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Implementation of an Efficient and Robotically Operated Home Automation System Using the Robustness of IOT

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Abstract: With the advancement of Automation technology, life is obtaining less complicated and easier in all aspects. In today's world, Automatic systems are being most well-liked over the manual system. With the speedy increase within the variety of users of the web over the past decade has created the web a region and parcel of life, and IoT is that the latest and rising web technology. Internet of things may be a growing network of the everyday object from industrial machine to a commodity which will share data and complete tasks whereas you're busy with alternative activities. Wireless Home Automation system (WHAS) victimization IoT may be a system that uses computers or mobile devices to regulate basic home functions and options mechanically through the web from any place around the world, an automatic house is generally referred to as a sensible home. It's meant to avoid wasting the electrical power and human energy. The house automation system differs from the alternative system by permitting the user to work the system from any place around the world through web affiliation. In this paper, we have a tendency to gift a Home Automation system (HAS) victimization raspberry pi that employs the combination of cloud networking, wireless communication, to produce the user with remote of varied lights, fans, and appliances within their home and storing the info within the cloud. The systems can mechanically amendment on the premise of sensors' information. This technique is meant to be low value and expandable permitting a spread of devices to be controlled.

Keywords: Home Automation System, Embedded Technology, Internet of Things, Cloud Networking, Raspberry pi.

I. INTRODUCTION

A. Overview

Homes of the twenty-first century can become additional and additional self-controlled and automatic thanks to the comfort it provides, particularly once utilized in an exceedingly non-public home. A home automation system could be a implies that permit users to regulate electrical appliances of varied kind. Several existing, well-established home automation systems area unit supported wired communication. This doesn't cause a tangle till the system is planned well before and put in throughout the physical construction of the building. Except for already existing buildings, the implementation value goes terribly high. In distinction, Wireless systems will be of nice facilitating for automation systems. With the advancement of wireless technologies similar to Xbee, WI-Fi and cloud networks within the recent past, wireless systems are a unit used a day and every place.

B. Advantages

In recent years, wireless systems like Wi-Fi Xbee, and Bluetooth became additional and additional common in home networking. Additionally, in home and building automation systems, the employment of wireless technologies offers many blessings that would not be achieved employing a wired network solely. 1) Reduced installation costs: initial and foremost, installation prices area unit considerably reduced since no cabling is critical. Wired solutions need cabling, wherever material additionally because the skilled egg laying of cables is pricey. 2) System measurability and simple extension: Deploying a wireless network is very advantageous once, thanks to new or modified needs, an extension of the network is critical. In distinction to wired installations, during which cabling extension is tedious. This makes wireless installations a seminal investment. 3) Integration of mobile devices: With wireless networks, associating mobile devices similar to PDAs and Smartphone's with the automation system becomes potential every place and at any time, as a device's actual physical location

isn't any longer crucial for an affiliation (as long because the device is in reach of the network). For all these reasons, wireless technology isn't solely a gorgeous selection in renovation and improvement, however additionally for brand new installations.

II. SYSTEM ANALYSIS

A. Problem Definition

Home automation systems face four main tasks; which are obstinacy, the high cost of possession, poor manageability, and trouble in attaining security. The key goals of this study are to plan and instrument a home automation system using IoT that is skillful of monitoring and automating most of the house applications through an easily controllable web interface. The proposed system has a great litheness by using Wi-Fi technology to connect its disseminated sensors to a home automation server. This will reduce the distribution cost and will surge the skill of progression, and system reconfiguration.

B. Proposed System Feature

The proposed system is a distributed home automation system, comprises of the server, sensors, and relays. Server controls and observes the speckled sensors and relays. It can also simply designed to handle additional hardware interface module (sensors). The raspberry pi, with Wi-Fi electronic device deeds as a home server. Automation System is accessed from the online browser of any native laptop or PC within the same LAN victimization server information processing, or remotely from any laptop or mobile hand-held device connected to the net with the acceptable browser through server uniform resource locator address. Wi-Fi technology is chosen to be the network infrastructure that connects server and therefore the sensors. Wireless fidelity is chosen to boost system security (by victimization secure wireless fidelity connection) and to extend system quality and quantifiability.

