# IOT BASED HOME AUTOMATION USING RASPBERRY PI

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**Abstract:** *The home environment has seen a rapid introduction of network enabled digital technology. This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Home automation refers to control of home appliances using information technology. There are lots of devices on the market that allows us to monitor our home from the central interface. Home automation now becomes an essential part of IoT applications and people use their smartphone to control home appliances from anywhere over internet. Social media is playing a major role in every people's hand, we are using social media for a lot of applications like chatting, video sharing and for a lot. To make life further easier we are going to use social media to control the appliances using a system called Raspberry Pi. There are various ways to control AC appliances with smartphones, including the telegram-controlled AC appliances with node MCU. This time we will use Raspberry Pi in place of Node MCU to control appliance through our smart phone. In this project we will control an AC lamp with a text message from Telegram application using Raspberry Pi.*
**Keywords:** Home automation, Iot, Raspberry Pi, Telegram Bot, Python**.**

## I.     INTRODUCTION

Technology has become a fundamental part of human life increasingly facilitating daily tasks. The Internet of Things (IoT) is supported by new information exchange technologies that provides not only People-To-Machine communication but also Machine-To-Machine (M2M). The IoT is responsible for information requests and/or executing commands remotely over hardware with different features and purposes. On the other hand, advances in technology also allow users with no specific knowledge to create hardware prototypes, as automation to be used in daily situations, and the Raspberry pi platform is a good example of technology that supports the Do It Yourself (DIY) concept.

The Raspberry Pi is one of the most known and used platforms regarding hardware prototypes construction, being used even for some final projects. This platform is very effective for small-scale projects construction, it is open source and it does not require specific knowledge for project development. In this context, the IoT and platforms such as Connecting Wires.
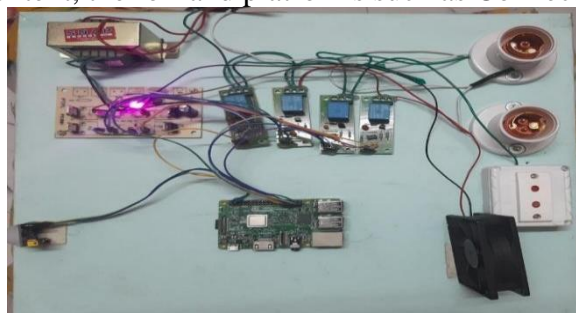


*Fig 1: Home Automation Board With Connecting System*

Raspberry pi allows common users to create their own hardware and communicate remotely with them through the Internet, as already highly used among people via smartphone messenger applications like WhatsApp or Telegram.

## II.     LITERATURE SURVEY

Home Automation System focuses on addressing the problems or power consumption range of operation and cost of the whole system. It is low cost, secure and access fast as compared to the previous systems.

*"Motion Activated Security System using Raspberry Pi"* K. N Karthick Kumar, H. Natraj [1] A home security and surveillance system is an essential part of any modern automated home for such purposes CCTV cameras and other monitoring equipment are used. As House break-ins and thefts are not reported in real time using the current CCTV surveillance systems and also a lot of memory is wasted in storing the redundant data our system is more efficient and reliable. This proposed system serves to be beneficial to any person who can incur a secure and cheap product which could provide alert features to any device that carries an active internet Network. Home security systems are becoming popular along with prominent features on mobile devices.

*"Remote home surveillance system"* Kumar [2] in this described the surveillance technique using an IP camera and Arduino board. In this paper, a user can view a remote desktop using a team viewer application whenever he needs to monitor his home from outside. This system is not sending any notification to the user whenever any unusual event occurs in his home.

*"Android Based Home Automation System using Bluetooth & voice command"* B. Pandya [3] proposed, it used an Arduino microcontroller for connecting the appliances, a Bluetooth module for transferring the signal which is running of a low-cost embedded platform for web-based monitoring and control of a smart home is presented in this work. The platform consists of a distributed sensing and control network, devices for access control and a residential gateway with touch-screen display offering an easy-to-use interface to the user as well as providing remote, web-based access.

