IOT based Home Automation using Raspberry PI 3B+

Vaishali vimal , Sumalatha, Jyoti, Amal Joseph
Dept. of Electronics and communication Engineering,
Yenepoya Institute of Technology,
Moodbidri, Karnataka, India

Prof. Gangadhara
Dept. of Electronics and communication Engineering,
Faculty of Engineering,Yenepoya Institute of Technology,
Moodbidri, Karnataka, India

Abstract: **This paper proposes the design of Inter of Things (IOT) based home automation system using Raspberry pi. Currently in day today's life we can hardly find a house without a home Automation system. This project is intended to construct a home automation system that uses any mobile device to control the home appliances. The home automation system is based on IOT. Home automation is very exciting field when it uses new technologies like Internet of Things (IOT). Raspberry pi is credit card size computer. Raspberry pi supports large number of peripherals. Raspberry pi is having different communication media like Ethernet port, HDMI port, USB port, Display Serial Interface, Camera Serial Interface, Bluetooth, Bluetooth low energy. It allows to control number of home appliances simultaneously. Here local server is created on Raspberry pi. User required to use different mobile devices like smart phones, Laptops, Tablets to operate the home appliances with the help of UI created on web page**

Key words - IoT, Sensors,hdmi port

I. INTRODUCTION

Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. With advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world there are lots of internet users has made it as a part of life. Also IOT is the latest and emerging internet technology that can share information and complete tasks while you are busy with other activities. Internet of Things is a concept where each device is assign to an IP address and through that IP address anyone makes that device identifiable on internet. IOT is having the potential to change the lifestyle of peoples. In day today's life, people prefer more of automatic systems rather than any manual systems.

Wireless Home security and Home automation are the dual aspects of this project. The currently built prototype of the system sends alerts to the owner over voice calls using the Internet if any sort of human movement is sensed near the entrance of his house and raises an alarm optionally upon the user's discretion. On the other hand if the owner identifies that the person entering his house is not an intruder but an unexpected guest of his then instead of triggering the security alarm, the user/owner can make arrangements.

II. METHODOLOGY

The proposed model of the home automation system is as shown in the figure. The model consist of number of relays to connect various devices. Initially all the devices are connected to the internet through Wi-Fi. When the connection is established in on web page we provide virtual switches to operate the connected devices. Also it will start reading the parameters of devices to shows the graph of current verses time for each device. If particular device exceeds the threshold set point then server will give notification to the user on web page and that device will automatically turned off. If problem found it report to cloud server. Here user can modify some settings and see the devices functionality and working.
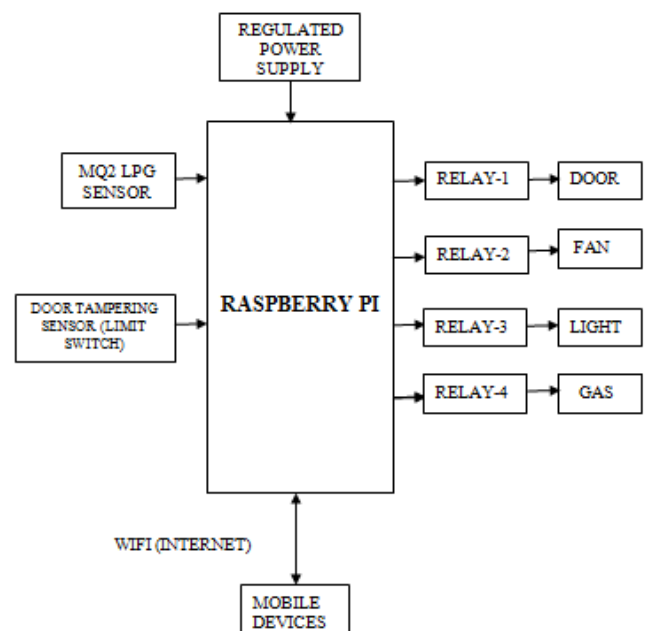

Figure 1. Block diagram of system

Gas Leakage
The system comprises of sensors for detecting gas leak interfaced to raspberry pi that will give an alert to a user whenever there is gas leakage, sending SMS to the user for notification whenever he/she might be turning off electric power with the help of relay. This will enable the user to take precaution of explosion disaster which may result on LPG cookers like loss of properties, injury or even death.
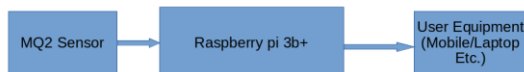
Figure2: Gas Detection

