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INDUSTRIAL AUTOMATION USING LINUX BASED WEBSERVER

Miss. Tambe Bhagyashri[1], Mr.J.K.Singh[2]

[1,2]*Department of Electronics & Telecommunication, VACOE, (India)*

ABSTRACT

The process of automation in our life is becoming more popular day by day because of its numerous applications. This can be done by using local networking or by using remote control. Automation is a system which controls the devices automatically and is useful for many applications such as security, comfort and efficiency. In today's world, there are many high tech Electronics appliances in our homes and industries which make our lives easier and manageable. So it becomes necessary to control these electronics appliances remotely or wirelessly by user. Therefore in this paper we are using Embedded Web Server. We can control all these appliances remotely from any distance by using Embedded Web Server. The set of switches are connected with the raspberry pi microcontroller board at home. All electronics appliances are connected with this raspberry pi microcontroller board through electromagnetic relay switches in a room. With the help of web server raspberry pi can be controlled from any distance or from any place. The webpage will be connected with the general purpose input output pins of raspberry pi wirelessly. This webpage connected with the general purpose input output pins of raspberry pi will be created by using language PHP. This webpage are having user name and password. After logged in, all switches connected with the appliances can be controlled by raspberry pi through Embedded Web Server. Raspberry pi controls the current flowing through the switches that can switch off the appliance. So in this paper we have presenting a machine automation using embedded web server and raspberry pi based on internet of things.

Keywords: Automation, Apache web server, Electromagnetic relay switches, Raspberry pi, Sensors.

I. INTRODUCTION

Today, technology has become very important part of our lives and it has enabled us to perform tasks that we could not do otherwise. Technology has made our life easier and comfortable. In present world, smart phones and internet are common things for everyone and it has become important part of our daily life.

V Sandip, K. LalithGopal, S. Naveen, A. Amudhan, and L. S. Kumar have developed a system [7] to control machine using raspberry pi based on internet of things or based on embedded web server.Embedded Web Server (EWS) is software built into hardware. Embedded web servers are mainly works very fast. They are economical and easy to use. An Embedded Web Server provides a control panel for configuring the device. The function of web server is to store, process and deliver web pages to the clients. The client sends request to the server via HTTP. A Web server is HTTP protocol stack limited to handling HTTP requests. Pages delivered to the clients are HTML documentsthat includes images, style sheets and scripts in addition to text content. In our project we are using web server to access different sensors data as well as to control different industrial applications. Fig 1.Shows a simple machine automation system which consist of a raspberry pi processor and a set of sensor.

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Girish Birajda, Shrikant Mahindrakar has developed a home automation system using raspberry pi based on embedded webserver [1]. All electronics appliances are control through web server using raspberry pi processor. Sarthak Jain, Anant Vaibhav and Lovely Goyal have mentioned in [2] is to control and monitor home appliances using Raspberry pi through e-mail. They are designing the system by using raspberry pi through reading the subject of e-mail. Firstly, the code will be set to initialize and then log in into g-mail account using the e-mail library of python IDE. After initialization, raspberry pi can reads the subjects of e-mails from the account specified in the code. The commands of the interfaced devices and subject of this e-mails are compared after that control signal will be generated according to it on the corresponding GPIO pin [2].

