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Smart Home Automation Using Web-Server

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Abstract: *IoT (Internet of Things) is fast emerging technology which involves interaction among things through internet without human interference. It has made human life easier and comfortable. Now-a-days digital devices in home are increasing rapidly due to which there is a need of accessing and controlling the devices remotely. This paper represents an affordable and flexible home control system using a Raspberry pi controller, web server with IP connectivity for interacting with devices and appliances remotely using Smartphone. It demonstrates the usefulness of the system using devices such as light, fan, and other appliances etc; this project is very useful for people with physical disability. The other reason to develop this system is to save time and man power along with maintaining security and convenience.*

Keywords: *Raspberry pi controller, Home appliances, Relays, Web server.*

I. INTRODUCTION

The rise of Wi-Fi's role in home automation has primarily come about due to the networked nature of deployed electronics where electronic devices (TVs and AV receivers, mobile devices, etc.) have started becoming part of the home IP network and due the increasing rate of adoption of mobile computing devices Smartphone, tablets, etc.

Home automation refers to monitoring and controlling home appliances by using micro-controller or computer technology. Automation is popular now days because it provides ease, security and efficiency. In this paper, a user can control and monitor any home appliance using mobile phone through webpage. If user is far away from home, he can access and change status of appliances i.e. switches it on/off. This system can also be very much useful to specially-abled and old aged ones.



Fig 1 Smart Home Concept Using Smartphone

For digitalizing home appliances such as lighting, heating, security, audio, video etc. IoT in home automation is the best commercial solution these days. With the increasing use of personal computing, media players, android mobile phones etc. people have more knowledge about these technologies and are more comfortable with its use. Thus home automation will be easily accepted by the people. The system can be use in several places like banks, hospital, labs and other sophisticated automated system, which

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dramatically reduced the hazards of unauthorized entry.

II. EXISTING SYSTEM

There has been a significant increase in home automation in recent years due to higher affordability and advancement in smart phones and tablets which allows vast connectivity. With the introduction of IoT the research and implementation of home automation are getting more popular. Various wireless technologies that can support some form of remote data transfer, sensing and control such as GSM, Bluetooth, Zigbee and IR remote control have been utilized to embed various levels of intelligence in the home. The studies have presented Android Based Smart Home System with Control via Bluetooth and Internet Connectivity [1]. The devices are physically connected to a Bluetooth sub controller which is then accessed & controlled by the smart phone using built-in Bluetooth connectivity. As the range of Bluetooth is limited, operation system can only be controlled within that particular area. Controlling the home appliances through the Bluetooth have some disadvantages due to which it is not always feasible for the devices that are at far distance. A GSM [2] and ZigBee [3] based communication and control for home appliances has also been presented by where the device is connected to a ZigBee Transceiver and it communicates with each and every node present inside home. From the mobile phone(GSM), command can be send via SMS to the Controller, which in turn interprets the command and then activates the required 'switch' to control the electrical item. The drawback of this system is that at remote places there should be proper coverage of GSM mobile signal. An Advanced universal remote controller for home automation and security has also been presented when there is inconvenience in controlling each digital home appliances that requires its own remote controller. It uses an advanced universal remote controller (URC) with the total solution for home automation and security. All kinds of home appliances can be controlled with the URC, which can be also connected to a PC dealing with Internet as well. With the URC, we can easily construct a ubiquitous home automation and security environment with the total solution. The drawback of using such system is a person may get confused if he wants to perform single operation which may lead to mal-operations. The above mentioned systems have made significant contributions to the design and development of home automation systems. However, the existing works were mainly focused on switching and controlling home appliances or connected devices rather than remotely monitoring of home environment. Home automation should provide a user-friendly interface on the host side, so that the devices can be easily setup, monitored & controlled. Furthermore the overall system should be swift enough to realize the true power of wireless technology. The system should also be cost effective so as to justify its application in the field of home automation.

III. PROPOSED METHODOLOGY

This section describes the proposed architecture and design of flexible and low cost home controlling and monitoring system. The three basic building blocks of this project are Raspberry pi microcontroller, Wifi router and Web server. The basic idea is to control different appliances and devices using the mentioned components. Raspberry pi controller acts as a platform to connect the Smartphone using wifi router. Web server will help the user to access the devices remotely. Such an application is very useful but less secure; anyone can share that application or access it if no security is provided. The raspberry pi should always be connected to wifi router. The user who is connected to that wifi network only he/ she can control the devices remotely.

