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Automatic Smart Home Monitoring System with Open Source Hardware

S. Neeraja[1] , B. S. S. Tejesh[2]
[1,2] *Dept of ECSE, KL University*

Abstract: ***Smart home is an observing, controlling and investigating service which includes Wireless transmission technology and electronic sensor innovation. It allows the client to get the full scope of services, the opportunity for continuous monitoring and controlling of the home environment. An embedded web server is developed which consists of screens for home environment parameters, for example, room temperature, light intensity, LDR sensor, PIR sensor, motion detection, fire detection, smoke sensor, humidity sensor and LPG gas leakage for monitoring and controlling remotely. In this project Raspberry Pi3B+ is used for monitoring, processing, controlling different sensors and communicating with embedded web server, because of its advanced features and ease of communicating through Internet of Things (IoT).***

Keywords: Internet of Things (IoT), Sensor node, Raspberry pi, Embedded Web server.

I. INTRODUCTION

Nowadays the technological global centralized principle is to automate every possible aspect for simplicity in existence, supplying security, saving strength and time. In that, home automation is one of the important aspects to automatically ON/OFF the home appliances. Home automation may be characterized as a technique for doing something without human inclusion. It is able to comprise delivered collectively to govern of lighting, heating, air flow, air-conditioning, machines, protection door locking and one of a kind structures, to offer progressed comfort, energy efficiency, and safety. The idea of automating each appliance in domestic is executed from many years in the past, it started out with connecting electric powered wires to the battery and close the circuit by means of connecting load as a mild. Later it is able to be advanced by way of one- of-a-kind businesses, creates its own automation systems with distinct gadgets like sensors, controllers, actuators, buses, and interfaces. There are few strategies for controlling domestic automation systems.

Smartphone traces and even coaxial links are generally applied as part of domestic security gadget. In these days most of the automated structures make use of the hardwired and wireless structures for managing the home equipment. It needs to have both gadget and programming set up for proficient structures.

Fig.1 Home Automation devices.

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The superiority of home automation has been expanding fantastically due to a whole lot higher reasonableness and simplicity through smart phones and wireless networks. Internet of Things (IoT) is interlinked via those networks, due to the popularity of the home automation is advanced by using the nice of provider supplied by using the devices. Extraordinary home automation systems are proposed with the aid of one-of-a-kind authors for robotically on and stale the appliances with one of a kind programs. In that, layout and development of Activation and Controlling of Home Automation System through SMS the usage of Micro- controller [1]. It predominantly concentrates on the manager of domestic home equipment remotely while the individual is ways from the house. In this machine, GSM module is used for sending a message, from at some stage in the arena and 8051 micro controllers as a processing unit [12]. It is a highly priced architecture and has low reliability. This principle control system executes remote Bluetooth innovation to give a way get right of entry to from computer/transportable computer or advanced cell with the layout of low price, consumer pleasant -interface and installation are straightforward in the way. By using this it has a low range of distance, not flexible and no safety [2].This paper is broadly speaking worried with the programmed control of mild or something different home machines through Internet using raspberry pi, micro controller, and sensors. It has complicated and luxurious architecture and high price [3]. This paper intends that a gadget is being created to sign up for any entry level with the Internet. There after the doorway controls that system and can be managed from anywhere on the earth. It costs fairly and difficult to function to manipulate the Door and Home Security by means of Raspberry Pi through the Internet [4]. This paper pursuit controlling home equipment through android mobiles. The use of Wi-Fi is to exchange protocol interfaces and Raspberry Pi as processing unit. The server is interfaced with relay board that controls the home equipment that is going for walks in the domestic. It has high price flexibility [5].

II. DESIGN AND IMPLEMENTATION

The point of interest of in this assignment is, to serve customers and function domestic appliances with their smart phones. This is to help older or handicapped people live a greater independent life as long as possible. The objective of our device is to attend to more home systems that can typically be hard for those who are a handicap or aged to take care of. The proposed idea will allow a person to any web server enabled the device to control and monitor their home. This utility will allow the person to manipulate a tool that is related to any domestic equipment this is Pi enabled. The focus of this application may be to direct a protection gadget with different types of sensors. Sensors are connected to the house appliances with Raspberry pi in order that they'll be monitored and controlled through web page [7].

In this system, we are using the "way 2 SMS" instead of GSM technology for sending the alert messages for each and every sensor when they sense any information. By using this URL = 'http://site24.way2sms. com/Login1.action?'link we are automatically Logging into the SMS Site and send the SMS to the user.

Assume a worker who has gone to work and during this period a thief enters the house through a window. Then the machine could not permit the consumer to enter into the home, because the PIR sensor triggers the LED and automatically an alert message was sent to the local authority.