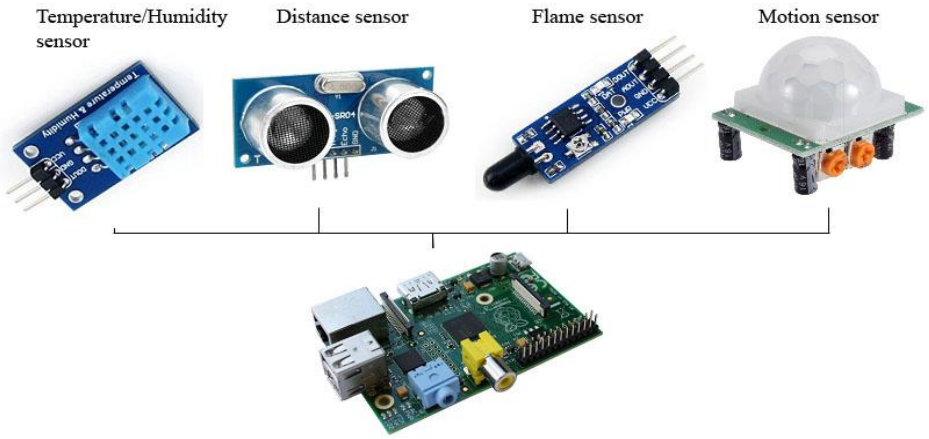

Fig.1.Simple Machine automation system

Vujovic´ V, Maksimovic´ M.have developed a system to monitor and to automate an object based on Embedded Web Server Application. The main aim of this paper is to develop a low-cost electronic prototype, with a built-in TCP-IP connectivity using an embedded web-server. It allows receiving and sending digital commands for automation and monitoring purpose without having dedicated server PC or even special software. Using web browser, users can browse the home page of the system and control the appliances at industries or at home. In this paper a low-cost electronic prototype is designed for monitoring and controlling the home appliances via web browser [5].

II. LITERATURE SURVEY

In paper ' by Udit'Review in Industrial Automation Mamodiya ,Priyanka Sharma published in IOSRjournal Volume 9, Issue 3 Ver. IV (May – Jun. 2014), PP 33-38 it states that " Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories, boilers , heat treating ovens, switching in telephone networks, steering and stabilization of ships, aircraft and other applications with minimal or reduced human intervention. The biggest benefit of automation is that it saves labor, save energy, materials and to improve quality, accuracy and precision. The wireless communication technologies are widely applied in the fields like Industrial Automation. Injection molding machines can fasten the molds in either a horizontal or vertical position. Wireless communication and smart sensors and actuators pose means to sustainably improve automation technology. To learn about Industrial Automation, a review process involving 2 stage approaches has been undertaken for 15 research papers which were published in the period of year 2000 to year 2013. After an exhaustive review process, four key issues were found “Controlling

method of injection molding machine for new technologies, new trends in industrial Automation, Energy Storage in co-generation power plant & Wireless Data Transmission" which is mostly need to enhance of Industrial Automation aspects to get better solution approach. The outcome of the review was in the form of various findings, found under various key issues. The findings included algorithms and methodologies used to solve particular research problem, along with their strengths and weaknesses and the scope for the future work in the area."[8]

In paper ' Industrial automation – A Review' by Prof. Jaikaran Singh, Prof. Mukesh Tiwari , Mr. Manish Shrivastava published in y (IJETT) – Volume 4 Issue 8- August 2013 it states that "Despite years of activity, truly open and intelligent control systems seem still to be a promise of the future. Agreement on common architectures and application objects is needed to raise open control systems from exchanging raw data to the level of real interoperability of off-the-shelf components. Future control platforms and programming languages should have new built-in mechanisms that support implementation of intelligent functions, such as flexible resource management and exception handling. This article argues that many of these challenges can be met by taking full advantage of emerging software engineering technologies. This also means that the modeling techniques and design practices of software engineering should be combined with the traditional ways of thinking in automation."[9]

In paper 'GSM Based Industrial Security System 1m. 'By Sravan Kumar, M.Mounika, L.RamyaPavani publishedin (IJCESR) it states that "Security and automation is a prime concern in our day-to-day life. The approach to home and industrial automation and security system design is almost standardized nowadays. In this paper, we have tried to increase these standards by combining new design techniques and developed a low cost home and industrial automated security systems. Everyone wants to be as much as secure as possible. The design of simple hardware circuit enables every user to use this wireless home security system with PIR sensor, Gas sensor, Smoke sensor and Main fuse Failure Detector at Home & Industries."[10]

In paper 'Wireless Home And Industrial Automation Security System Using GSM' by R.Anandan ,Mr.B.Karthik. , Dr.T.V.U.Kiran Kumar published in JGRCS it states that "Security and automation is a prime concern in our day-to-day life. The approach to home and industrial automation and security system design is almost standardized nowadays. In this paper, we have tried to increase these standards by combining new design techniques and developed a low cost home and industrial automated security systems. Everyone wants to be as much as secure as possible. The design of simple hardware circuit enables every user to use this wireless home security system with PIR sensor, Gas sensor, Smoke sensor and Main fuse Failure Detector at Home & Industries [6]. The system is fully controlled by the 8 bit P89V51RD2 microcontroller. All the sensors and detector are interconnected to microcontroller by using various types of interface circuits. The microcontroller will continuously monitor all the sensors and if it senses any security problem then the microcontroller will send the SMS to the user mobile through GSM modem. The Microcontroller also turns ON and OFF the electrical appliances in home and industry based on SMS received from the user. "[4]