The key issues related to the design of the proposed platform were addressed: the problem of security and the robustness of the distributed control network to network fault. One of the main advantages of this system include scalability – the multipoint network can easily be extended with new sensor/controller/actuator nodes, new embedded Ethernet gateways can be added to the local network (e.g. for monitoring and control of the greenhouse and of the garden) which can be exposed directly to the web through embedded web servers or through the residential gateway by following the restful architecture.

For making the home automation easy, the control of all the devices should be brought in one place. To do this several works have been done. But there are some obstacles to be overcome for making the home automation system easier and popular; these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. In a Java based home automation system, a complex and costly installation is needed. The requirement of a high-end PC makes the system expensive. To avoid and overcome these problems, we are proposing home automation using IoT with Raspberry pi.

*"RASPBERRY PI BASED HOME AUTOMATION WITH WIRELESS SENSORS USING SMARTPHONE"* Jinsoo Han, Jaekwan Yun, Jonghyun Jang, Kwang-Roh Park [4] The home automation system is developed using Raspberry Pi, by reading algorithms and subject of emails. The Raspberry Pi is guaranteed to be an efficient implementation platform and proven to be an intelligent and economical home automation system. Home automation using Raspberry pi is better than any other residential automation method implemented in other ways. For example, using home automation DTMF (Dual Tone Multi-Frequency), the detection rate proved to be a big drawback, that is, the problem that cannot be mentioned in the proposed method. Even though Web servers are designed for home automation and the required storage space through a web server, they are ignored in this way because it only uses web server services that have been set up via email.

The LED is used to identify the switching action. The system is an efficient and flexible interactive system. Send a command to the Raspberry Pi, run on the server side of our laptop or the web server receives the user side input command and the script is sent correctly to the client (Raspberry Pi). Here, these inputs are used as commands to turn the lights on/off. When we give the command to turn on the light script server side, the data and information activation relays are forwarded to the Raspberry Pi and GPIO pins. The system can send the current update to the server to detect if the light is on/off.

*"EMBEDDED PLATFORM FOR WEB BASED MONITORING AND CONTROL OF A*

*SMART HOME"* The architecture *AUTOMATION CONTROL SYSTEM USING SMS*" Vamsi krishna Patchava, Sonti Dinesh Kumar, Shaik Riyaz Hussain, K. Rama Naidu [5] In the realm of computerization we need our day-by-day life to be controlled remotely. The point of the task is controlling home machines remotely when the client is far from the place. This is an SMS based framework and client employment remote innovation (GSM). The framework utilizes GSM innovation in this manner giving all around access to the framework for mechanized machine control.8051 Micro Controller is the crucial part of this task.

The fundamental target of this venture is to research controlling of home apparatuses remotely and cost successfully. The inspiration was to encourage the clients to robotize their homes having remotely widespread access. The home machines control framework with a compelling expense was believed to be constructed that ought to be versatile giving remote access controlling plans to the apparatuses.Screen and control house or office mechanical assemblies and supplies effectively through the mobile phone set by sending Commands as SMS messages and getting the contraptions status. The rule thought driving this endeavor is getting the sent SMS and further dealing with it as required to play out a couple of undertakings. The possibility of the SMS sent picks the sort of movement.

The undertaking depends on a very direct standard. In any case, the SMS sent is secured and accumulated from the getting versatile station and after that the required control banner is delivered and sent to the moderate gear that we have arranged by the course got from the sent message.A microcontroller based using SMS structure has been proposed for our endeavor. GSM (Global Systemfor Mobile Communication): It is a cell correspondence standard. SMS (Short Message Service): it is an organization open on electronic mobile phones that permits the sending of short substance messages.