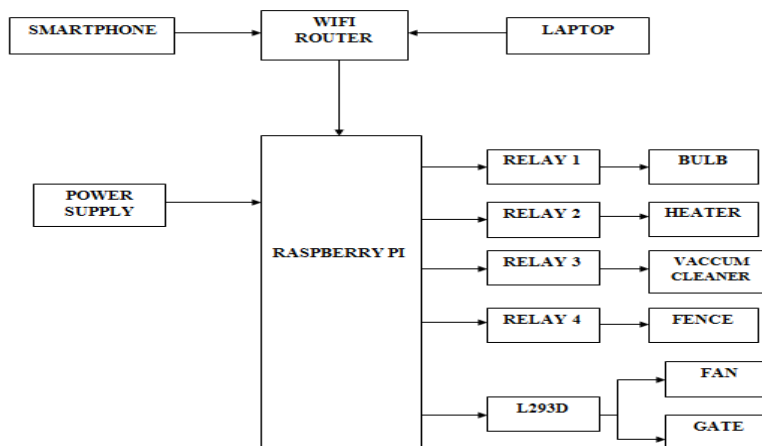


Fig 2 Basic Block diagram of Proposed System

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A. Raspberry pi

Raspberry Pi is an open source hardware technology combined with a programming language and an Integrated Development Environment (IDE). The Raspberry Pi platform allows the user to create custom hardware and applications to control it via its namesake programming language. Raspberry pi is a portable, powerful, and minicomputer. The board length is only 85mm and width is only 56mm. Its size only as big as a credit card but it is a capable little PC. It can be used for many of the things that your desktop PC does, like high-definition video, spreadsheets, word-processing, games and more. Raspberry Pi also has more wide application range, such as music machines, parent detectors to weather stations, home automation server, etc. It enables people of all ages to explore computing, learn to program and understand how computers work. This project uses Raspberry pi B + model. The Raspberry Pi Model B+ provides more GPIO, more USB than Model B. It also improves power consumption, audio circuit and SD card. Operating systems that are available to install the Raspberry is Raspbian. Raspbian is based upon the Debian Wheezy Linux operating system and has been optimized for use with Raspberry Pi. The Raspberry Pi is connected to the Raspberry Pi's GPIO pins, and with the inclusion of the software, I will be able to communicate between our electronic devices, the Raspberry Pi's operating system, and web-based propose model.

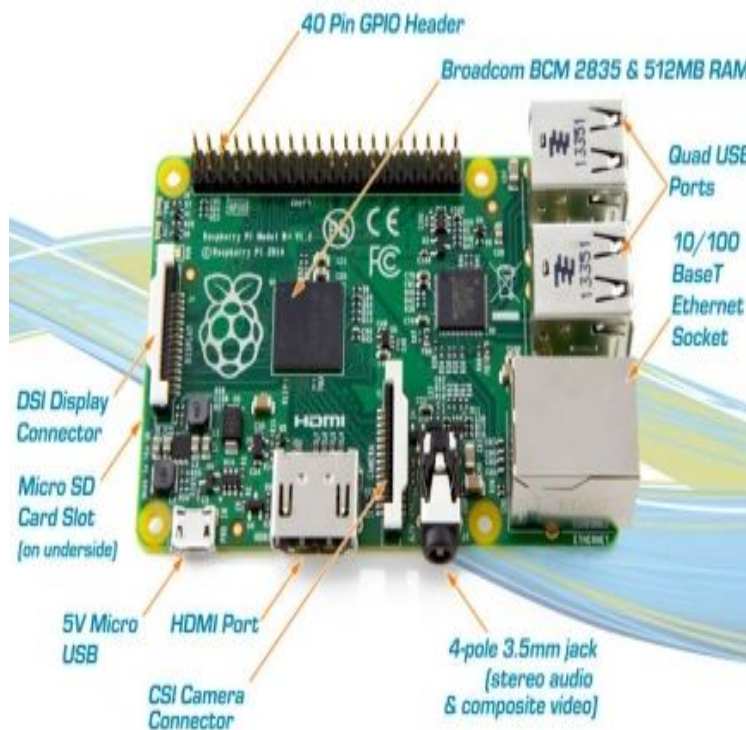


Fig 3 Raspberry pi 2 B+ model

B. Web-server

The web server is used for storing the signals and user records and serves to the other components in the system. It manages the communication between the Raspberry pi and mobile smart device and is used for supporting the bidirectional communication between them, local device and web server and also mobile device and web server. In our project web server is developed to connect the hardware devices and the microcontroller and then to mobile phone. To successfully connect and access the web server in the home automation system the user has to enter the real IP address. If a web server grant access to home automation system the command containing the response code is received. Now the user can control and monitor the appliances from web-server.