In paper ' A Raspberry Pi Based Global Industrial Process Monitoring through Wireless Communication ' by Priyanka S Lonare , Dr. Mahesh Kolte published in IJARCCE it states that " In recent research work the Wireless technologies are being more and more used in automation and also in the field of wireless communications are diverse. The advancement in wireless technology offers a good opportunity in the area of

communication in perfect region. When the embedded devices are provided with internet access the demand will rise due to the remote accessing capability of these devices. Users can monitor & control remote systems by using embedded Easy IOT server. Wireless based industrial automation is a prime concern in our day-to-day life. The approach to Wireless Network for Industrial Applications standardized nowadays. Intelligent and low-cost automation of industrial processes are crucial in order to improve process efficiencies, deliver quality products, and ensure timeliness and accuracy of systems .Wireless is predicted to be one of the fastest growing technologies in the area of process automation sector This paper is focused on design & implementing a secured wireless communication system of ARM embedded IOT server based on Raspberry Pi. For effective designing & implementing a system we use wireless technology. This wireless technology along with router makes the system Accessible from anywhere in the world. Various Sensors are interfaced with microcontroller. Parameters like Temperature, gas, motion, distance, humidity are measured & real time sensed data is available on the remote pc as well as on the android Smartphone. Due to the use of wireless technology we can achieve super speed transmission of large amount of data in very less time. As the overall system is based on generating of dynamic IP address every time, we can say that the system is much secured than all the previous systems. Thus Proper use of wireless sensor networks (WSNs) lowers the rate of failures, overall cost of the system, & increases the productivity, efficiency of overall industrial operations." [11]

III.HARDWARE DEVELOPMENT

Almost every automation system needs processor to process the signal or to function properly given by the user. This processor is then interfaced with other devices at home for controlling and monitoring the electronics appliances. In our project we have used a raspberry pi microcontroller board to control the electronics appliances from long distance. The raspberry pi processor is connected with the set of sensors such as light, gas, humidity and temperature sensors in a room at home. The information about raspberry pi processor, electromagnetic relays and apache web server is explained next.

3.1 Raspberry pi microcontroller board

Raspberry pi is ARM based single board portable, powerful and minicomputer. The length of board is only 85mm and 56mm of width. Raspberry Pi processor is available in the three models, namely Model A, Model B, Model A+ and Model B+. Model A is the lower-spec variant having 256Mb RAM, one USB port and no network connection. Model B is a higher-spec variant of the raspberry pi. It has 512Mb RAM, 2 USB ports and an Ethernet port. Model B consist of a Broadcom BCM2835 system on chip. Broadcom BCM2835 chip includes an ARMl176JZF -S 700 MHz processor, Video Core IV GPU and an SD card. The GPU has capability of Blu-ray quality playback by using H.264 at 40MBits/s. It has a fast 3D core accessed by using the supplied Open VG libraries and OpenGL ES2.0. It specifically provides HDMI and it has no VGA support. Model B+ is a higher-spec variant of the raspberry pi. It is similar to the Model B but it has more GPIO ports and more USB ports than Model B. Model B+ has lower power consumption and has better audio. Fig 2 shows raspberry pi microcontroller board.

