

An intelligent remote controlled system for smart home automation

Nupur Chandak¹, Prof Dr Atul Joshi²

¹Nupur chandak, Dept. of Electronics and Telecommunication Engineering, Sipna Coet, Maharashtra, India

²Professor Dr. Atul Joshi, Dept. of electronics and Telecommunication Engineering, Sipna Coet, Maharashtra, India

Abstract - Home automation is an important milestone in achieving smart grid technology. Advancement in technologies have made homes appliances to be monitored and controlled more efficiently and securely. Introduction of Raspberry Pi to the world of home automation allows numerous customizations to turn a regular home into a smart home.

Raspberry Pi provides a low cost platform for interconnecting electrical/electronic devices and various sensors in a home via the internet network.

This paper highlights the design and implementation of Smart Home automation system with surveillance monitoring system using Raspberry pi and PIR sensor for mobile devices. It increases the usage of mobile technology to provide essential security to our homes and for other control applications.

Key Words: Raspberry Pi, PIR sensor

1. INTRODUCTION

This project focuses on helping users to operate home appliances with their own smartphones and to help to live a more independent life as long as possible. The motto of designing our system is to take care of several domestic appliances to be monitored and controlled. The proposed design will allow a user to download software on their android enabled smart phones and monitor and control the applications and devices as required. This application will allow the user to control a device that is connected to any home appliance that is Pi enabled. The focus of this application will be to direct a security system with webcam surveillance, door sensor notification and a light control system. Sensors like LPG, smoke detector will be connected to the home appliances with Pi so that they can be monitored and controlled.

The proposed system would enable the client to monitor his home when a door or a window sensor triggers the alarm. Client monitors his home with webcam and could immediately inform local authority or a policeman. The Client could also check the status of the outside light and turn on and off the light without the need to get out of bed. These devices would also benefit users with limited mobility that may have a difficult time getting to or even reaching their light switch. These objectives require a large amount of technology. The user interface must be as simple and powerful as possible and operate in a self _organized way.

1.1 Literature review

Currently, there are many papers on home automation systems already published by different authors that provide similar functionality on a smaller scale.

For example, in

[1.] "Smart Home Control by using Raspberry Pi & Arduino UNO", the system utilizes network based Raspberry Pi2 and Arduino Uno Microcontroller with an aim to provide flexibility and to lower the cost to the smart home automation process. However, this system requires many components, which adds to its complexity and cost

[2]. One of the systems in "Internet of Things based Home

Automation using Raspberry PI" describes the use of Internet of Things (IoT) concept to interface home appliances with each other using Raspberry Pi. This system, however, uses a web-based interface, which lacks. The ease-of-access for its user

[3]. Another unpopular system in "Home automation using

Raspberry Pi" suggests making the use of an older version of Raspberry Pi, which does not contain inbuilt Wi-Fi support

[4].This increases the costs significantly, whilst also increasing complexity of the circuit.

However, our proposed system not only aims to be smart and efficient, but also simple, cost-effective and technologically up-to-date.

1.2 Objective

The objective of our system is to take care of several domestic systems that may normally be difficult. The proposed idea will allow a user with any android enabled device to run a piece of downloadable software on any mobile device such as a smartphones. This application allows the user to control a device that is connected to any home appliance that is Pi enabled. The focus of this application is to direct a security system with webcam surveillance, door sensor notification and a light control system. Sensors are connected to the home appliances with Pi so that they can be monitored and controlled.

2. Functional Block Diagram

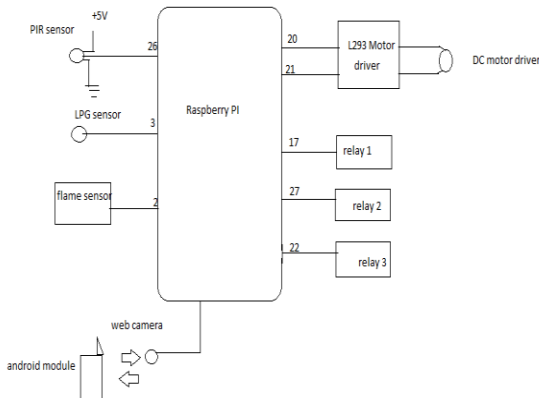
A.USB Camera captures the image and sends it to the USB port of the Raspberry Pi board. The camera model used here is USB Camera model 2.0.

