RASPBERRY PI BASED HOME AUTOMATION USING RFID AND GSM

DUTTA AVINASH ATCHYUTUNI¹, SAMIKSHA SHRIKANT PATIL¹, MANNEM SAI VARMA¹, KAMALANATHAN CHANDRAN², BHASKARA SREENIVAS³

¹UG Student, Department of Electrical, Electronics and Communication Engineering,
²Associate Professor, Department of Electrical, Electronics and Communication Engineering,
³Assistant Professor, Department of Electronics and Communication Engineering

¹,²GITAM School of Technology, GITAM Deemed to be University, Bengaluru.
³School of Engineering, Presidency University, Bengaluru

ABSTRACT

This paper proposes the design of the home automation system based on Raspberry Pi, RFID technology and GSM technology. The project is intended to develop a home automation system that controls home appliances using any mobile device. Home automation in recent years has become extremely popular and enhances comfort and quality of life. The main objective of this Raspberry Pi based home automation system is versatility and cost-effective wireless automation of home environment. The RFID technology is used as security purpose in the automation system and the GSM module is used to transfer messages from the Raspberry Pi to the user to control the home appliances.

1. INTRODUCTION

Home Automation refers to the use of IT/computer to control home appliances. It combines electrical appliances with one another in a home. For example: it can include centralized lighting control, home appliances, gate & door security lock to provide enhanced convenience, comfort, energy, performance and protection.

The previous home environment consisting of user controlling and monitoring the home appliances by themselves, a physically impaired user could not control his home appliances without any external help. But through this proposed home automation system, one who is sitting in the office or one who is physically impaired would control the home appliances without any external help, by just using their Smartphone.

The principal objective of this project is to design a system to control and monitor devices such as lights, Fans, and other electrical appliances. To accomplish this goal, the system operates a program on the Raspbian software and an interface between the Raspberry Pi and home appliances is made via GSM module.

The proposed system of home automation is essentially divided into three parts. The first part is the Raspberry Pi, in which program to control the appliances is written. The second part of
this system is the control unit. This part consists of an RFID tag and reader; it takes only valid user input and allows the device or appliance to be controlled. Finally, the last part consists of the GSM module, which communicates via SMS with the Raspberry Pi.

2. LITERATURE REVIEW

2.1 Bluetooth based home automation system using cell phones:

The home appliances are connected to the Arduino board at input output ports using relay. The connection is made via Bluetooth. The password protection is provided so only authorized user is allowed to access the appliances. In this system the python script is used and it can install on any of the Symbian OS environment, it is portable. One circuit is designed and implemented for receiving the feedback from the phone, which indicate the status of the device. [1]

2.2 ZigBee based home automation system using cell phones:

To monitor and control the home appliances the system is designed and implemented using ZigBee. For this the Wi-Fi network is used, which uses the four switch port standard wireless ADSL modern router. Over ZigBee network, ZigBee controller sent messages to the end. To reduce the expense of the system and the intrusiveness of respective installation of the system ZigBee communication is helpful. [2]

2.3 GSM based home automation system using cell phones:

It shows how the home sensors and devices interact with the home network and communicates through GSM and SIM. The system use transducer which convert machine function into electrical signals which goes into microcontroller. The sensors of system convert the physical qualities like sound, temperature and humidity into some other quantity like voltage. The microcontroller analysis all signal and convert them into command to understand by GSM module. [3]

2.4 Home automation using RF module:

A home automation system s designed using a RF controlled remote. In order to accomplish this, a RF remote is combined to the microcontroller on transmitter side that sends ON/OFF signals to the receiver where devices are connected. By operating the stated remote switch on the transmitter, the loads can be turned ON/OFF globally using wireless technology. [4]
2.6 DTMF based Home Automation System

DTMF is an abbreviation for Dual Tone Multiple Frequency technology which focuses on the keypad usage of a phone for data communication. It creates a signal on pressing a key on a keypad. Two or more frequency is mixed and the tone we get is called Dual tone. A cell phone is connected using aux wire to a DTMF decoder MT8890 IC. Every key creates and output of 4 digits and a table is prepared. Based on table different home appliances are controlled [5].

3. METHODOLOGY

3.1 EXISTING SYSTEM

There are several papers on home automation system. One such paper is web application based; the software uses security through passwords. The password protection is provided so that only approved users may access the apps. As a security medium, it requires a good authentication method and a need to prevent unauthorized users from accessing the application. Another project involves a system with Bluetooth based technology has a major limitation; the Bluetooth has a limited range of coverage area and therefore it makes the user confined and can't be used outside the coverage area.

A research paper uses DTMF-based system which has the limitation that only a small number of devices can be connected to the network. A home automation system implemented using Arduino has its drawbacks, when several devices are connected together, this system lags in processing heavy data. One of the Implementation of home automation involves a technique of voice recognition. It includes several drawbacks; voice recognition can exhibit variation in output since human voices are unspecified or random in nature. Voices may have multiple tones, loudness and accents.