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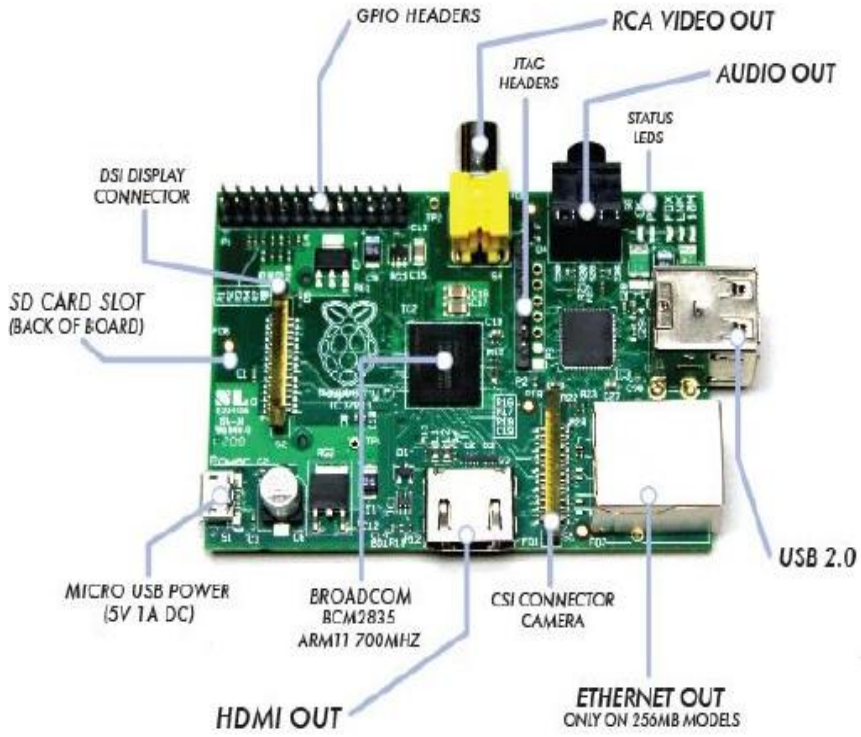

Fig.2 Raspberry Pi Microcontroller Board

3.2 Apache Web Server

Apache is the most widely used web server which is developed and maintained by apache software foundation. It is open source software available for free. Apache web server is used to develop and maintain open source HTTP server for modern operating system including UNIX and windows. It runs on 67% of all web servers in the world. It is fast reliable and secure type of web server. It can be highly customized to meet the needs for many different environments by using extensions and modules.

A website is a collection of multiple webpages which are having their own domain like www.gmail.com.In our project we have creating a webpage that is used to access through the internet of things. Therefore to create a webpage we require some memory space on network. But it is very costly to make a website or webpage. So we require one web server which will be open ware or free. This web server will provide us memory for our webpage or website. This web server is apache web server. Apache web server provides us memory for displaying web page. That means we are using apache web server for our web service to run.

3.3 Introduction of PHP

PHP is a server side scripting language used to designed web development. It is also used as a general purpose programming language. PHP is not a proper web standard-but an open source technology which runs on various platforms such as windows, Linux, Unix, Mac OS X, etc. the PHP is originally created by RasmusLeedorf but the PHP reference implementation is now developed by the PHP group. PHP originally stood for personal home page but it is now stands for PHP Hypertext Preprocessor.