C. Software Description

1) PHP

PHP is a server-side scripting language designed primarily for web development but is also used as a general-purpose programming language. PHP originally stood for Personal Home Page, but it now stands for the recursive acronym PHP: Hypertext Preprocessor. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems, web content management systems, and web frameworks. The PHP code is usually processed by a PHP interpreter implemented as a module in the web server or as a Common Gateway Interface (CGI) executable. The web server combines the results of the interpreted and executed PHP code, which may be any type of data, including images, with the generated web page. PHP code may also be executed with a command-line interface (CLI) and can be used to implement standalone graphical applications.

2) MySQL

MySQL is an open-source relational database management system (RDBMS). The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. MySQL is a central component of the LAMP open-source web application software stack. MySQL is also used in many high-profile, large-scale websites, including Google (though not for searches), Facebook, Twitter, Flickr, and YouTube.

3) Jquery

jQuery is a cross-platform JavaScript library designed to simplify the client-side scripting of HTML. jQuery is the most popular JavaScript library in use today, with installation on 65% of the top 10 million highest-trafficked sites on the Web. jQuery is free, open-source software licensed under the MIT License. jQuery's syntax is designed to make it easier to navigate a document, select DOM elements, create animations, handle events, and develop Ajax applications. jQuery also provides capabilities for developers to create plug-ins on top of the JavaScript library. This enables developers to create abstractions for low-level interaction and animation, advanced effects and high-level, themeable widgets. The modular approach to the jQuery library allows the creation of powerful dynamic web pages and Web applications. jQuery also aims to incorporate other highly used JavaScript functionality.
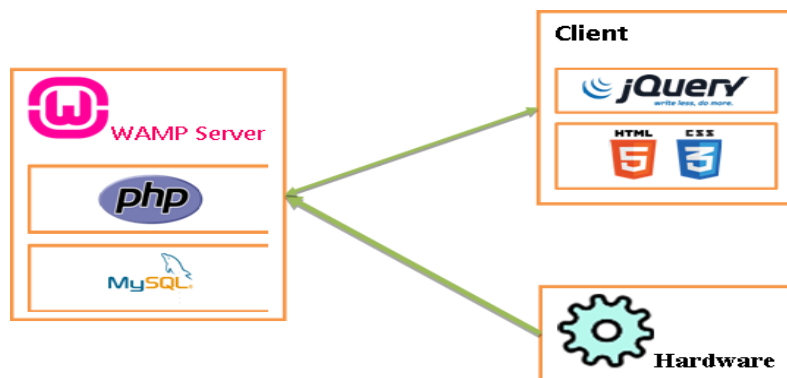

Fig 1: Software module for home automation

By using the above software language we create the web page HAS web page and tested locally using Wamp server and published a same web page in the web-based cloud in https://www.000webhost.com.