Light Control

Raspberry pi cannot turn the lamp on by itself, so we use a relay switch to simple break the circuit when we want the lamp off and then connect the circuit when we want it in. This is controlled by an electrical magnet in the relay switch. You will hear a distinctive click when the relay switch is opened or closed.
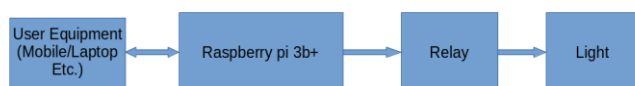

Figure 3: Light Control

Door Tampering

The tamper switches should be connected so that they send an alert both when the door is open and closed. The tamper switches are connected to a dedicated "tamper input" on the alarm or access control system. When a tamper switch is activated, it is usually causes an alarm signal to be immediately sent to the system. Notification that a tamper switch has been activated may also be displayed on web page.
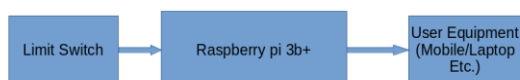

Figure 4: Door Tampering

Fan

The Raspberry PI B+ is connected with Wi-Fi or LAN for the connectivity with internet. After the successful connection to the server, the data of sensor are sent to the web server for monitoring of the system internet. The web server gives the information about the relay whether it is turned on/off in different places of the house. It also gives the status of the fan. Which we can control remotely.

Figure 5: Fan control

III. SOFTWARE DESCRIPTION

IDLE (integrated development and learning environment) is an integrated development environment used to develop python programs, which has been used with the default implementation of the language since 1998. It is used as an add on for Python packaging with many Linux. It is completely written in Python and the Tinder GUI toolkit. IDLE is intended to be a simple IDE and suitable for beginners, especially in an educational environment. To that end, it is cross-platform, and avoids feature clutter.
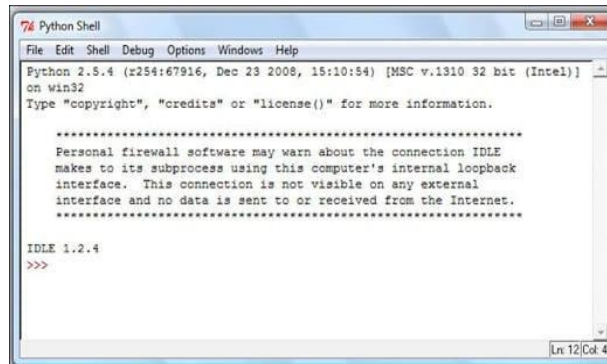

Figure 6:Snapshot of Idle python shell

The main features of IDLE are coded in 100% pure Python, using the GUI toolkit.

* cross-platform: works mostly the same on Windows, Unix, and MAC OS.
* Python shell window (interactive interpreter) with colorizing of code input, output, and error messages.
* multi-window text editor with multiple undo, Python colorizing, smart indent, call tips, auto completion, and other features.
* search within any window, replace within editor windows, and search through multiple files (grip).
* debugger with persistent breakpoints, stepping, and viewing of global and local namespaces.
* configuration, browsers, and other dialogs.

With the multi-window text editor in the IDLE we write the python programmed required and using check module we check the syntax error. Then we can run the programmed using run module.
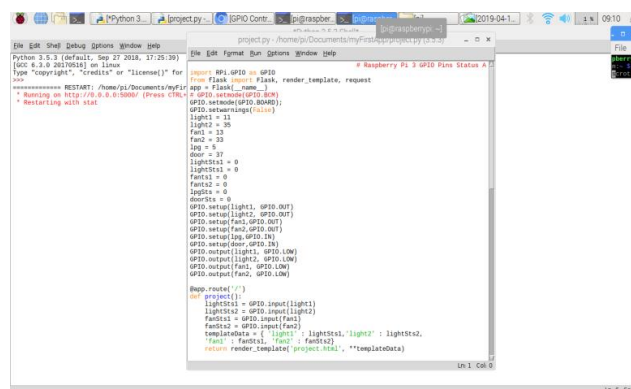

Figure 7: Python code for controlling home appliances

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IV. TESTING AND RESULT

Experimental Results

- The complete experimental setup of "Home appliances control and security using raspberry pi 3b" is shown in the figure below.

