

IoT Based Home Automation and Security System using Raspberry PI

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Abstract -Home Automation using cloud network is a system that uses computers or mobile devices to manage basic home functions and options automatically through internet from anyplace round the world, an automatic home is generally known as a smart home. This network uses a consolidation of a mobile application and computer based program to produce the means of interface to the user. The home automation system differs from different system by permitting the user to control the system from anyplace round the world through internet affiliation. In this paper a Home Automation system that employs the combination of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication is developed, to supply the user with device of varied lights and appliances at intervals their home this technique uses a consolidation of a mobile application, hand-held wireless remote, and computer based mostly program to supply a method of interface to the user. The home automation system differs from different systems by permitting the user to control the system while not the dependency of a mobile carrier or internet affiliation via the in-home wireless remote. This technique is intended to be low value and expandable permitting a range of devices to be controlled

Keywords-cloud networking, internet, android, multi-touch mobile, power line communication

I. INTRODUCTION

Many people are always on the move from place to place leaving all their household appliances without any kind of monitoring and control. at different intervals depending on the time of the day. Some devices if not controlled properly consume a lot of energy which leads to extra expenditure on electricity. Home automation is automation of the home, housekeeping or family activity. Home

automation could embrace centralized management of lighting, heating, ventilation and air conditioning appliances, and various other systems, to produce improved convenience, comfort, energy potency and security. In existing system, the control of home appliances is provided through landline by dialling the designated number for the particular load. Dialing can be done from the home phone or a call made to the home number from outside. This system is designed based on digital logic using the technology called Dual Tone multiple frequency (DTMF) without using a programmable microcontroller. To develop the digital output, the system receives the command from the landline phone.

The idea of home automation has been around for an extended time and product are on the marketplace for decades; however nobody's answer has broken through to the mainstream. Home automation for the aged and disabled will offer inflated quality of life for persons World Health Organization may otherwise need caregivers or institutional care. It may offer a foreign interface to home appliances or the automation system itself, via telephone line, wireless transmission or the net, to produce control and observance via a smart phone or browser. This paper can describe the approach that we tend to implementing and manage numerous home appliances with golem good phone.

II. SYSTEM ARCHITECTURE

A. *Internet of Things*

The IoT-based architecture is an approach which is relevant in many different environments such as patient monitoring system, security, traffic signal

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control or controlling various applications and it provides high-level flexibility at the communication and information is shown in Fig.1. The main objective of IoT is to manage and control physical objects around us in a more intelligent and meaningful manner[1] and also improve quality of life by providing cost effective living including safety, security and entertainment. The alerts and the status of the IoT system can be accessed by the user from anywhere even where Internet connectivity may not be readily available as it is not necessary for the mobile phone to be connected to internet only board is required to have an access to Wi-Fi.

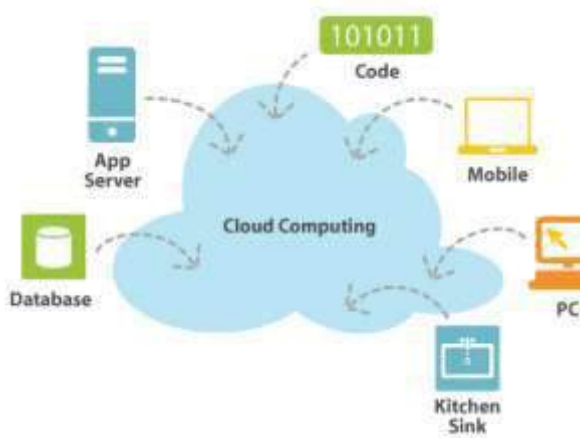


Fig.1. Working of IOT

The physical layer consists of the devices which are to be controlled. The data link layer consist of IoT gateway router, device manager and various communication protocols. The device manager will be the part of raspberry pi. The raspberry pi is used as the IoT gateway which communicates to personalComputer or smart phone by means internet in the network and transport layer. The application and presentation layer consist of web portal which is nothing but designing a web page by which we can control the various appliances [5]. The appliances can also be controlled by creating an app in mobilephone which is similar to web portal. Smart phones can be used to take the immediate action if there is an emergency and it will automatically connect to nearby fire station in case of any fire accidents. The layer of IoT for the proposed solution is shown in the Fig.2.

