

Wireless Home Automation System

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Abstract: Home automation is one of the research areas that have become very relevant in the last few years. Home automation allows for remote monitoring of connected home appliances using microcontrollers and sensors, allowing for multiple benefits ranging from security to energy efficiency. The current work briefly reviews different wireless home automation systems and then puts forward a proposal for a cheap, efficient, web-based wireless home automation solution using Raspberry-Pi.

Keywords: wireless, home automation, web-based GUI, Raspberry-Pi, microcontroller, sensor

I. INTRODUCTION

Automation can be easily described as anything that is done without human assistance. Modern houses are gradually shifting from conventional switches to centralized control system, involving wireless controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a simpler solution with Android application technology. The current work is aimed at developing a simple electronic system for controlling home appliances automatically. A simple circuit followed by a GUI Web Application makes the work even easier. The User is able to control each and every device remotely with just a few clicks from his smartphone/computer over the internet. Section II surveys some of the recent and relevant literature in the domain of home automation. Section III describes the electronic system proposed in this paper. Section IV concludes the paper with a discussion on the scope for further research in this domain.

II. LITERATURE SURVEY

Home automation systems provide many benefits, especially to elderly people and invalids [1]. Researchers have designed and evaluated FPGA and GSM based cheap home automation systems [2]. Cloud based systems for higher speed and more reliable connectivity have also been investigated by researchers [3]. Zigbee based IoT enabled systems have also been proposed by some researchers [4]. IoT has also emerged as an important technology for enabling home automation [5][6]. Sensors coupled with microcontrollers have been used to implement home automation solutions in an extensive manner [7]. The essential problem in the solutions proposed by various researchers is the high cost involved in the implementation of their proposed solutions, as well as the limitations in the number of devices controllable by the processors used. The current paper aims to address these issues through the proposed system discussed in the following section.

III. PROPOSED SYSTEM

Home automation systems are used to provide ease of use, reliability and security for the solutions to be acceptable in a widespread manner. The system proposed in this paper is web-based, consisting of a central controller consisting of a powerful Raspberry-Pi processor to take inputs from sensors and control the various Wi-Fi connected devices through the internet. The schematic diagram of the setup is presented in the following figure 1.

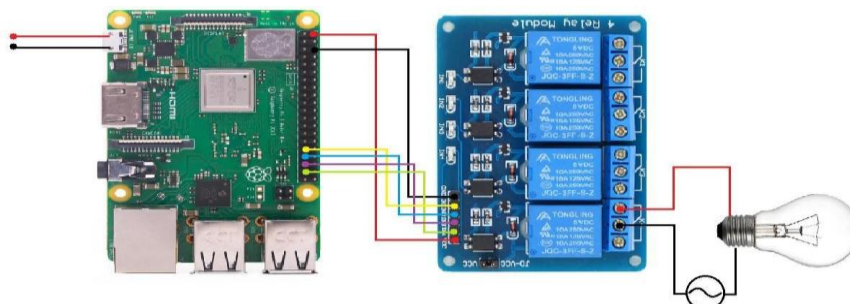


Figure 1: Basic Schematic Diagram

The Raspberry Pi is connected to a 5V DC power source. 4 of the Raspberry Pi's GPIO ports can be used as output ports for connecting the Relays. The 5V output from the R-Pi is connected to the Vcc of the 4 Channel Relay module. The Ground is connected to the Ground pin of the relay module. The relay interfaces the High Voltage AC circuit with the low voltage DC Circuit. The AC appliances are connected to the AC source with the Relay acting as a switch.

The Raspberry Pi is connected to the Internet & the WebIOPi module is activated. The user logs in to the home Network of the R-Pi using the user name and the password. The web page containing the list of appliances and their On/Off switch appears on the screen. The user clicks a button from the screen and the WebIOPi module on receiving the signal from the webpage starts its back-end task. The Raspberry Pi is pre-programmed to operate on certain GPIO lines and according to that the GPIO pins go LOW/HIGH. The appliances connected to the relay are switched on. A timer option is present in the second webpage. The user can enter any time they wanted the appliances to run. The certain appliance will run only during that certain period of time.

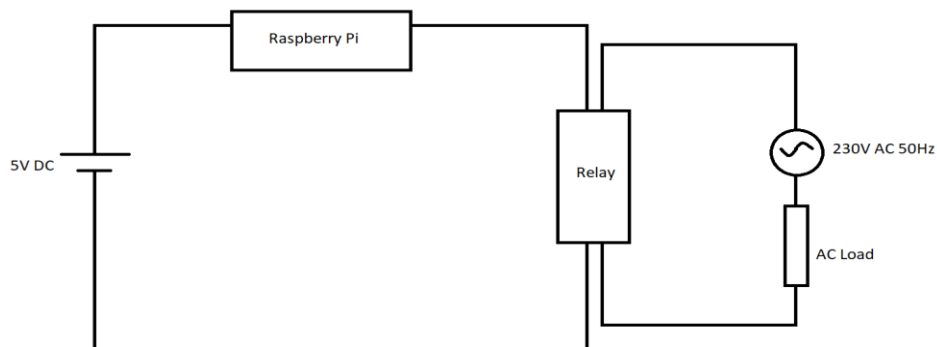


Figure 2: Circuit Schematic

The advantage of the proposed system is its simplicity, low cost and flexibility. Its simplicity makes the system easier to repair or replace required components in the advent of a failure or burnout. Voice integration with Google Home Support can also be implemented for voice control of the system. Sensor aggregation and automation is also easier in this system due to the number of devices connectable to the Raspberry-Pi being greater than other microcontroller boards.

IV. CONCLUSION

The current work accomplished in this paper comprised of a brief review of existing home automation solutions followed by a proposal of a cheap, simple and robust alternative to typical home automation systems.

A future work in this direction may be the implementation of basic machine learning for distributed control through learning of typical patterns as well as prediction of variations from such patterns, allowing systems to be controlled in a semi-intuitive fashion, further lowering the power consumption and increasing of ease of use of the system.

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