

IOT BASED SMART HOME AUTOMATION

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Abstract: To enhance the convenience of life, Internet of Things (IOT), the current advanced technology plays a major role. In this project we develop IOT based system to control all the electrical devices connected to the switches and it helps in increasing home security. Internet of Things (IoT) focuses on the idea of remotely controlling all the electrical devices by connecting to the internet and also view the status of connected all electrical devices.

Keywords: Internet of Things(IOT), Raspberry Pi, Relay Switches, Power Supply, Home Appliances.

I. INTRODUCTION

The Internet of Things (IoT) is the inter-networking of physical devices (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, and network connectivity that enable these objects to collect and exchange data. The Internet of Things refers to the ever-growing network of physical objects that feature an IP address for Internet connectivity and the communication that occurs between these objects and other Internet-enabled devices and systems.

Automation is a System of controlling a process by electronic devices with reducing human involvement to a minimum. A home automation system consist of two main components the first part is Android application that can give orders to units that one wishes to control by locally or remotely and second part is Raspberry Pi that has appropriate interface to sensors and appliances of home automation system and communicates with an Android application through wireless technology[2]. The home automation system can have a vital role in reducing total energy consumed by home appliances.

II. LITERATURE SURVEY

N. Sriskanthan and Tan Karan[1] have presented in their work an application of Bluetooth Technology for Home Automation. The Bluetooth technology which emerged in late 1990's is used for implementing the wireless home automation system. Various appliances such as air conditioners, home theatres, cellular phones etc., are interconnected, thus creating a Personal Area Network in Home Environment.

Z. Alkar and U. Buhur[2] have developed an Internet based wireless home automation system for multifunctional devices. A flexible, low cost, wireless solution to the home automation is introduced. The transformation of the initial simple functionality control mechanism of devices to more complex devices has been discussed

Muhammad Izhar Ramli, Mohd Helmy Abd Wahab, Nabihah[3] developed a prototype electrical device control system using Web. They have developed a web based controller, for controlling electrical devices. Whenever the

condition of server is down they also set their server with auto restart. The system does not use mobile technology. Being a web based system; this application is less effective since the use of headphones and Smart phones is increasing rapidly.

E. Yavuz, B. Hasan, I. Serkan and K. Duygu [4] have designed and implemented a telephone and PIC remote controlled device for controlling the home electrical devices. In this Pin check algorithm has been introduced where it was with cable network and not wireless communication. The system ensures safety as it cannot be used by unauthorized users as the system uses Pin-check system. The architecture is very complex, but it gives an idea of remote handling of home automation system.

Shahriyar, E. Hoque, M. M. Akbar, S. Sohan, I. Naim, and M. K. Khan[5] presented a GSM based communication and control for home appliances. Different AT commands are sent to the Home Mobile for controlling different appliances. The drawback of this system is that a Graphical User Interface (GUI) is not provided to the user.

Jitendra Rajendra Rana and Sunil N. Pawar[6] have implemented in their paper a Zigbee based home automation system. Zigbee is a high-level communication protocol used to create personal area network. It supports any kind of microcontroller. The system eliminates the complication of wiring in case of wired automation. Considerable amount of power saving is also possible. Operating range is more than Bluetooth. But the system does not allow remote monitoring and controlling of appliances.

All the researchers of the survey have mentioned about the controlling of the electrical devices using Bluetooth, Zigbee etc. They have not mentioned about Raspberry Pi which uses Wi-Fi to cover a wide range of area and also can be controlled from anywhere.

III. EXISTING SYSTEM

The existing system has implemented by making the use of a Microcontroller called PIC18F2550 used for serial & USB features. The sensor used is HSM-20G for humidity and temperature sense. For instance, the effective area under control from a Bluetooth module is 100 meters in diameter[1]. The primary and secondary connections which were supposed to be the backbone and the saving-face of the system intruded it physically.