The Client can also check the status of the lights, fans and some other home appliances whether turned ON/OFF without the need of any single movement. Those devices might additionally benefit users with limited mobility which could have a tough time getting to or even reaching their light switch. Those targets require a big amount of technology. The consumer interfaces have to be as easy and effective as possible and operate in a self-controlled manner. User can control all the home appliances through web server only.

III. HARDWARE DESIGN

A. Raspberry

It is aboard with miniature marvel, packing vast computing electricity into a footprint no larger than a credit card. The PC on the guts of the RASPBERRY PI 3B+ Model will be a Broad com BCM2835 machine-on-chip (SoC) multimedia system processor because of this the sizable majority of the device's factors, in addition to its applicable and images processing devices beside the audio and communications hardware, are built onto that unmarried detail hidden to a lower location the 256 MB silicon chip in the center of the board. It's no longer true that this SOC technique produces certainly the BCM2835 which is a processor positioned to your computer. Moreover, it used a unique instruction set format (ISA), known as ARM [6]. The BCM2835 SOC settled to a lower area a Hynix silicon chip advanced with the resource of Acorn computer systems returned within the past due 1980s, the ARM design may be an enormously unusual sight in the PC international. Anywhere it excels, however, is in cellular gadgets [10]. The Smartphone in your pocket almost actually has at minimal of one ARM-based absolutely processing middle hidden away inner. Its

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aggregate of an easily decreased training set (RISC) layout and coffee electricity draw create it the proper possibility over laptop chips with excessive strength desires and complicated exercise set (CISC) architectures. The ARM-primarily based absolutely BCM2835 is that the name of the game of but the RASPBERRY PI is able to artwork on sincerely the 5V 1A energy provided via using the board micro-USB port. It's moreover the cause why you won't recognize any warm temperature-sinks on the device: the chip's low strength draw right now interprets into very little waste warmness, even in some unspecified time in the future of difficult technique duties.

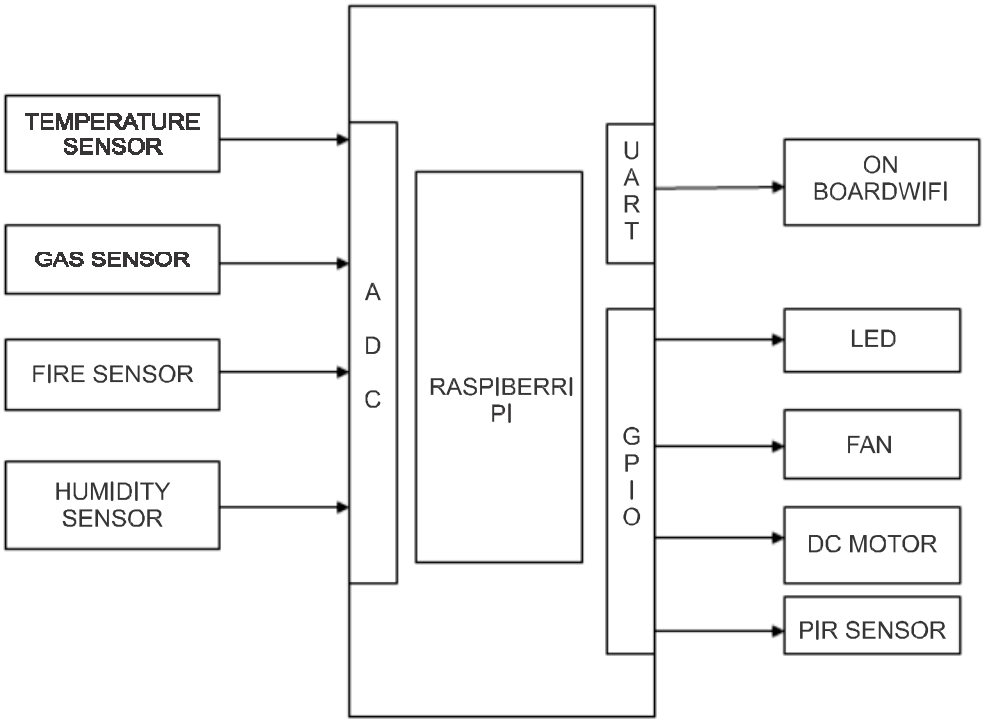

Fig.1 Block Diagram.

B. Wi-Fi Router Configuration

The Wi-Fi unit acts as a medium for communication, it can be also organized to make security services. The Wi-Fi should be organized with a certain address and user commands will be directing through Wi-Fi unit.

Step 1: You may use sudo nano /etc/network/interfaces for configuring Wi-Fi with raspberry-pi.

Step 2: This opens the edit window in editor window *you* have to change the WIFI configuration file.