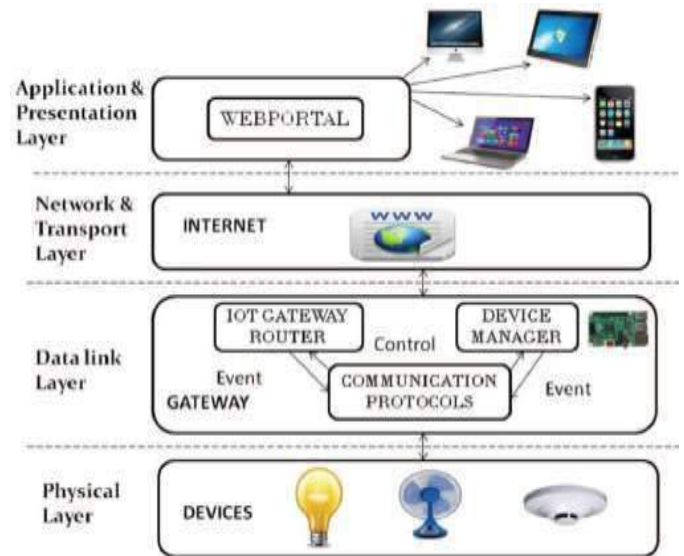


Fig. 2. Layers of IoT

B. Android

Home automation and security systems are concentrates on Android platform as it has huge market and many open sources. The mobile device that includes an operating system, middleware and key applications is a software stack called Android. Linux acts as a base for android based systems. Android Applications are developed based on Java-like programming languages running on a virtual machine called “Dalvik” which is created by Google. To begin developing applications on the Android platform, the Android SDK provides the tools and necessary APIs are required and it is developed using the Java programming language, Android OS version 2.3.4 Gingerbread and 3.1 Honeycomb and above contains the feature of Accessory mode. [4] discussed about Intelligent Sensor Network for Vehicle Maintenance System. Modern automobiles are no longer mere mechanical devices; they are pervasively monitored through various sensor networks & using integrated circuits and microprocessor based design and control techniques while this transformation has driven major advancements in efficiency and safety.

C. Web Server

Various applications located at home can be remotely controlled or monitored by implanting the devices with the web server. The static and dynamic information are stored in embedded system and it fulfils the demands on web browsers. Such type of web servers are called embedded web server.[6]. It's not solely that we will use the Raspberry Pi to induce the information from servers via the web; however it also can act as a server itself. There are many

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alternative web servers that may be installing on the Raspberry Pi. Ancient web servers, like Apache, serve the files from Raspberry pi board to purchasers. Raspberry pi also can serve sound, video, workable programs, and far a lot [7]. However, there's a new breed of tools that reach programming languages like Python, Ruby, and JavaScript to make net servers that dynamically generate the hypertext mark-up language once they receive communications protocol requests from an online browser.

III. SYSTEM DESIGN

As we tend to enter the twenty first century, the interaction between humans and pc is breaking ancient barriers and coming into a brand new realm. in the extremely new technology driven world of today's mobile phones have become a neighbourhood of our Lifestyles. Mobile phones aren't simply communication tool. Our project tries to derive resolution providing higher management on appliance with facilitate of cellular phone. the present System consists of physical appliances in our home that are been controlled through switches. These devices will be switched ON & OFF manually whenever required. This method is a smaller amount secured and liable to electrical hazards. Additionally the wastage of electricity tends to be a significant issue of concern. The projected project is planned networking our mobile phone to any or all appliances via a wise logic circuit. The projected system consists of good Logic Circuit connected to the appliances as shown in Fig.3. Status of all home appliances might be controlled by user from remote location with facilitate of user's mobile phone. The planned home automation system will control and manage the appliance such as:

- Lights on/off/dim
- Fan on/off
- On/off different appliance
- Leakage of gas

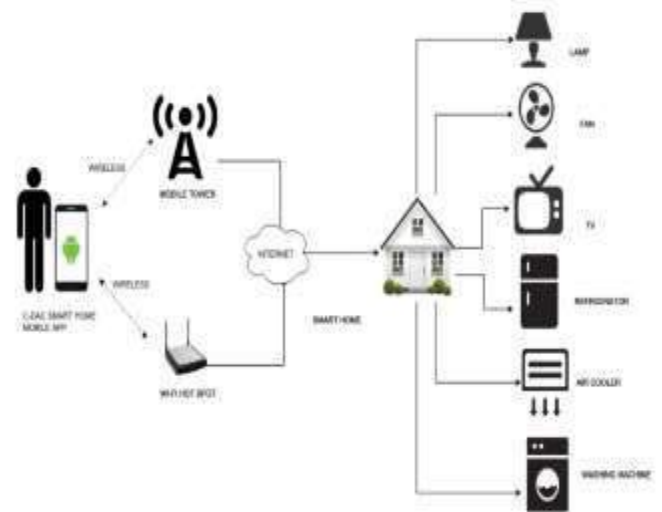


Fig. 3. Block diagram of the home automation system

The markup tags tell the internet browser a way to show the page. The HTML files should have an HTML file extension. EEPROM Storage: EEPROM computing observes, manage, store and process information rather than employing a pc by using remote servers on the internet. Cloud computing could be a general term that's higher divided into 3 categories: Infrastructure-as-a-Service, Platform-as-a-Service, and Software-as-a-Service. IaaS (or utility computing) follows a conventional utilities model, providing servers and storage on demand with the buyer paying consequently. PaaS permits for the development of applications among a provider's framework, like Google's App Engine. SaaS allows customers to use AN application on demand via a browser. a standard example of cloud computing is Gmail, wherever you'll access your keep information from any pc with internet access. Here we have a tendency of using Gmail for the storage of the information. The simulation model of the proposed system is shown in Fig. 4.

