# IoT Based Smart Security and Home Automation

Shradha Somani
Department of Computer Engineering
PVG's COET
Pune, India
shradhasomani1803@gmail.com

Shaunak Oke
Department of Computer Engineering
PVG's COET
Pune, India
shaunoke111@gmail.com

Parikshit Solunke
Department of Computer Engineering
PVG's COET
Pune, India
solunkeparikshit@gmail.com

Parth Medhi
Department of Computer Engineering
PVG's COET
Pune, India
parth.medhi@gmail.com

Prof. P.P. Laturkar

Department of Computer Engineering

PVG's COET

Pune, India

ppl\_comp@pvgcoet.ac.in

Abstract— Internet of Things is a system where appliances are embedded with software, sensors and actuators. The devices are able to transfer data over a network and also communicate with each other. This technique is incorporated in our house to make the appliances convenient and automated. This project focuses on building a home security system which will be wireless. Security over a network is achieved using AES encryption. Security of house is managed by sending notifications to the user using Internet in case of any trespasser and it can also ring an alarm if required. Home automation is utilized by using appropriate sensors installed around house. Raspberry pi is used as a server and controller. Raspberry pi has task of controlling electrical appliances and providing authentication and security to user.

Keywords— Internet of Things (IoT), Home Automation, Smart Security, Intrusion Detection, Raspberry Pi.

### I. INTRODUCTION

Today, there is an increasing demand of automated systems so that human intervention is reduced. This paper focuses on a system that provides features of Home Automation relying on Internet of Things to operate easily, in addition to that it includes a camera module and provides home security. The android app basically converts Smartphone into a remote for all home appliances. Security is

achieved with motion sensors if movement is sensed at the entrance of the house; a notification is sent that contains a photo of house entrance in real time. This notification will be received by the owner of the house via internet such that app can trigger a notification. So owner can raise an alarm in case of any intrusion or he/she can toggle the appliances like opening the door if the person is a guest. The user can make use of this system to control switching on of lights, fan, AC, etc. automatically. [2] We have also incorporated a smoke sensor which, on detection of smoke will ring an alarm and alert the user on their phone by SMS alert.

The user can access complete IoT system from anywhere using Internet. But the micro-controller must always have Internet connectivity [1].Raspberry Pi is a small sized computer which acts as a server for the system. The Raspberry Pi system functions like a computer with a small setup. It contains GPIO pins and USB ports and also supports port for camera module. These pins can be toggled on/off using simple programs.

The project mainly aims to overcome the shortcomings of home security systems by providing information of current situation when the owner is away from the house. It will also enhance the IoTs' network security using encryption and decryption of the user's data.

Further sections of this paper are organised as follows:

Section II represents the related work done in the field of Home Automation. Section III illustrates how the system has been implemented, while it also goes into greater detail about working of the individual components present in the system. The actual control flow of operations in the system has been demonstrated in section IV .Some further modifications which can be done to increase the fidelity and user friendliness of the current prototype have been discussed in section V.

#### II. RELATED WORK

As per our survey, there exist many systems that can control home appliances using Android based phones/tablets. Each system has its unique features. Work on designing home automation system model is an ongoing process. The existing systems have certain deficiencies namely: Lack of an intuitive UI, high base cost, lack of a good security system. We have tried to make improvements on the same. Some models that have been developed already are discussed below.

Andrea Zanella explained the model of comprehensive survey of enabling technologies, protocols and architecture for an urban IOT . They explained various technical solutions and best-practice guidelines adopted in the Padova Smart City project, a proof of concept deploymenst of an IoT in the city of Padova, Italy, performed in collaboration with the city municipality.

Pavithra.D explained the model for efficient implementation of IoT in monitoring and controlling the home appliances via world wide web(www). This model is economical and scalable. The model provided control of appliances via a web server as well as locally without internet access [5].

Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana explained the model for IoT project which focuses on building a smart wireless home security system which sends alerts to the owner by using Internet in case of any trespass and raises an alarm optionally. The microcontroller used in the current prototype is the TI-CC3200 Launchpad board. This system can send alerts and the status sent by the wifi connected microcontroller managed system can be received by the user on his phone from any distance irrespective of whether his mobile phone is connected to the internet [1].

Vamsikrishna Patchava, Hari Babu Kandala, P Ravi Babu proposed the system for Smart Home Automation technique with Raspberry Pi using IoT and it is done by integrating cameras and motion sensors into a web application. Raspberry Pi operates and controls motion sensors and video cameras for sensing and surveillance. For instance, it captures intruder's identity and detects its presence using simple Computer Vision Technique (CVT)[4].

The paper -"Internet of Things Business Models, Users, and Networks" describes various wireless IoT protocols used in smart home. It also describes the application protocols used for IoT. It is useful to recommend the best security features of different protocols and helps choose which protocol to use. [7]

#### III. IMPLEMENTATION

The architecture of Home Automation using Internet of Things is shown in [Figure-1]. Following are the main components of the system:

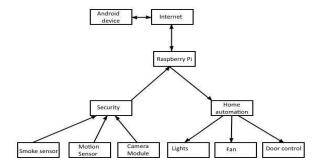


Fig. 1. System Architecture

# A. Raspberry Pi

A Raspberry Pi is a small -sized computer originally designed for portability, inspired by the 1981 BBC Micro. Eben Upton's created the device to make a small and affordable device to help improve programming skills and hardware understanding of students. Its small size and affordable price made it suitable for various applications. Hence it was quickly adopted by many customers [3]. The Raspberry Pi is a complete Linux computer and provides all its functionalities at a low-power consumption level.

