

# Home Automation Using Internet of Things (IoT)

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**Abstract**— In the 21st century, with the increasing population, no stones can be left unturned in an attempt to save energy. The ability to access and control the home appliances from a remote place can greatly help in conserving energy. A user can use a pc, mobile application or a web system to control the appliances. The so designed system could use communication methods such as Wi-Fi, Bluetooth, ZigBee, GSM, GPRS (2G,3G,4G). Various controlling devices on the hardware side could be the already existing Microcontrollers/Microcomputers. This paper is an attempt to elaborate on home automation systems using internet of things.

**Key words:** Internet of Things (IoT), Home Automation

## I. INTRODUCTION

Any environment which consists of appliances such as fans, television sets, air conditioners, motors, heater, lighting systems, etc can be called an electrical and electronic environment in this context. An environment in which an appliance can be remotely accessed is known as a remotely accessible environment, which includes an Android application and a Web application. Such remotely accessible systems are already available in the market, but have a number of drawbacks as well. This paper aims to show an efficient and cost effective method for home automation using Internet of Things.

## II. REQUIREMENTS

For a successful implementation of home automation using Internet of Things, the prerequisites are (a) Dynamic resource demand (b) Real time needs (c) Exponential growth of demand (d) Availability of applications (e) Data protection and user privacy (f) Efficient power consumption of applications (g) Execution of the applications near to end users (h) Access to an open and interoperable cloud system. There are three components, which are required for seamless Internet of Things (IoT) computing (a) Hardware—composed of sensors, actuators, IP cameras, CCTV and embedded communication hardware (b) Middleware—on demand storage and computing tools for data analytics with cloud and Big Data Analytics (c) Presentation—easy to understand visualization and interpretation tools that can be designed for the different applications.

## III. METHODOLOGY

The whole method is centred around the idea of Raspberry Pi getting its commands from the mobile application via the internet and performing the task commanded to it, like turn on/off the bulb, fan, TV etc. The mobile application updates the table entries on a database on the internet and the Pi periodically scans the table (every 2-3 seconds depending on the internet speed) and carries out the corresponding action.

The real time monitoring has been an important feature that can be used in the home automation systems. As the change in status occurs, user can be informed in real time. The user commands are transferred to a server which is usually done by the android application in this case. The server which is hosted on www.000webhost.com has collectively three PHP codes uploaded. One is the devices code which includes all the devices present in the system and the other two codes are to get and post the current status of the appliances and to help the mobile application communicate with the Raspberry Pi. Internet being available to majority of the cities and customers, using internet for home automation makes the concept very easy and efficient to be implemented. Each application node has four parts – the transmitter, receiver, I/O device and a microcontroller.

The main control program in the server takes status information from the devices' transceiver in real time.

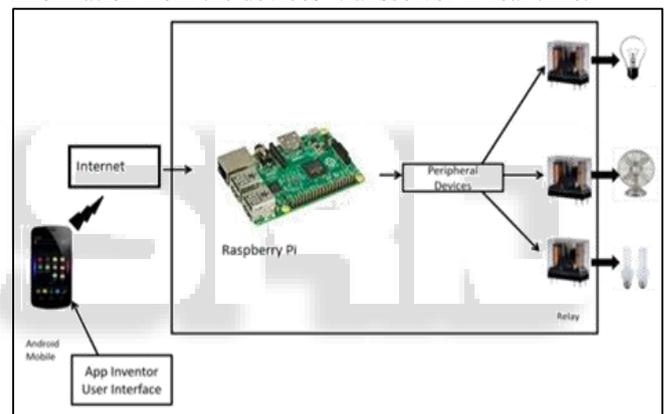


Fig. 1: Block Diagram

The system makes use of Raspberry Pi microcomputer for home appliances control. It makes use of the internet for the control of the appliances. This is an internet based system and internet has been used for it since it is fast and reliable and very cost effective. The control of home appliances is primarily done through the commands done via the application. Although the Pi doesn't directly get the commands straight from the application, the application first updates the data base to the corresponding value of '0' which suggests OFF or '1' which suggests ON. These values are then scanned by the Pi continuously using the PHP codes. The JSON response which the server gives is processed by the python code and the corresponding action is carried out. For each scan the Pi carries out, it checks the status of each of the appliances present in the system. Once the Pi receives the status of the devices connected to its peripherals, the python code checks for a '0' or '1'. This decides which of the appliances get turned OFF or ON respectively. The raspberry Pi simply gives out a pulse to the designated pin which acts like an input pulse to the transistor relay circuit. Upon receiving the pulse, the normally open relay closes the circuit and connects the mains to the device thus turning it on.

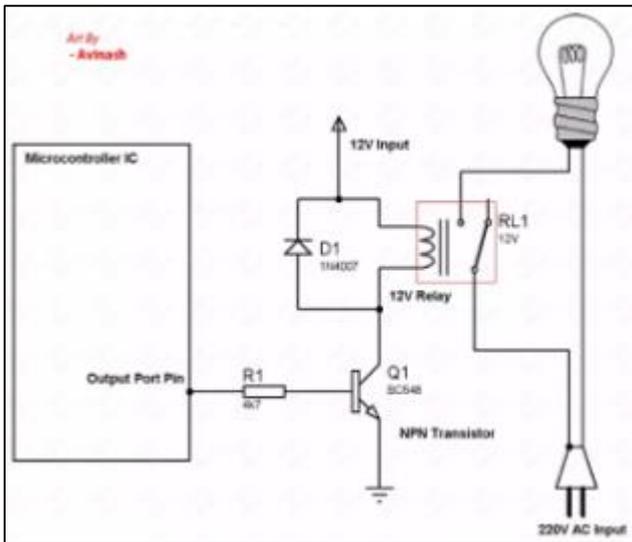


Fig. 2: Light Relay Circuit

Now, if the device was already ON, and it had to be turned OFF, the relay would receive another pulse which would actuate it back to the normally open position and disconnect the appliance from the mains supply. The relay which has been used is 50/60 Hz, 7 Amps 250 volts AC, 12 amps 120 volts DC. The Raspberry Pi which has been used is Pi 3 Model B and can be connected to the internet either via local area network through the LAN port provided or via Wi-Fi. The mobile application on the other hand can send the commands via Wi-Fi or GPRS internet connection.



Fig. 3: Relay

#### IV. APPLICATION

By the rapid developments of new technologies, monitoring, controlling services have been started to be served along with internet as an instrument providing interaction with machinery and devices. The system can be use in several places like banks, hospital, labs and other sophisticated automated system, which dramatically reduced the hazards of unauthorized entry. This system can also be used in a daily household. They can also help baby monitoring and normal security more efficient.

#### V. CONCLUSION

Very soon in near future, the traditional grids of today will evolve into a robust, effective, environment friendly and energy efficient system known as the Smart Grid. Even our home will undergo its own transformation towards the smart homes that will be in constant interaction with the grid in an effort for better energy management and full home automation to ensure comfort, security and privacy. Present paper sought to design a smart home to be controlled by the Raspberry Pi via the IoT. This system is also equipped with

automated lights and virtual switches for controlling lights and appliances in the home remotely using external or internal networking with the Raspberry Pi via an HTML page. Raspberry Pi can play very important role in designing smart home of the future at very low cost. An energy aware smart home can be developed using Raspberry Pi.

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