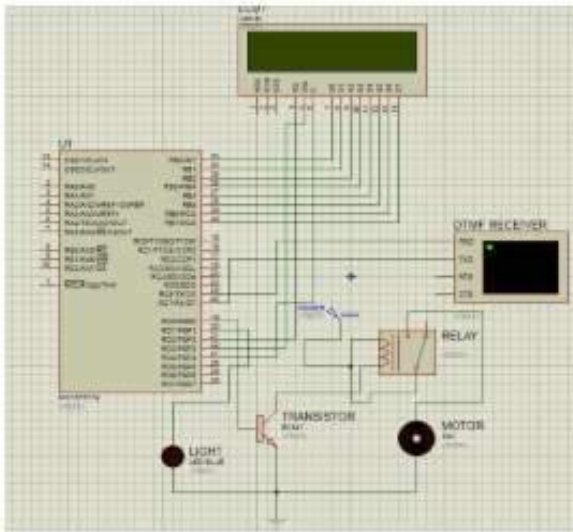


Fig. 4. Simulation diagram of the proposed system

IV. SYSTEM IMPLEMENTATION

As mentioned earlier we tend to develop android application which consists of main operations like light controlling, Door controlling, Smoke detection and Temperature sensing. Once app starts user is initial attested, if user is permitted he is navigated to main screen. The main screen contains a list of all operations among that the, user will choose anyone function that he wish to regulate. Once choosing a operate he would be able to see a current device to attach to the Arduino that we are going to later implement as an android USB accessory. The ADK board provides input and output pins that you just will implement through the utilization of attachments which is referred to as "shields." With an android device and the „Mega ADK“, you'll be able to use all the sensors and actuators you need to form your own accessories. This might embody a LED outputs, and temperature and light sensors. If user desires, he will change or disable the meant device. The system is wise enough to activate alarm once smoke is detected or it's programmed to automatically on/off lights throughout late night hours. If temperature goes terribly high or low it will automatically regulate fan/AC as per the temperature. Its voice navigation that is specifically helpful to blind individuals.

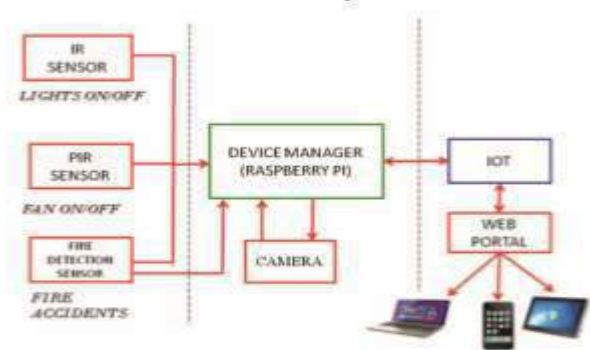


Fig. 5. Architecture of Smart Home

V. HARDWARE IMPLEMENTATION

once the affiliation is established it'll begin reading the parameters of sensors like fan, tube light, gas sensing element etc. let the threshold levels of the desired sensors be set as t1, t2, and t3 etc. The device information are sent to the internet server and hold on within the cloud. The information may be analysed at any place and any time. If the device parameters are greater than the threshold level then the individual alarm a1, a2, a3 etc. are going to be raised and also the needed actuation is finished for the controlling of the parameters. A model home is designed for the house automation system and is as shown in the Fig.6. Light can activate automatically once light device detects the darkness based on the intensity of the light. A cooler/Fan can activate once the area temperature exceeds the set threshold and successively reduces the area temperature. The gas sensing element LM35 is placed inside the room to find any gas outflow, if any discharge is detected the alarm within the hall is raised. Relay is employed to change the electrical appliances like light, fan etc. The Intel galileo is placed future area or garage. The Raspberry PI B is connected with wireless local area network or local area network for the property with web