III. SYSTEM DESIGN AND IMPLEMENTATION

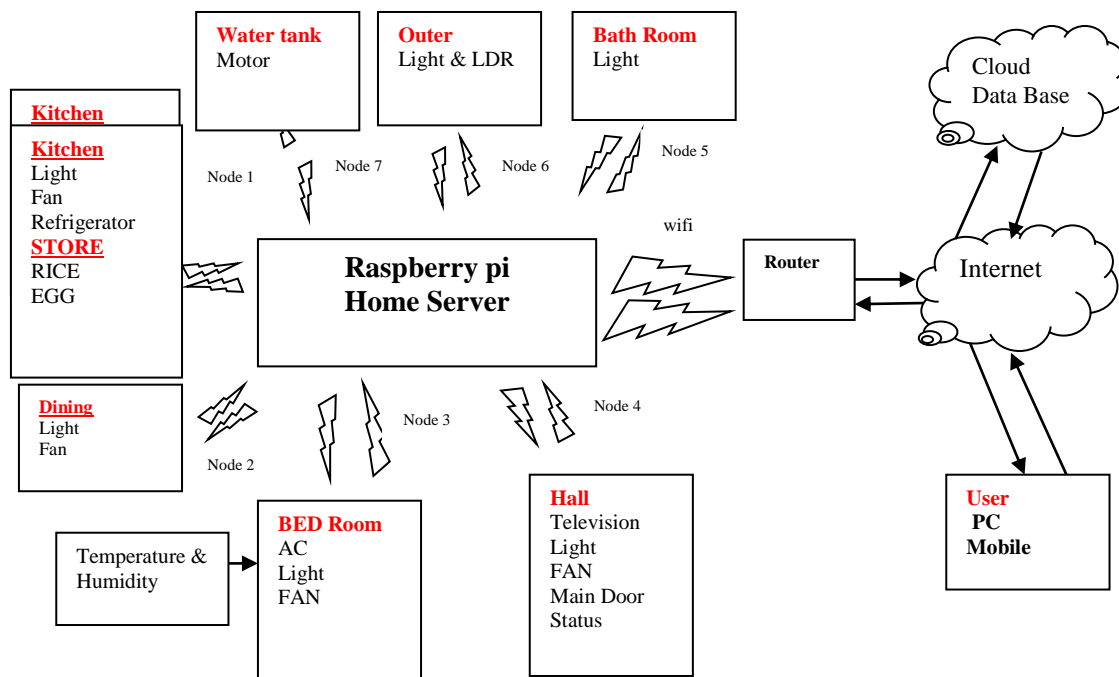### A. Proposed Home Automation System

Fig 2 Proposed model of Home automation system

The proposed model of the home automation system is as shown in Fig 2. The model comprises of various sensors like humidity, temperature, motion and LDR. Firstly the raspberry pi interconnects the web through Wireless.

Fidelity Node1 and Node2 are the key components to read the parameters of the sensors after the good establishment of the connection, etc. The cloud is the vital area for data's accumulated from sensors. The data may be examined anywhere at any time. Alarms are actuated while the parameters are larger than the verge value. In the proposed model the rice, egg etc. in the kitchen store is observed and notification will be reported to the users. The water level in the tank is observed and if it reached below stipulated level robotically it turns on the water pump and if reaches the high level it turns off. Temperature, motion in the house is monitored. The cloud also analyses the temperature and the motion detection. If the temperature surpasses the verge level then the cooler will turn on robotically and it will off when the temperature is regulated.

Likewise once there's an outflow of gas within the house alarm is raised giving the alert sound. The outer lights of home area unit turned on/off mechanically by sensing the daylight outside the house. The consumer may also monitor the electrical appliances through the internet. If the lights or any electrical appliances are left on in hurry is seen and turned off remotely through merely typewriting the address of the net server.

A. Proposed Home Automation System Functions

The proposed home automation system has the competences to regulate the succeeding components in users home and monitor the following alarms:

➢ Egg and Rice status
➢ Refrigerator status
➢ Door status
➢ Temperature and humidity
➢ Motion detection
➢ Light level
➢ The proposed home automation system can control the following appliance:
➢ Lights on/off/dim
➢ Fan on/off
➢ On/off different appliance
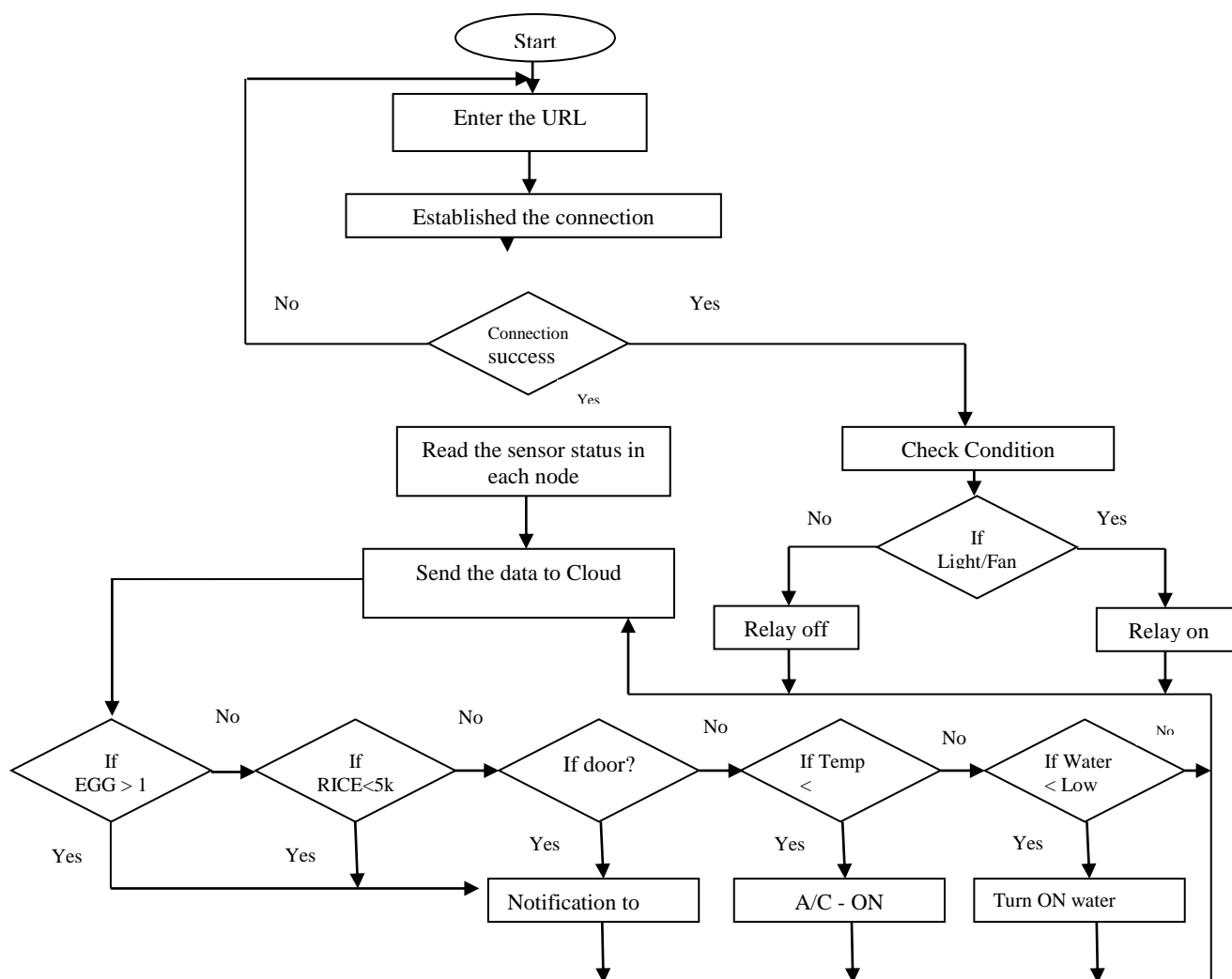
B. Implementation Setup

Fig 3 Sequence of activities system

Fig 3 exemplifies the structure of activities in the WHAS. When the construction is customized it will start analysing the parameters of sensors from node1, node2, node3 etc. The verge levels for the essential sensors are set as t1, t2, and t3 etc. The sensor data are sent to the internet and kept in the cloud. The data can be analysed wherever at any time. If the sensor parameters are larger than the verge level then the respective alarms will be raised up and also indication is sent to the consumer and the required actuation is done for the monitoring of the parameters mechanically.
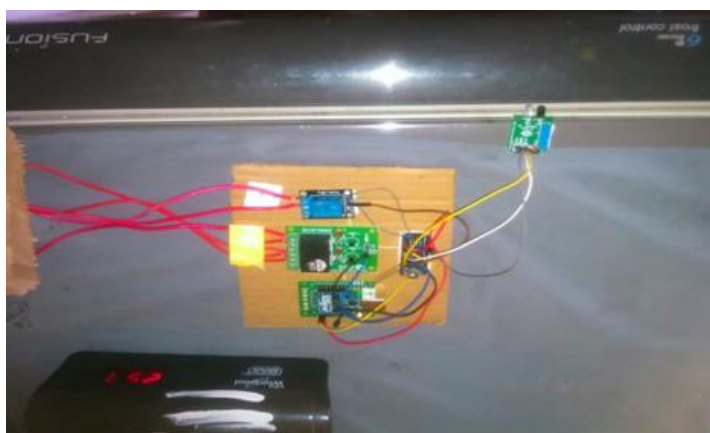