#### B. Sensors

The PIR motion detection sensor can be used to detect any intruders at the door. It uses infrared rays to detect any movement. On detecting motion, the user is alerted and a picture is captured. MQ-2 module is useful for gas leakage detection (in home and industry). It can detect various dangerous fumes of gases like H2, LPG, CH4, CO, Alcohol, Smoke or Propane. For detecting temperature and humidity of home, there are various sensors but, among them DHT22 digital sensor is precise and gives an accurate reading. A camera is attached at home for surveillance activity and for security purpose.

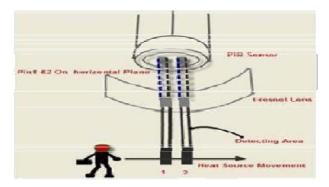


Fig. 2. Working of PIR Motion Sensor

# C. Appliances

The various appliances include lights, fans, electronic door latches and security camera. Our design has its own application to control the various home appliances and also to monitor the security features. User can interact with the application to carry out various functions. The user will receive alerts on the application if there is any attempt to break in to their home. User will also be notified in case of emergency like fire etc. by text message without using internet. This further adds security to our system. The data is received only by the server at the specified port and data are further analyzed. Our project is different in a sense it has its own software level application to control the home appliances and providing security both.



Fig. 3. Android Application Skeleton

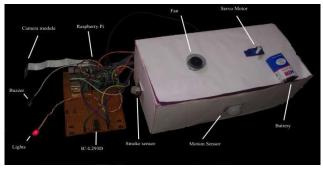


Fig. 4. Hardware Implementation

#### IV. CONTROL FLOW

Initially the user logs in to our android app by entering default credentials. There is facility for admin access to add/remove users and change the default username and password.

AES encryption is employed in the app to provide network security. A socket runs at server (Raspberry Pi) ,which is open constantly and waits for request from user.

When user clicks on login a client socket is created in android app and connection begins between Raspberry Pi and the android device. The encrypted data is passed through this socket to Raspberry Pi.

At Raspberry Pi side decryption of the data takes place. This decrypted data is verified with the entries present in Raspberry Pi memory itself. If correct details are provided a response is sent back to device which starts a new activity.

This new activity can then be used to control any home appliances with a simple on/off button UI. The requests are handled at server side by Raspberry Pi.

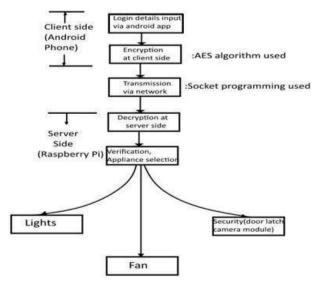


Fig. 5. Control Flow

The GPIO pins of Raspberry Pi are connected to appliances and according to request any appliance can be controlled easily.

The Raspberry Pi is also configured to provide automatic response in case of smoke detection or trespasser. A response is sent to Android device and the user can take appropriate action. A camera module is used to capture the image in real time so user can accurately assess the situation. The image is sent over the mail to the user's registered email address by using SMTP. A text message is also sent to user via way2sms API so that user can get alerts without internet access from the android device.

# V. CONCLUSION

The prime objective of our project is to use an android smart phone to control the home appliances conveniently and to provide robust home security and safety measures. In future, the system can be improved by integrating the voice call feature within the same smart phone application through which the user can control his home appliances. Login can also be done with different upcoming technologies like retina/fingerprint scanning. We can add image processing to improve accuracy of the security system. This system would use a trusted face database to determine whether an intruder is detected or if it is a false alarm.

#### REFERENCES

 Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana, "IoT Based Smart Security and Home Automation System"

- 2] Jasmeet Chhabra, Punit Gupta, "IoT based Smart Home Design using Power and Security Management"
- [3] Stan Kurkovsky, Chad Williams," Raspberry Pi as a Platform for the Internet of Things Projects: Experiences and Lessons ",2017.
- [4] Vamsikrishna Patchava, Hari Babu Kandala, P Ravi Babu, "A Smart Home Automation technique with Raspberry Pi using IoT", 2015.
- [5] B. R. Pavithra, D., "lot based monitoring an control system for home automation," 2015.
- [6] Al-Ali, A.R.; Dept. of Comput. Eng., American Univ., United Arab Emirates; AL-Rousan, M., "Java-based home automation system"2004.
- [7] Stefan Marksteiner, Víctor Juan Exposito Jimenez, Heribert Valiant, Herwig Zeiner, "Internet of Things Business Models, Users, and Networks", 2017.
- [8] S. Tanwar, P. Patel, K. Patel, S. Tyagi, N. Kumar, M. S. Obaidat, "An advance Internet of Things based Security Alert System for Smart Home"