B. Raspberry Pi: Raspberry pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems

C. A PIR motion sensor consists of a Fresnel lens, an infrared detector and supporting detection circuitry. The lens on the sensor focuses any infrared radiation present around it towards the infrared detector. Our bodies generate infrared heat and as a result this gets picked up by the motion sensor

D. L293 contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively

Figure -1: Functional block diagram of smart home automation



2.1 Results

Mentioned below are the test results which indicates the successful achievement of smart home automation system

When the switch of a device connected to raspberry PI is switched on at the web application that can be operated via smart phone or laptop as shown in the fig a the relay light glows indicating that the device is turned on remotely via web based application. Fig b shows the relay light being turned on as soon as the switch for device is turned on

tornado WebSocket example

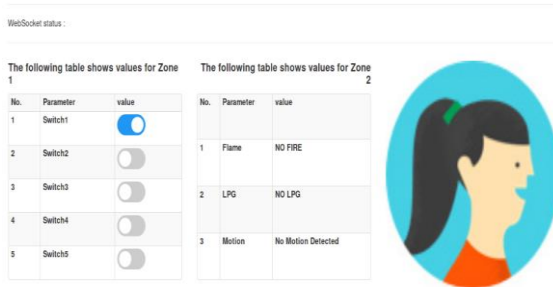


Fig a

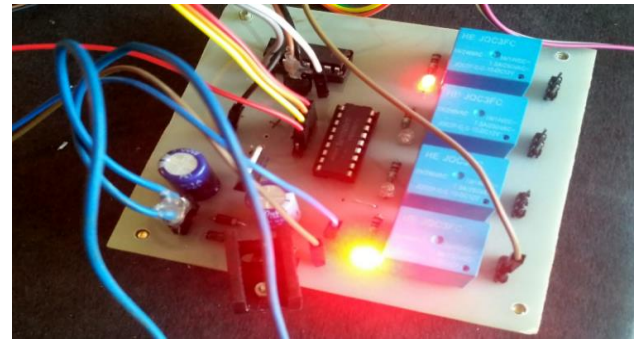


Fig b

Fig c indicates that when a match stick is ignited in front of the flame sensor. Thus the sensed parameter output is displayed on the web application as shown in fig d

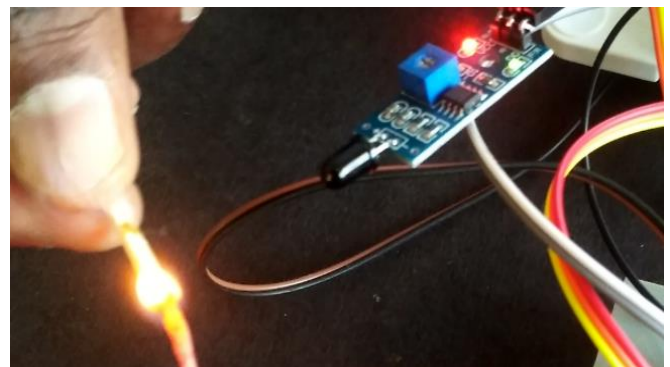


Fig c

tornado WebSocket example

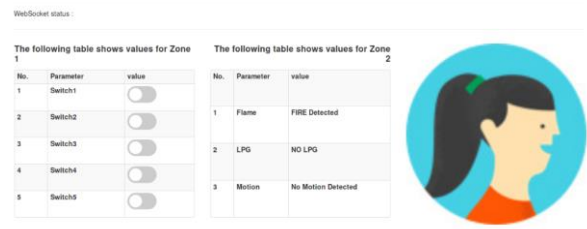


Fig d

Fig e indicates that when a motion is detected by the PIR sensor the web cam captures the image of a person and sends it to the web application indicating that the motion is detected