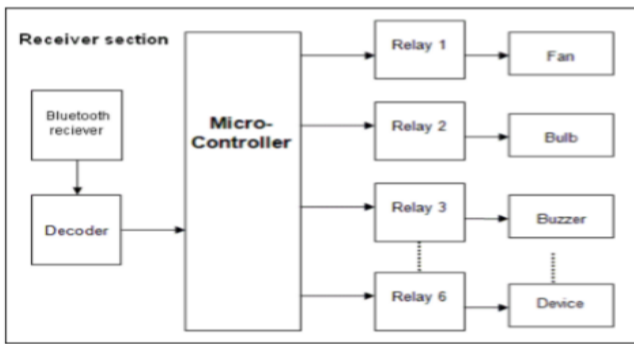


Figure 1: Bluetooth based Home Automation

IV. PROPOSED SYSTEM

The proposed home automation system is working with very popular Android phones. It is having mainly three components; the Android enabled user device, a Wi-Fi having a good scalable range, and a Raspberry Pi board. Here the users have provision to control the home appliances through Android enabled device. This will improve the system popularity since there is no need for a wired connection. The instructions from the user will be transmitted through the Wi-Fi network. The Raspberry Pi board is configured according to the home system and it will enable the relay circuit as per user request. The relay circuit can control the home appliances also. We can add appliances to the system also can add additional security features.

V. DESIGN

A. SYSTEM ARCHITECTURE

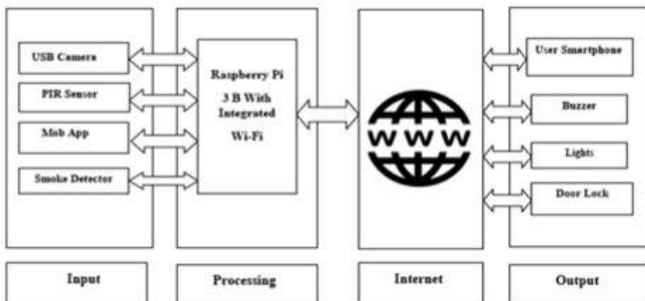
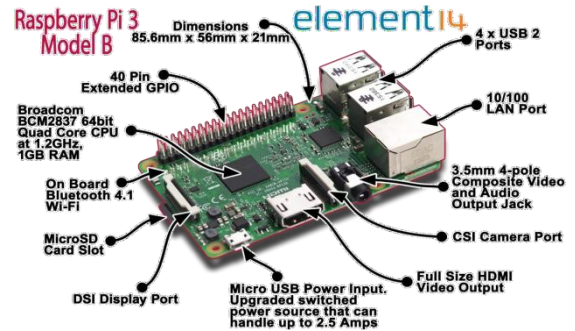


Figure 2: System Architecture

The above figure shows the system, the user gets immediate alert when someone will be near the main door. The system employs PIR sensors to detect the persons entering/waiting outside the room and sends the output signal to the Raspberry pi board for processing. The Raspberry board drives the relay circuit to control fan and light and capture the image using camera.

At this stage all the processing activities, interfacing and signal transportation is done by the Raspberry Pi. All the processing such as input and output operations are handled by Pi, the devices which takes input from different sources are processed according to the operations and executes proper operations for what the Pi is programmed.



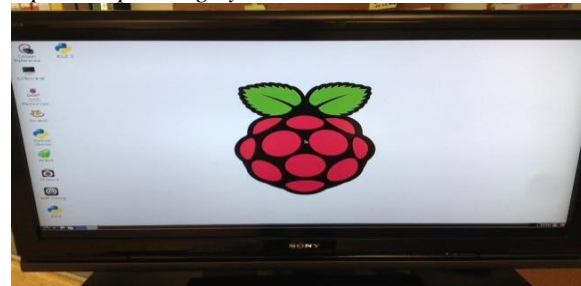
It helps to communicate and control the devices through the User's Smartphone i.e. If user wants to control any home appliance like lights, fans, doors etc. will be turned on or off from the mobile app. The Raspberry Pi is programmed in Python language which gives it ability to work more quickly and more light weight processing.

B. COMPONENTS

1. Raspberry Pi

The Raspberry Pi is a series of credit card-sized single-board computer. All models feature a Broadcom System on a Chip (SoC), which includes an ARM compatible central processing unit (CPU) and an on chip Graphics Processing Unit (GPU, a Video Core IV). CPU speed ranges from 700 MHz to 1.2 GHz for the Pi 3 and on board memory range from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system.

2. Raspbian Operating System



The Raspbian is a Debian-based computer operating system for Raspberry pi. Raspbian is highly optimized for Raspberry pi. There are several versions of Raspbian including Raspbian Stretch and Raspbian Jessie.

