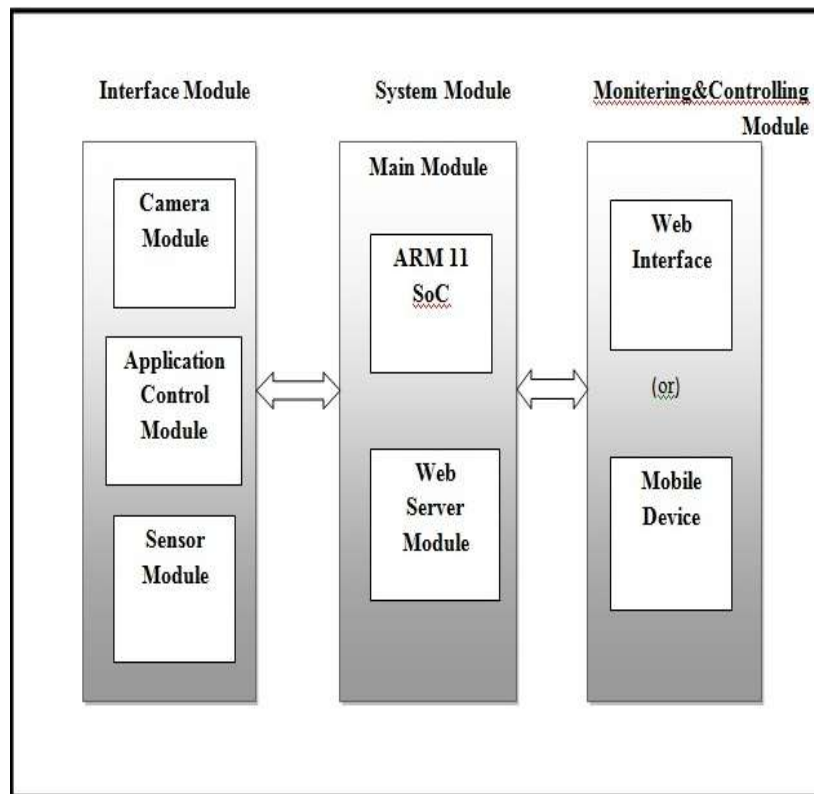


Fig.4 Block Diagram of Project

V ALGORITHM

Step1: Start Raspberry Pi

Step2: Raspberry pi Loads OS, sequentially it loads apache web server which is configured to run as demon after OS boots.

Step3: Start the scripts

- a. Webiopi.py
- b. Motion.py
- c. Surveillance.py

Step4:

- a. Webiopi will be displaying the status of the interfaced devices through Web page and also controls them
- b. Motion will be streaming the video to web page through web camera
- c. Surveillance monitors constantly for interrupts and focuses the interrupt generated location.

Step 5: Repeat step4 and update status on web.

Step6: Turn of the system if power down or else continuous perform steps 4 & step 5

VI FLOW CHART

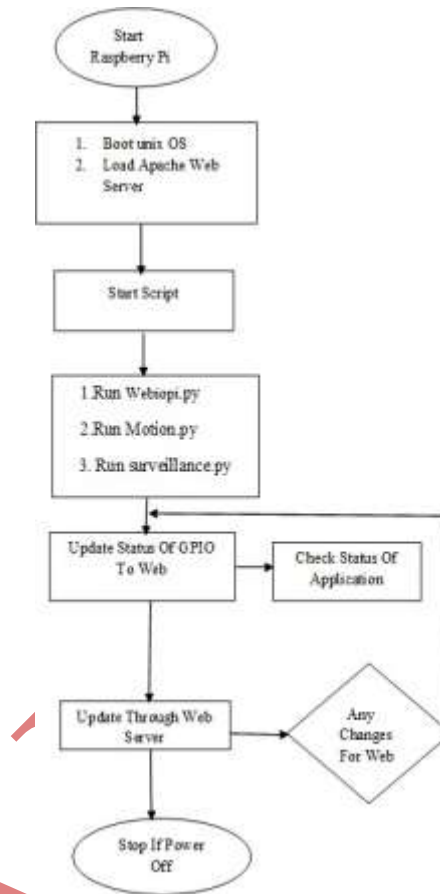


Fig.5 FlowChart of Project

VII CONCLUSION

The mobile monitoring and controlling system through Raspberry Pi is tested through web and manually. The web interface is providing an elegant GUI of both live streaming of video and web status of devices at remote end. The web interface is providing a perfect status update of remote devices connected to raspberry pi and also controlling the devices through web interface.

The obstacle detection sensors are sensing any interrupt occurs and making the web camera to focus to the corresponding direction of interrupt generating direction. Overall mobile monitoring and controlling through Raspberry pi is cost efficient easily deployable real time monitoring and controlling system.

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AUTHOR PROFILE



K SANTOSH KUMAR obtained his B.Tech from JNT University, Hyderabad and M.Tech in VLSI System Design from JNT University, Hyderabad working as Associate professor in Marri Laxman Reddy Institute of Technology & Management, Dundigal, Hyderabad from June 2010 to till date. His areas of research interest Embedded Systems, Signal and Image Processing, Human Computer Interface.



J.PRANITHA REDDY completed her B.Tech From Vijay Institute of Technology & Sciences, KamaReddy. She is Pursuing her M.Tech in Embedded Systems in Marri Laxman Reddy Institute of Technology & Management, Hyderabad. Her Research interests includes Embedded Systems, Signal Processing, RADAR Communications, Low Power VLSI.