tornado WebSocket example

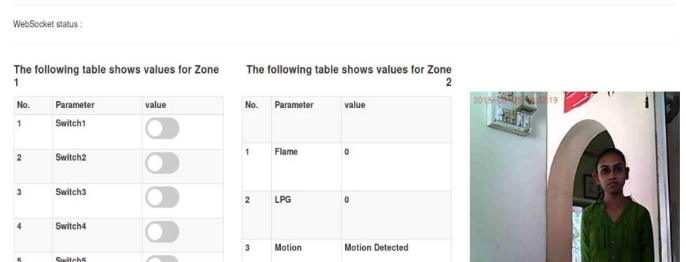


Fig e

3. CONCLUSIONS

Thus we have designed a smart surveillance system capable of recording/capturing video/image and transmitting to a smart phone whenever a motion is detected by PIR sensor. It is advantageous as it offers reliability and privacy. It is authenticated and encrypted on the receiver side; hence only concerned person who is monitoring would be able to look into the details when logged in the web application.

The person who is monitoring the home from the remote area would be able to monitor the opening and closing of the door on the application accessed remotely

Smart on/off feature for the devices are enabled on this application web page to monitor and control the devices connected.

Detection of fire and LPG leakage is achieved and is notified on the application web page.

ACKNOWLEDGEMENT

The authors wish to thank their guide and mentor, Prof. Dr. Atul Joshi whose continued guidance, timely suggestions and constructive encouragement inspired to complete everything in the present form. The authors would also like to thank Sipna College of Engineering and its staff for providing permissions to use their abundant library and internet facilities.

REFERENCES

[1] Sharma, Rupam Kumar, et al. "Android interface based GSM home security system." *Issues and Challenges in Intelligent Computing Techniques (ICICT)*, 2014 International Conference on. IEEE, 2014.

[2]. De Luca, Gabriele, et al. "The use of NFC and Android technologies to enable a KNX-based smart home." *Software, Telecommunications and Computer Networks (SoftCOM)*, 2013 21st International Conference on. IEEE, 2013.

[3].Gu, Yi, et al. "Design and Implementation of UPnP-Based Surveillance Camera System for Home Security." *Information Science and Applications (ICISA)*, 2013 International Conference on. IEEE, 2013.

[4].Van Thanh Trung, Bui, and Nguyen Van Cuong. "Monitoring and controlling devices system by GPRS on FPGA platform." *Advanced Technologies for Communications (ATC)*, 2013 International Conference on. IEEE, 2013.

[5].Karia, Deepak, et al. "Performance analysis of ZigBee based Load Control and power monitoring system." *Advances in Computing, Communications and Informatics (ICACCI)*, 2013 International Conference on. IEEE, 2013.

[6].Ryu, Yeonghyeon, Jeakyu Yoo, and Youngroc Kim. "Cloud services based Mobile monitoring for Photovoltaic Systems."

Cloud Computing Technology and Science (CloudCom), 2012 IEEE 4th International Conference on. IEEE, 2012.

[7].Robson, Clyde, et al. "High performance web applications for secure system monitoring and control." *Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC)*, 2012 IEEE. IEEE, 2012.

[8].Han, Jinsoo, et al. "User-friendly home automation based on 3D virtual world." *Consumer Electronics, IEEE Transactions on* 56.3 (2010): 1843-1847.

[9].Bajorek, Marcin, and Jędrzej Nowak. "The role of a mobile device in a home monitoring healthcare system." *Computer Science and Information Systems (FedCSIS)*, 2011 Federated Conference on. IEEE, 2011.

[10].Acker, Robin, and Michael Massoth. "Secure ubiquitous house and facility control solution." *Internet and Web Applications and Services (ICIW)*, 2010 Fifth International Conference on. IEEE, 2010.

[11].Tupakula, Udaya, Vijay Varadharajan, and Sunil Kumar Vuppala. "Security Techniques for Beyond 3G Wireless Mobile Networks." *Embedded and Ubiquitous Computing (EUC)*, 2011 IFIP 9th International Conference on. IEEE, 2011.

[12]. Kosba, Ahmed E., and Moustafa Youssef. "RASID demo: A robust WLAN device-free passive motion detection system." *Pervasive Computing and Communications Workshops (PERCOM Workshops)*, 2012 IEEE International Conference on. IEEE, 2012.