3.2 PROPOSED SYSTEM

A new method is introduced to resolve existing system issues. In this proposed system, we have developed our project with a Raspberry Pi. It has tremendous advantages, the Raspberry Pi is 40 times faster than an Arduino and for most of the functions no external hardware is needed. This project uses RFID technology as a security purpose for controlling and monitoring the home appliances, which can be more suitable than a web server or application based password protected systems.

When it comes to coverage area for operating the appliances, the GSM technology provides with a wide range of coverage when compared to Bluetooth based systems, hence the user
can control his home appliances even if he is not present inside home. This project uses GSM module for receiving commands from the Raspberry Pi for monitoring and controlling devices in home.

![Block diagram of the system](image)

Fig 5.1: Block diagram of the system

This system works as the user has to use his RFID card as form of security input in-order to enter the house and once the input is valid, he is now authorized to access all the applications in house, and the valid user can also control the appliances using his phone by sending messages to the GSM module. In case the person fails in RFID input check at the door, an immediate message is sent to the user’s phone about an unauthorized access to his home and person who breaks into the house will have no control over any appliances and rooms, thus making it more secure and safe. The whole system is integrated with relays.
FLOW CHART:

![Flow Chart Image]

Fig 3.1: Flow chart of the system

ALGORITHM:

Step 1: Start.

Step 2: Run the code.

Step 3: Check for the RFID tag on the RFID scanner.

Step 4: If RFID tag is valid; appliances can be turned ON/OFF.

Step 5: If RFID tag is invalid; appliances cannot be controlled.

Step 6: Message sent to the user’s mobile about unauthorised entry.

Step 7: Message received from the user deciding to access the appliances or not.

Step 8: End.
4. EXPERIMENTAL SETUP

Connections to the home automation circuit based on Raspberry Pi are quite easy. The Raspberry Pi is connected via HDMI to the computer and interfaces the GSM module and relay with Raspberry Pi. The software used here is Raspbian. The Raspbian is a 32-bit, Debian-based operating system for Raspberry Pi. The operating system is still undergoing active development. Raspbian is highly optimized for low-performance ARM CPUs on the Raspberry Pi line. Raspbian uses PIXEL, Pi Improved X-Window Environment. It consists of a modified LXDE desktop environment and the Open box stacking window manager with a new theme and a few other changes. The distribution is shipped with a copy of the computer algebra program Mathematica and a version of Minecraft called Minecraft Pi, as well as a lightweight version of the latest version of Chromium.

5. RESULT

With the help of the proposed system we are capable of successfully controlling the room lights and fans. As the user enters the home and checks his RFID tag on the RFID reader, if the RFID tag entered is valid, he is now authorized to control the lights and the fan of the room. In other case, when the other person checks his RFID tag on reader at the door and turns to be invalid, an immediate message is sent to the user's mobile about an unauthorized access to his home and the person who fails to check the RFID will not be able to control any device, making it more secure and secure.

<table>
<thead>
<tr>
<th>S.NO.</th>
<th>TAG NO.</th>
<th>STATUS</th>
<th>APPLIANCES</th>
<th>SMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B912CB00</td>
<td>Access granted</td>
<td>ON</td>
<td>Welcome home</td>
</tr>
<tr>
<td>2</td>
<td>C9E2E800</td>
<td>Access denied</td>
<td>OFF</td>
<td>Intruder alert</td>
</tr>
<tr>
<td>3</td>
<td>079F3526</td>
<td>Access granted</td>
<td>ON</td>
<td>Welcome home</td>
</tr>
<tr>
<td>4</td>
<td>A912CB01</td>
<td>Access denied</td>
<td>OFF</td>
<td>Intruder alert</td>
</tr>
<tr>
<td>5</td>
<td>D9E2E801</td>
<td>Access granted</td>
<td>ON</td>
<td>Welcome home</td>
</tr>
</tbody>
</table>
6. CONCLUSION

The proposed home automation system has been successfully designed and implemented. The system is built for persons who are not present at home, physically impaired or elderly. The proposed system allows the user, with an RFID and SMS tag, to control and to monitor home appliances. It provides easy control of devices in the house, making one's life comfortable and at the same time accessible remotely via mobile devices such as smart phones. Lights and fans in a room of a low or middle class home are common aspects. Because of this large number of people will get a good and a user-friendly environment which controls home appliances through their smart phone without any requirement of internet or additional app.

7. FUTURE SCOPE

Using this system as framework, the system can also be enhanced to include many other features that could include home security feature byporting the system to the cloud and for even energy monitoring. This type of system design with additional improvements can be introduced in the hospitals for disabled people and also in industries where human interference is difficult or harmful. A biometric-based home automation system can be designed to provide greater security.

REFERENCES