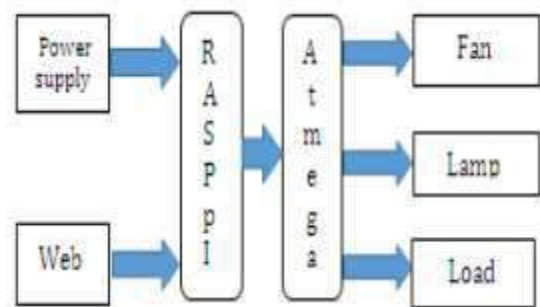


Fig. 6. Control flow diagram

Android Device - it's the device through that application interacts with sensors. USB connector - it's the hardware port within the kit through that the

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USB device is hooked up to the embedded kit. Android accessory Development Kit(ADK) - ADK permits android Phone to act as USB Device wherever because the "Arduino-Mega2560 ADK" can act as USB Host. This enables communication between android battery-powered Devices (like phone, tablet) and external Hardware like industrial controls. Embedded Device - It consists of individual embedded kits in conjunction with individual sensors System analysis. Sensor interfacing with hardware wiring is shown in Fig. 7.

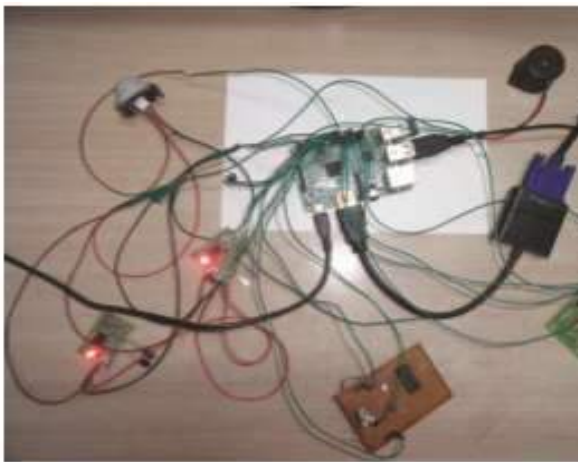


Fig. 7. Hardware implementation with sensor interfacing

VI. SOFTWARE IMPLEMENTATION

Front End Design: HTML may be a format that tells a pc a way to show an internet web page. The documents themselves are plain text files with special "tags" or codes that an internet web page browser uses to interpret and show data on your display screen. HTML stands for Hyper Text Mark-up Language; an HTML file may be a document containing tiny mark-up tags. The mark-up tags tell the online browser the way to show the page. An HTML files should have an htm or HTML file extension.

Database Storage: The system generates forms to gather information and stores the responses in a information storage system. The system is extremely versatile since the info will embody HTML, permitting the system to perform further process exploitation JavaScript or alternative HTML techniques.

VII. ADVANTAGES

This low cost system with minimum requirements takes care of both home security as well as homeautomation

- This home security system does not use any smartphone application or any type of user interface

instead uses digits from the keypad on the phone, the system is platform independent and hence can be accessed from a wide range of phones with different operating systems.

- To operate home security system the user need not have data connection enabled in his phone. The system runs fine with the launchpad connected to wifi at home/office.
- The optional smart phone application takes care of the fact that the user may also wish to control his home appliances without sensors being triggered.
- Since the launchpad sends a voice call to only a particular number which is present in the web API there is no need to worry about security leakage as the system cannot be accessed by any other unauthenticated ser. This in turn increases the fidelity of the security system.
- The use of WiFi enabled launchpad in the system enables the system to be controlled from any partof the globe contrary to Blue-tooth controlled or IR remote controlled existing home automation solutions that too without any net connectivity in the phone.
- Since the same set of motion sensors can be deployed for home automation as well as security system the system is simple and inexpensive.
- This system does not require the user to manually trigger an alarm but still it provides the user withthe advantage of analyzing the situation and then triggering the security alarm remotely from his phone. This idea overcomes the common fault in many existing home security systems which cause unnecessary embarrassment by triggering security alarm due to the systems inability to judge a special situation in which it should not have triggered the alarm.

VIII. CONCLUSION

The home automation using web of Things has been by experimentation established to figure satisfactorily by connecting easy appliances thereto and also the appliances were with success controlled remotely through web. The designed system not solely monitors the sensing element information, like temperature, gas, light, motion sensors, however additionally actuates a method per the need, as an example shift on the sunshine once it gets dark. It additionally stores the sensing element parameters within the cloud (Gmail) in a very timely manner. this may facilitate the user to investigate the condition of assorted parameters within the home anytime anyplace . using this technique as framework, the system are often dilated embody to incorporate varied alternative choices that might

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include home security feature like capturing the picture of someone on the road the house and storing it onto the cloud. This may cut back the information storage than victimisation the CCTV camera which can record all the time and stores it. The system is often dilated for energy observance, or weather stations. This type of a system with various changes is often enforced within the hospitals for disable folks or in industries wherever human invasion is not possible or dangerous, and it may also be enforced for environmental observance.

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