C. Sensor Node

Gas sensor is an ideal detector that is used to detect the presence of a dangerous LPG leak in your home or in an exceedingly station, tank atmosphere. This unit will be simply incorporated into associate alarm unit or provides a visual indication of the LPG mixture. The detector has magnificent sensitivity combined with a fast latency. The detector can sense iso-butane, propane, LNG and also tobacco smoke.

Passive Infrared sensors (PIRs) are digital devices that are hired in the protection of alarm structures to insight the movement of an infrared emitting, commonly a person frame. The pyroelectric detector is manufactured from a crystalline cloth that generates a surface electrical occurrence. When it is exposed to heat inside, some sort of infrared emissions takes place. Once the amount of radiation placing the crystal changes, a number of price changes and it can be measured with a sensitive FET tool embedded within the detector. This radiation (electricity) is invisible to the human eye but is detected by means of digital devices designed for this kind of motive [8].

Humidity is the presence of water percent in air. The amount of water vapor in the air would effect the human comforts as severe generating processes in industries. The presence of water vapor mixture influences various chemical, physical and biological strategies. Humidity with in industries is crucial because it effects on the enterprise cost of the products and moreover the suitability and safety of the personnel.

The basic physics principle behind CPU cooling is convection. A hot object transfers a number of that heat to the air molecules close

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to its surface, cooling slightly within the method. If the air is moving, then these heated molecules can float away, permitting cooler air to switch them and absorb a lot of heat. Employing fan forces the air to maneuver, providing a constant stream of cooler air absorbs heat from the article and considerably increasing the speed of cooling. In this project, we are using the small 9v dc motor as our home appliances like AC, refrigerator.

IV. SOFTWARE DESIGN

A server is designed on a Raspberry pi 3 improvement board in Linux environment, which reinforces HTTP, TCP/IP, AT Commands and SLIP conventions. The web server Flash File System supports progressively created documents that can incorporate information from transducers and equipment assets. This sort of document is called an embedded web server page (ESP).

HTML is a particular kind of all complete languages used for adorning a website page. HTML acronyms for Hypertext Markup Language. Hypertext is a context that spends a lot on additional determinations. For example, arranging, image processing and so on. Markup is a procedure of including the additional images. HTML has its own protocols, Hyper Text Transfer Protocol (HTTP) is one among them. HTML is a universal language to communicate with different web pages. It demonstrates the details of user name and address which portion is highlighted and where an image includes and so on [9].

It uses various tag lines such as Header Tag, Button tag, and frame stage. There are several types of format instructions that are taken into consideration like head, title, body etc.

Python is a general-purpose, high-level programming language its acts as interpreter. It is easy to compile and understandable language. Python supports multiprogramming model like object oriented, functional programming, imperative and procedural styles. It features is automatic memory management and dynamic type system.

There are different directions that are utilized and runs the putty setup in that stage. Likewise, it is utilized for booting up the raspberry pi working framework. It mostly accessible as an open source.

V. MODEL SIMULATION AND RESULTS

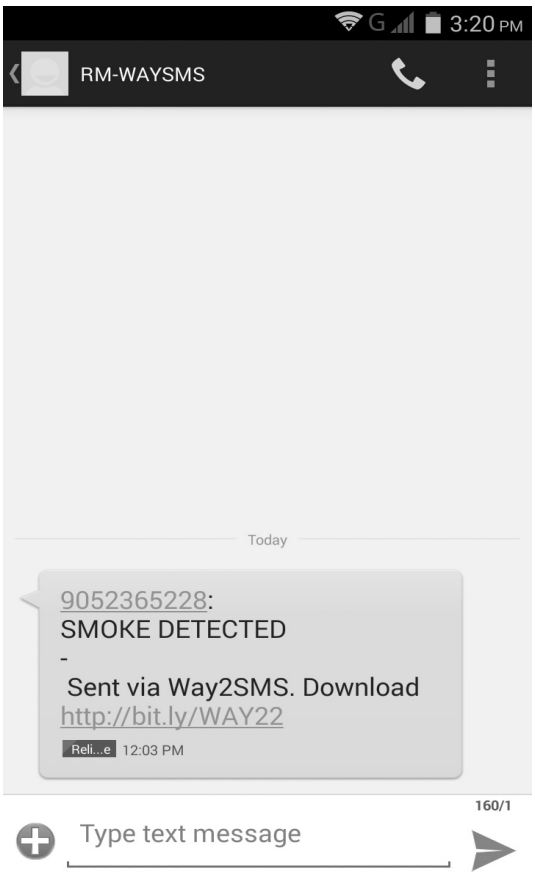

Fig.3 Sensor readings in web page.