## III.    PROPOSED SYSTEM

In this project we will use the Raspberry Pi controller to control appliances through our smart phone. In this project we will control an AC lamp, Fan with a text message from a Telegram application using Raspberry Pi. In addition to controlling loads, we are monitoring motion detection to provide more security to the home. If a motion sensor detects motion of a person, light will be automatically ON. Raspberry Pi is connected with the Internet to get chat messages from Telegram and the appliances which we have to control should be connected to the GPIO pins of Raspberry Pi through a relay circuit. Raspberry Pi is programmed for receiving chats from the Telegram app, whenever we send messages to the phone though telegram and it receives a message then it gets turned ON and OFF.

**BLOCK DIAGRAM OF PROPOSED SYSTEM:**
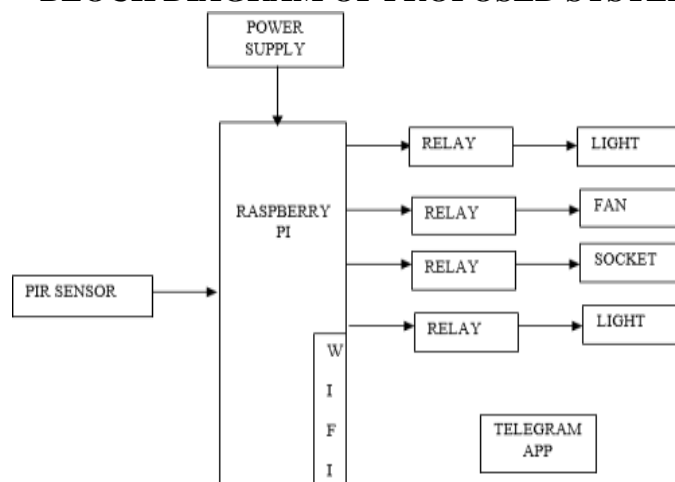


*Fig 1: Block Diagram Of Proposed System*

Raspberry Pi the system is connected with the Internet to get chat messages from the Telegram and the appliances which we have to control should be connected to the GPIO pins of Raspberry Pi

through relay circuit.

### HARDWARE REQUIREMENTS:
1. Raspberry Pi
2. Power Adapter
3. HDMI to VGA converter (optional, when connecting to Monitor
4. Relay
5. Home Appliances
6. PIR Sensor

### SOFTWARE REQUIREMENTS:
1. Telegram Android App
2. Python Language
3. Raspbian OS

## IV.    HARDWARE DESCRIPTION

**Raspberry pi 3 module b:**

The Raspberry Pi 3 delivers 10 times the processing capacity of the Raspberry Pi 1 model. This second generation Raspberry Pi has an upgraded Broadcom BCM2837 processor, which is a powerful ARM Cortex-A53 based 64 bit quad-core processor that runs at 1.2GHz. The board also features an increase in memory capacity to 1 G byte.

The Raspberry Pi has a Broadcom BCM2836 system on a chip which includes an 900 MHz 32- bit quad-core ARM Cortex-A7, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a Micro SD.
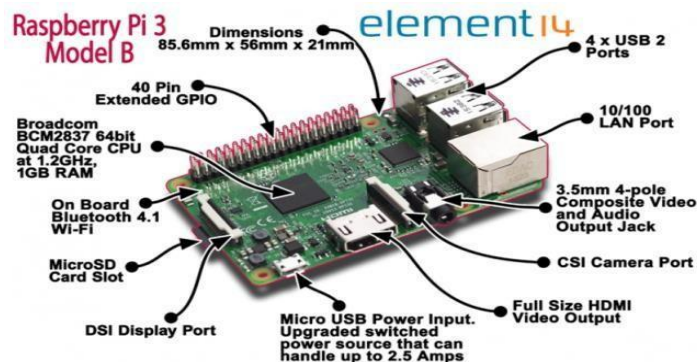


*Fig 2: Raspberry Pi Board*

**PIR SENSOR**

PIR Sensor Detects a Human Being Moving Around Within Approximately 10m From The Sensor. Its actual range is 5m and 12m of PIR sensor, Which Can Detect Levels of Infrared Radiation. For Numerous Essential Projects or Items That Need to Discover When an Individual Has Left or Entered the Area. PIR Sensors Are Incredible, They Are Flat Control and Minimal Effort, Have A Wide Lens Range, And Are Simple to Interface With.