Figure 8: Snapshot of prototype of home appliances control and security

- Control of the light on/off using web page in our mobile(or PC) is given in the figure below. The left side of the figure shows web page and right side of the figure shows corresponding hardware part.
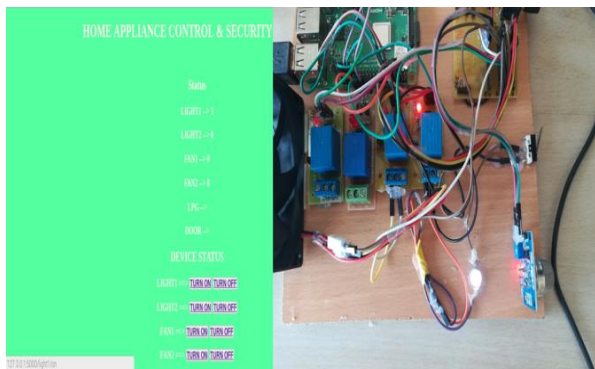

Figure 9: Light controlling

- Control of the fan on/off using web page in our mobile(or PC) is given in the figure below.

Figure 10: Fan controller

- Gas detection function is shown in the figure below. The right side of the figure shows an environment which is introduced with gas and left side shows alert message regarding that gas leakage in a web page.
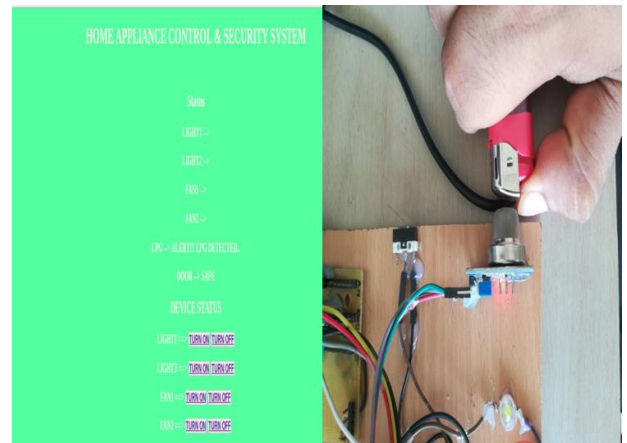

Figure 11: Gas detection

- The intruder alert for door tampering is shown below. The left side shows web page and right side shows its hardware part.
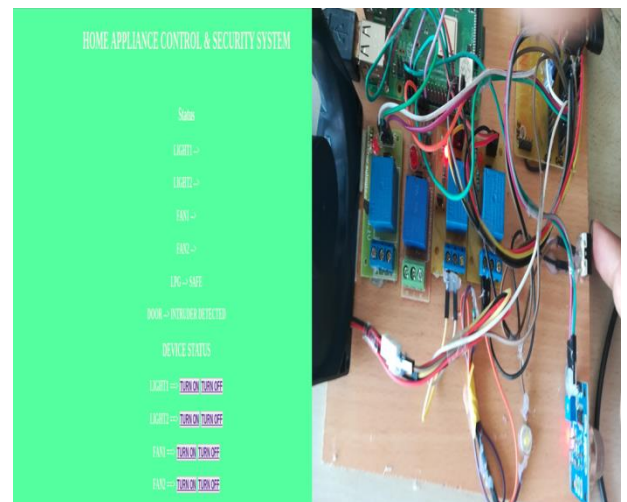

Figure 12: Door tampering

VI. APPLICATIONS

a. To help handicapped people.
b. Where less energy consumption is major factor.
c. Gas leak detection system.
d. Fire/Safety detection system.

VII. ADVANTAGES

a. Adds Safety Through Appliance and Lighting Control.
b. Save time
c. Save money and increase convenience
d. Allow to appliances control when out of town

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V. CONCLUSION AND FUTURE SCOPE

These kinds of Home Automation System are required because a human can make mistakes and forget to switch off the appliances when in no use and in this case, they are useful in order to utilize the power effectively and also in a secured manner. Home Automation system is a leading step towards the increase in the technological advancement in the industry of appliances and another method by which the human errors can be avoided and the energy consumption can be reduced.

This system can be proved as a future of artificial intelligence and a powerful and a dependable system through which the goal of energy saving and efficient use of the energy resources can be achieved soon. Raspberry Pi being an intelligent platform using which multiple appliances can be connected to each other and can be controlled from a longer range of distance because the connection which is to be used would be through the internet. Due to which appliances, can be accessible easily.

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