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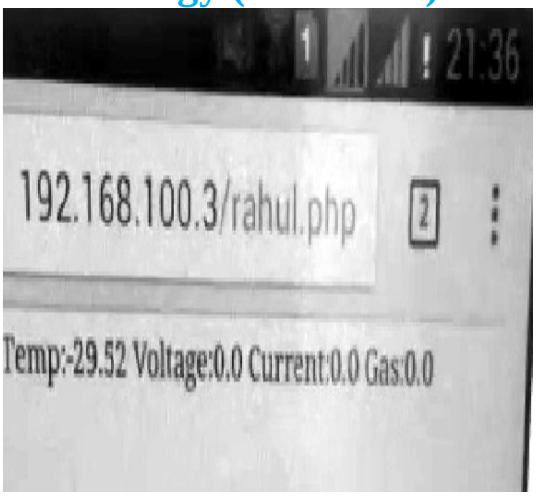

Fig. 4 Screenshot of mobile notifications.

VI. CONCLUSION

This intelligent system is used for remote controlling and monitoring of home appliances in an Internet of Things (IoT) environment using RASPBERRY PI. This architecture can also be used for video surveillance applications, industrial monitoring and controlling and precision agriculture by integrating appropriate sensors and actuators

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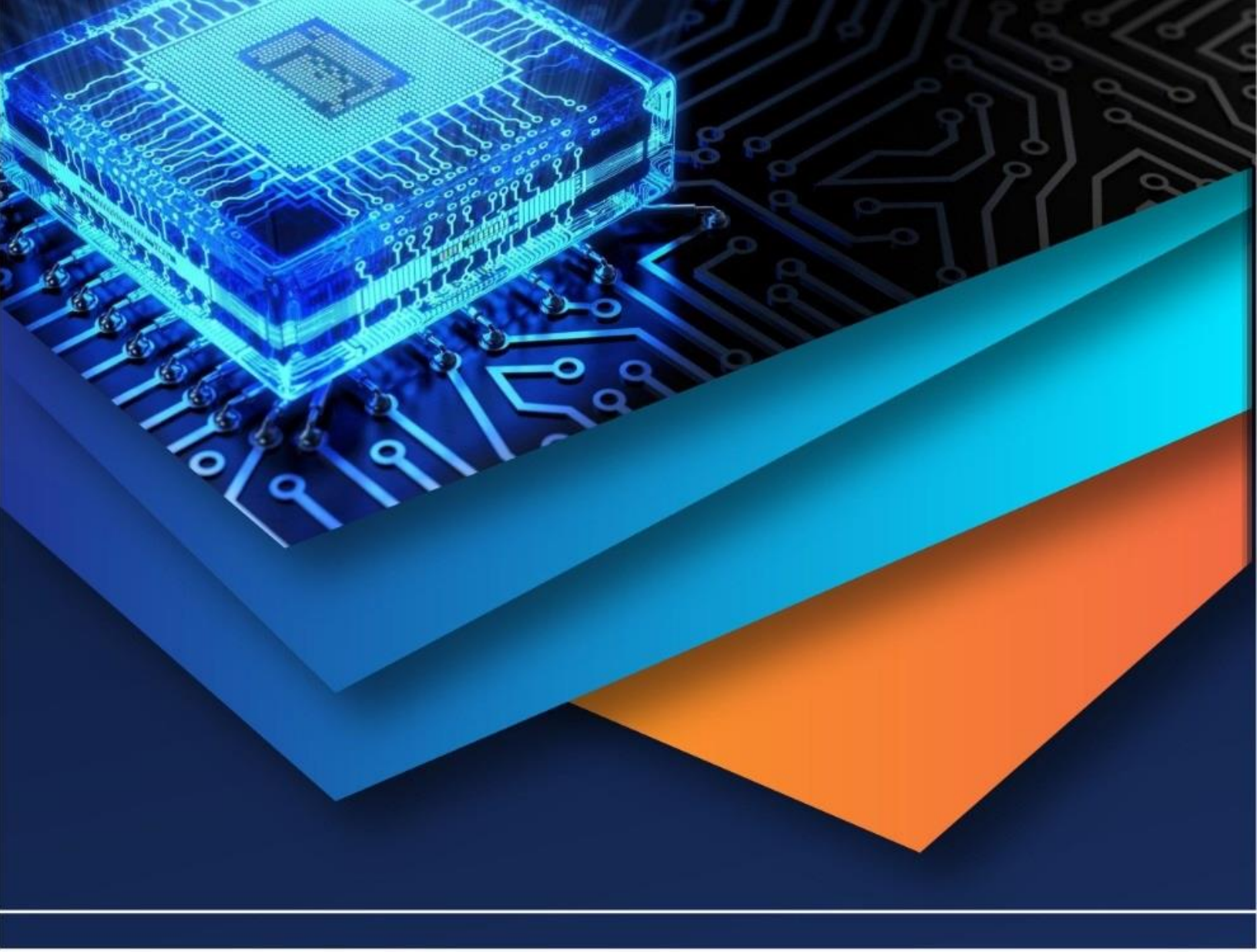

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