Fig 4 Experimental setup of HAS node 1 – kitchen

**Fig 5 Experimental setup of HAS node 4-Hall**

It is enforced within the house and is made for the house automation system as shown in Fig 4 to 6. At the door of the house, a motion sensing element is fastened to notice any movement close to the door. Outer Lights can activate mechanically once light-weight sensing element detects the darkness. A cooler/fan can trigger once the space temperature surpasses the set verge and consecutively reduces the space temperature. The gas sensing element MQ-6 is located within the room to notice any gas escape, if any escape is noticed the alarm within the hall is raised up. The relay is employed to change the electrical appliances like light-weight, fan etc. The IR sensing element is employed to witness the white goods door standing. The electrical phenomenon bit sensing element is employed to point out to the standing of egg and cargo cell is employed to measure the load of rice dekaliter etc. within the room store. Float sensing element is employed to observe the tank standing and management. Raspberry pi used to act as a home server that collects all the info from every node like node1, node2, node3, etc. The raspberry pi is connected with WLAN with the antennas for the connectivity with the web.

IV. SYSTEM DESIGN AND IMPLEMENTATION

After the productive association to the server, the information of the device is sent to the net server for observation of the system. Fig 7 shows the net server page which can permit us to manage the system. By impending into the URL address this net server page can appear. The net server offers the data regarding the temperature in several places of the house and motion state within the house. It additionally offers the standing of the assorted electrical appliances like lightweight, fan, room standing etc that we will manage remotely.