*Fig 3:PIR Sensor*

**RELAYS**

A relay is an electrical switch that opens and closes under the control of another electrical circuit. Relays are usually SPDT (single pole double through switch) or DPDT(double pole double through switch) but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available.

*Fig 4: Relay*

## SECURE DIGITAL HIGH-CAPACITY CARD

The four families are the original Standard-Capacity (SDSC), The High-Capacity (SDHC), the extended-Capacity (SDXC), and the SDIO, which combines input functions with data storage. The three form factors are the original size, the mini size, and the micro size. Electrically passive adapters allow a smaller card to fit and function in a device built for a larger card.

## V.      SOFTWARE TOOLS AND INSTALLATION PYTHON

Python is an object-oriented language and also easy to learn. It is a user-friendly language and also open source. It supports real time applications like Web Development, CAD, Business etc., It is very compatible with all platforms including Windows, Mac and Unix operating systems. Python has more inbuilt functions, it has a huge inbuilt standard library. Python packages contain libraries that allow them to perform all the necessary actions. Python is fully supported for the Raspberry Pi and Python packages also can be used in the Raspberry Pi Connections.

### TELEPOT:

Telepot is an inbuilt function of the Python for Telegram Bot API. It works on Python2 and Python3. For using the telegram app to synchronize with the python we have to take a token from telegram Bot by charting with Bot Father. We have to install Telepot in Raspberry Pi to chat with the Telegram bot using the access token of the bot, for accessing the token we have to create a unique ID. This ID creation is Done when we create the Bot in the Telegram.

### RASPBERRY PI OS:

The Raspberry Pi is a Small Computer, it is in Credit Card Size, Raspberry Pi Operating System will run on every single kind of Raspberry Pi board. For the Easy way of installing Raspberry Pi Os is the Raspberry Pi imager, it is an open source model. Raspberry Pi Os is associated with the BCM module it is for the Desktop.

### REQUIREMENTS FOR SOFTWARE INSTALLATION:

The Raspberry Pi is a very capable minicomputer that's small enough to fit in your pocket (even though you'd probably never keep it there). You can add up to two USB devices (which, in most cases, will be a mouse and keyboard) and connect it to the internet via wired Ethernet. The Raspberry Pi is powerful and inexpensive, allowing you to create a home media center, internet radio, or even your own VPN server on the cheap.

That said, a little setup and a lot of other parts are required to get it up and running. In this post we'll take a look at how to get a Raspberry Pi set up so you can start using it for a variety of purposes. The Raspberry Pi may be a computer all on its own, but you'll still need a lot of other things to make it work.

**An HDMI:** HDMI or capable monitor because it offers better resolution and built-in sound. You can us.

**A good quality, micro-USB power supply that can provide at least700mA at 5V**: Most modern Smartphone chargers supply 700mA at 5V, but not all do. If it offers at least that much power, probably good to go to.

**Set up Raspberry pi with a basic OS:**

*Fig 5: Selection of Ultra SD Card for So Installation*

We can use the Raspberry Pi for all sorts of different things, some of which may require their own special operating systems but to start out, it's a good idea to get acquainted with the Pi by installing Raspbian, a Raspberry Pi-focused version of Linux. Here's what you need to do.
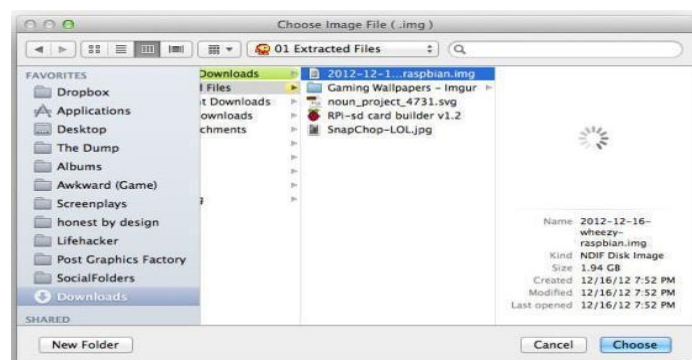
**WINDOWS:**