3. Relays



Relays as an electrically operated switch. Many relays use an Electromagnet to mechanically operate a switch. Relays are used where it is necessary to control a circuit by a separate low -power signal, or where several circuits must be controlled by one signal.

4. Android Phone

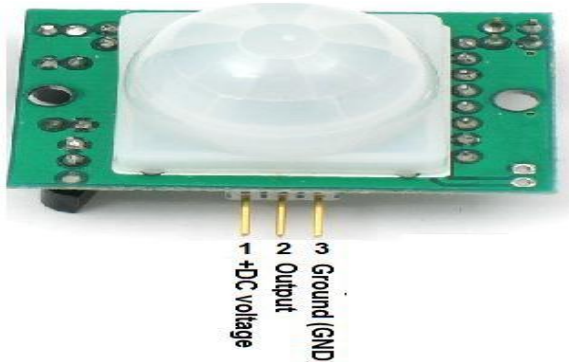


Whenever the other input devices gets any input, they will immediately sends and input notifications to the mobile application and informs the user. The user interface between these devices and mobile application is Raspberry Pi, this give an ability to transfer signal between them.

5. Infrared Sensor

A Infrared sensor is an electrical sensors that measures light radiating from object in its field of view. They are most often used in IR based detection. IR shell catch the disturbance and willsend signal to Raspberry Pi.

VI. IMPLEMENTATION AND SNAPSHOTS



The system is implemented with the following modules.

- Login module- The authenticated user gets logged into the system.
- Wi-fi module- The internet connection should be established with the mobile phone and Raspberry Pi which is using wifi.
- Power Supply module- The electrical power supply should be to all the components on Raspberry board and to all the appliances.
- Relay Switch module- The switches connected to the Raspberry Pi which receives signals.
- Sensor module- Sensor module senses the object detection and sends signals to Raspberry Pi.

The hardware components of the system are Raspberry Pi, Relay Switches, Infrared Sensor and Voltage Convertor.

The software components of the system are Raspbian operating system and python scripting language.

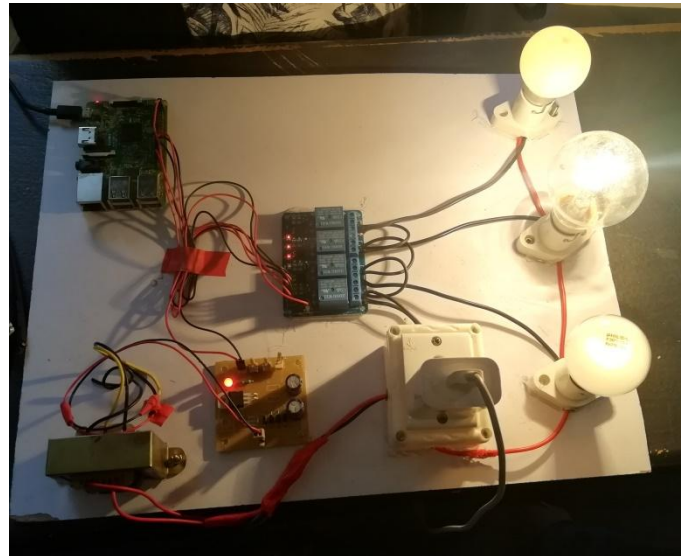


Figure 3: Snapshot of the Project.

VII. CONCLUSION

The main application of this system is inthe field of automation; earlier where a user had to do work manually or had network constraints, now user can fully control his home from mobile application.The proposed system works wirelessly and gives broad range for communication between user and the controllinghead.

The proposed project provides various ways to control the devices in the house, it makes ones living comfortable and at the same time easily accessible through portable devices like mobile phones. It gives the administrator all the rights to decide which makes it reliable as it always asks before taking a decision, which helps when there are necessary decisions to be taken and they can be taken fast in case of an emergency. If you left any home appliance switched on by mistake, then you can check the status of the appliance on the graphical interface made on your mobile and can switch it off using the internet connectivity.

VIII. FUTURE SCOPE

Using this system as framework, the system can be expanded to include various other options which could include home security. One can keep an eye on his or her home through an internet connected to the user's mobile phone or PC or laptop.

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