All the essential data is kept in the cloud https://www.000webhost.com. The stored data can be analyzed at any time. Fig 8 demonstrates the temperature in degree Celsius stored at various time interludes. State of the motion detector is also shown along with the time. It also delivers the information about the motion detected and the number of times as well. All together this information is collected in the cloud which can be verified by the user anytime anywhere even away from home.
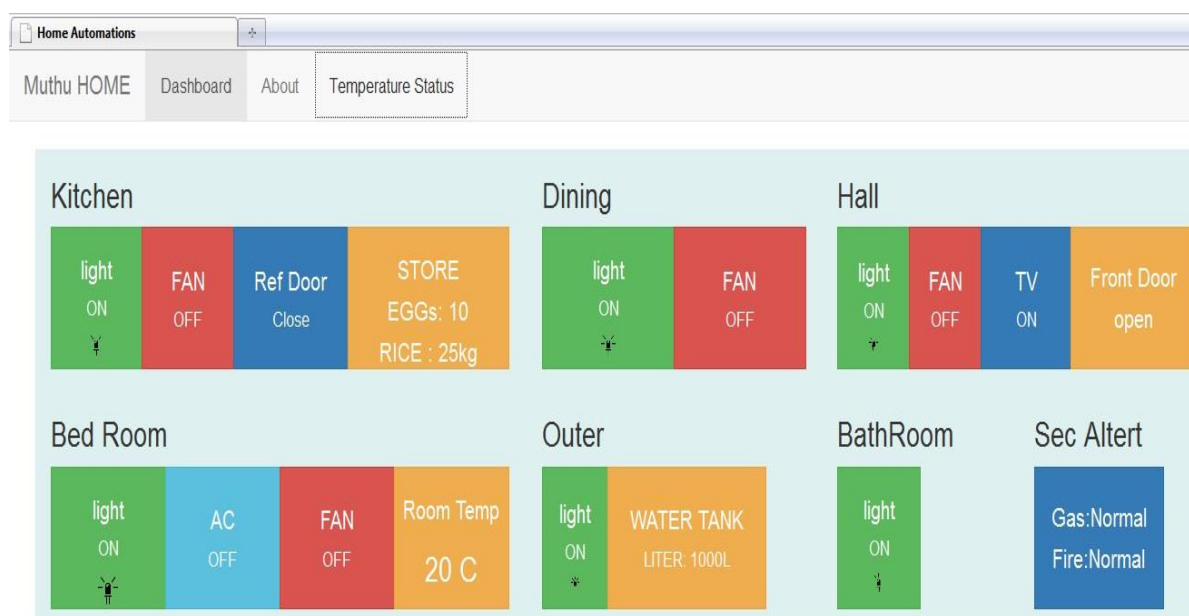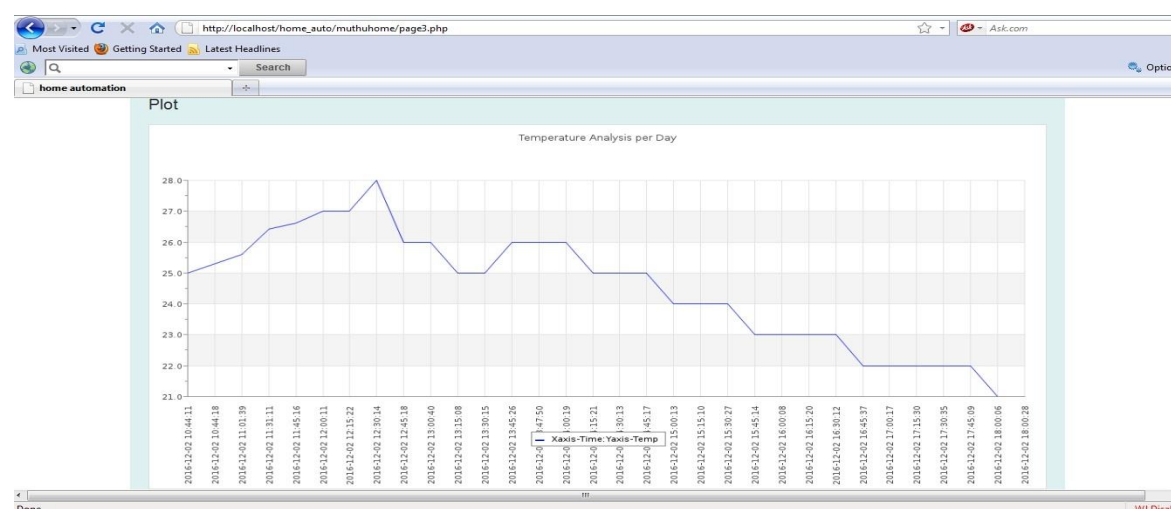
Figure 9: Graph showing the different temperature value along with the threshold

The graph shown in figure 9 gives the examination of the temperature at a different time and the threshold level of the temperature. By visualizing the graph we can come across a change in the temperature & at the time at which temperature was low/ high. We can also distinguish the temperature level above the threshold or not if it was above then at what time. Likewise, we can also examine the water usage and rice usage per day in the home.

CONCLUSION

The home automation using Internet of Things has been through an experiment tried to figure satisfactorily by connecting easy appliances thereto and therefore the appliances were with success controlled remotely through the web. The designed system does not solely monitor the sensing element information, like temperature, gas, light, motion sensors, however additionally actuates a method in line with the need, let's say switch on the sunshine once it gets dark. It additionally stores the sensing element parameters within the cloud in an exceedingly timely manner. This can facilitate the user to investigate the condition of varied parameters within the home any time any place.

VI. FUTURE WORK

By means of this method as a framework, the system is expanded embrace varied different choices that might include home security feature like capturing the picture of an individual roving the house and storing it in the cloud. This can cut back the info storage than mistreatment the CCTV camera which can record all the time and stores it. The system is expanded for energy observance or weather stations. This type of a system with individual changes is enforced within the hospitals for disabling folks or in industries wherever human invasion is not possible or dangerous, and it also can be enforced for the environmental observance.

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