*Fig 6: Windows Image File*

1. Download the latest version of Raspbian and unzip the.img file inside. (It's almost 500MB so it may take a little while to download.)
2. Download        Win32DiskImager and unzip the application (.exe file) inside.
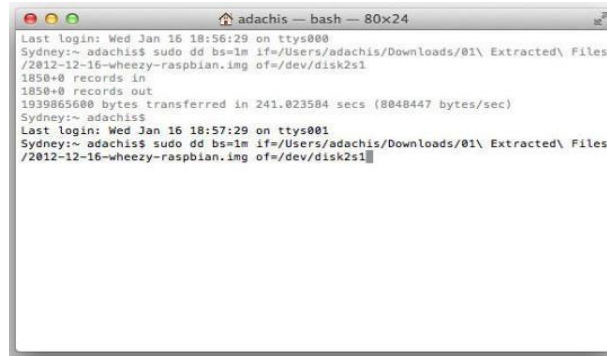3. Insert SD card into Windows PC using a card reader

**OPERATING SYSTEM:**


*Fig 7: Image File Selection*

1. Select expand roots (the second option) and press enter.
2. Confirm that you want to expand the file system and let Raspbian do its thing.
3. When you're returned to the configuration lift, go all the way to the bottom and select the finish option.
4. It'll ask if you want to reboot.

**LINUX:**



*Fig 8: Linux Image File*

Your Raspberry Pi will reboot and take a little longer this time because it needs to expand the file system. After about a minute, you'll be asked to log in.

**CONFIGURE RASPBERRY PI:**



Once Raspberry Pi boots for the first time you'll need to configure a few things. You'll know it's ready for you when you see a **Raspi-config** window with a pretty big list of settings. You can mess with the others if you feel so inclined. But the only thing you really need to do is expand the file system so you can use up all the space on your SD card. To do so, follow these steps:

1. Select expand roots (the second option) and press enter.
2. Confirm that you want to expand the file system and let Raspbian do its thing.
3. When you're returned to the configuration list, go all the way to the bottom and select the Finish option.
4. It'll ask you if you want to reboot. Choose yes.

Your Raspberry Pi will reboot and take a little longer this time because it needs to expand the file system. After about a minute, you'll be asked to log in.

**VI.   RESULTS**

Telegram is Open at the Raspberry Pi board and home automation bot and then see the comments initially all the fan, socket and lights are in off state, when we give the "Light on", "Fan on" and "Socket on" massage on the telegram it will shows the results like bellow figures 6.1 and 6.2 and when we want to turn off the all we will give "Light off", "Fan off" and "Socket off", This all operating from my telegram bot only that is "sravanti_bot" it is created with the permission of telegram Bot. And another one is, we are operating for balcony this is operated by using PIR sensor the result shown in the Figure 6.3, when PIR sensor detects the input, the bulb will on with in 1 sec and we have to set the time for how much time it is in the on state like 5 sec.

*Fig 9:Telegram Massage Input And Outputs*

*Fig 10: Outputs Through Telegram Massages*

*Fig 11: Bulb on Through PIR*

## VII. CONCLUSION

The smart home system proposed through this paper was experimentally proven to work with the support of the various methods implemented like voice, Telegram and app. Control of appliances achieved through these methods with voice in home and remotely through apps anywhere in the world. The design not only monitors the status of the sensor and logs date to Gmail and telegram whenever needed. This will help the user to analyse the conditions in the home anytime, anywhere. The system is like a plug and play which can be mounted anywhere in the house with less cost and more security. This only is possible by using open hardware and free and open-source software.

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