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3.4 Overall system

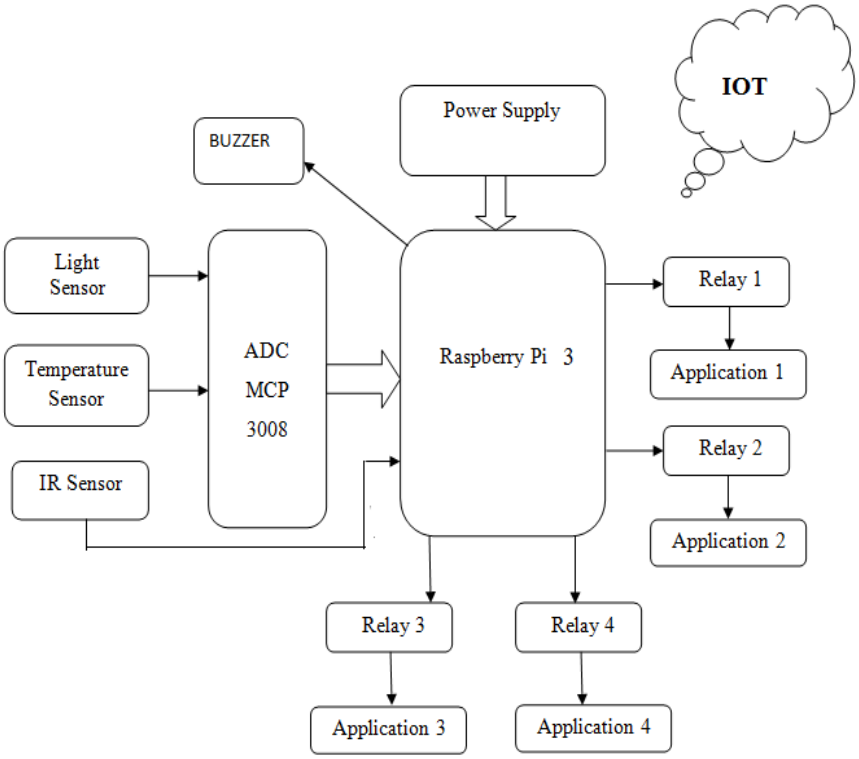

Fig.3 Block Diagram of industrial Automation System by Using Raspberry Pi

IV. SYSTEM WORKING

We have developed an industrial automation system using raspberry pi based on internet of things. The block diagram of the industrial automation is shown in fig 3. An embedded web server used in our project is very fast, economical and easy to use. This system is used for monitoring and controlling the electronics appliances remotely via internet of things using raspberry pi microcontroller board. The sensors are connected with every electronic appliance. Every system requires a

The code of PHP language may be embedded into HTML code. It can be used in various web template systems, web frameworks and web content management system. By using PHP interpreter module, PHP code is processed. PHP interpreter module is implemented in the web server. The web server is then combines the result of executed PHP code which includes images, any type of data or generated web pages. Website is a collection of web pages. Every website is having their own domain. We are using single webpage in our project. The web page will be designed by using PHP and its name will supposed to be assigned as automation.PHP. Webpage includes the username and password. User can log in by accessing webpage. This webpage (automation.php) will be displayed with help of apache web server. An apache server and raspberry pi processor will be interfaced with each other. After connection webpage will be access by setting the path of webpageprocessor to work properly or to process the given input. Here raspberry pi processor is used for continuously monitoring and controlling the appliances at home or business place or in industries through the internet of things. A set of switches is connected to Raspberry pi processor to control the appliances. Raspberry pi is connected to every appliance through the relay switches at home and it is interfaced with the embedded web server. Webpage

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created by using PHP is having username and password. Every user will get their own username and password. User can logged in at any time or from any place. After logging in user can see the status of the appliance that means whether the appliance is on or off. If user wants to switch off the appliance from outside place he will access the webpage and after logging in he can switched off the appliance. The raspberry pi is then controls the current flowing through the electromagnetic relay switches.

V. RESULT

5.1 Login page

The login page is used for authorized person's authentication purpose.

5.2 Webpage:

The main webpage is used to show status of all sensors as well as to control wireless application.

VI.CONCLUSION

Industrial automation and monitoring system using embedded web server is successfully implemented. An automation system is remote control based which controls the appliances and equipment in the house

automatically. But these systems are very costly. Because of the high price of these systems, forcing seek alternative cheaper solutions that could afford each user. One of these decisions can be based on a system mini-computer Raspberry Pi and internet of things.

In this paper, we have introduced industrial automation system using raspberry pi processor based on internet of things or embedded web server. The number of sensors installed at industry is controlled by the raspberry pi processor. Using PHP a webpage is created based on apache web server. This webpage has username and password. After accessing the webpage, the appliances will be monitored and controlled from anywhere. This system can be access from any Computer/Laptop, PDA or Smartphone which are having internet connectivity. This system not only eliminates the need of having a pc based web servers for maintaining the web-pages, but also the need for special software, thus proving beneficial in terms of minimizing cost.

6.1 Advantages

1. Convenience - It provides the user with comfort & convenience since the user can control the connected Industrial appliances from any remote machine having internet connectivity.
2. Real-time Control – User can monitor the real-time status of each of the connected
Appliances and make adjustment as & when he/she feels it necessary.
3. Notifications – Provides user with appliance related notifications regarding state of the appliance etc. as & when required.
4. Addition of an appliance – Enables users to add an appliance with ease & simplicity. The overhead of adding an appliance is very low & is restricted to the hardware required.
5. Security – The system can be employed as a very efficient security tool by connecting cameras, motion & light sensors etc. to the system. The status of these sensors & monitors can be monitored from a remote location & can be used to gather security information about the Industrial in general & take the required measures for the same.

6.2 Disadvantages

This system is dependent on internet. This is only disadvantage of this system.

6.3 Applications

1. Water management system.
2. Boiler.
3. Home appliances control system.
4. Industrial automation system.

VII. ACKNOWLEDGEMENT

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