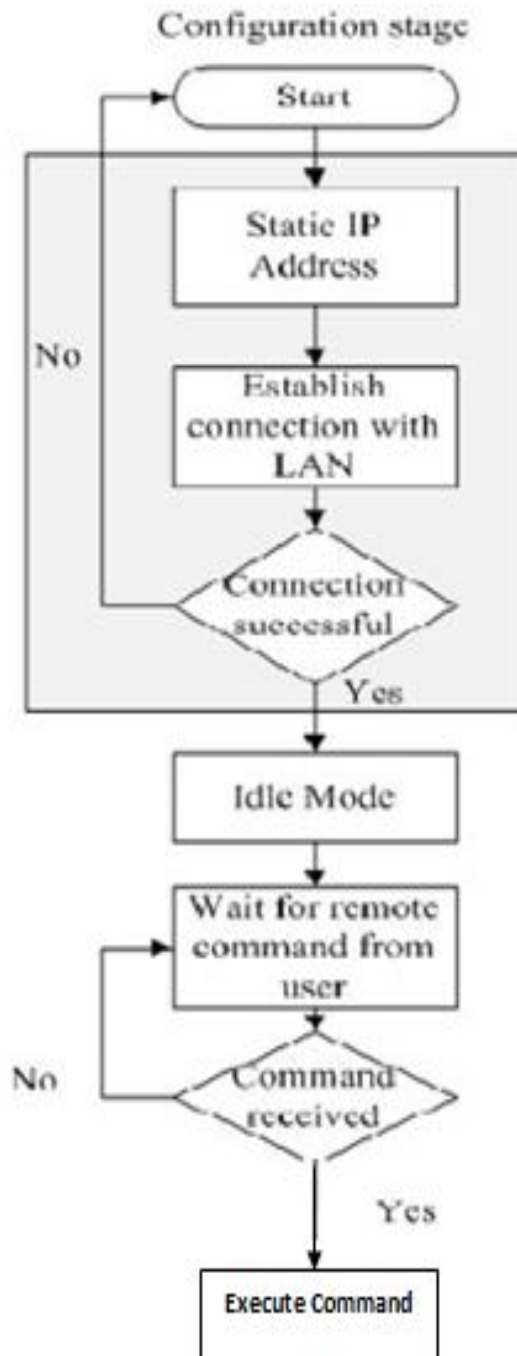
C. Wi-Fi Router

A wireless router is a device that performs the functions of a router and also includes the functions of a wireless access point. It is used to provide access to the Internet or a private computer network. It can function in a wired LAN (local area network), in a wireless-only LAN (WLAN), or in a mixed wired/wireless network, depending on the manufacturer and model. The Raspberry pi

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should always be connected to router, only then it can function. The user should be connected to the wifi network then only he is able to control the device using mobile phone/ laptop.

D. Flowchart



IV. RESULTS

This prototype is designed to control and monitor the home appliances using Smartphone. Some of the prototypes are as follows:

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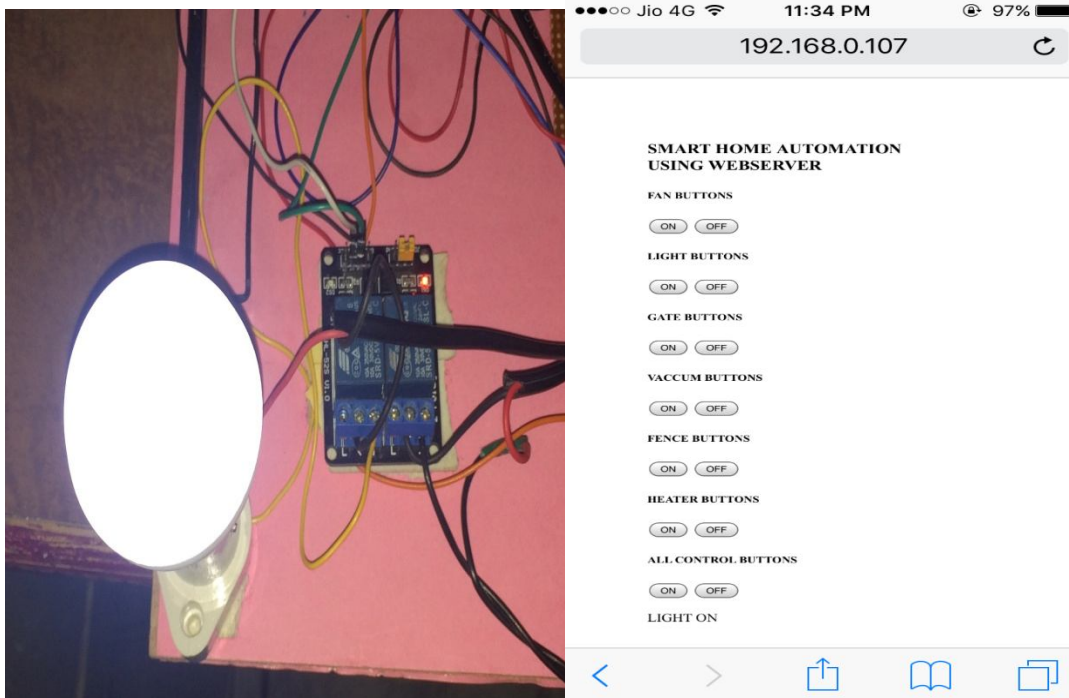


Fig 4 Bulb is on when light button in Smartphone is pressed and screenshot shows the status of bulb showing in ON mode

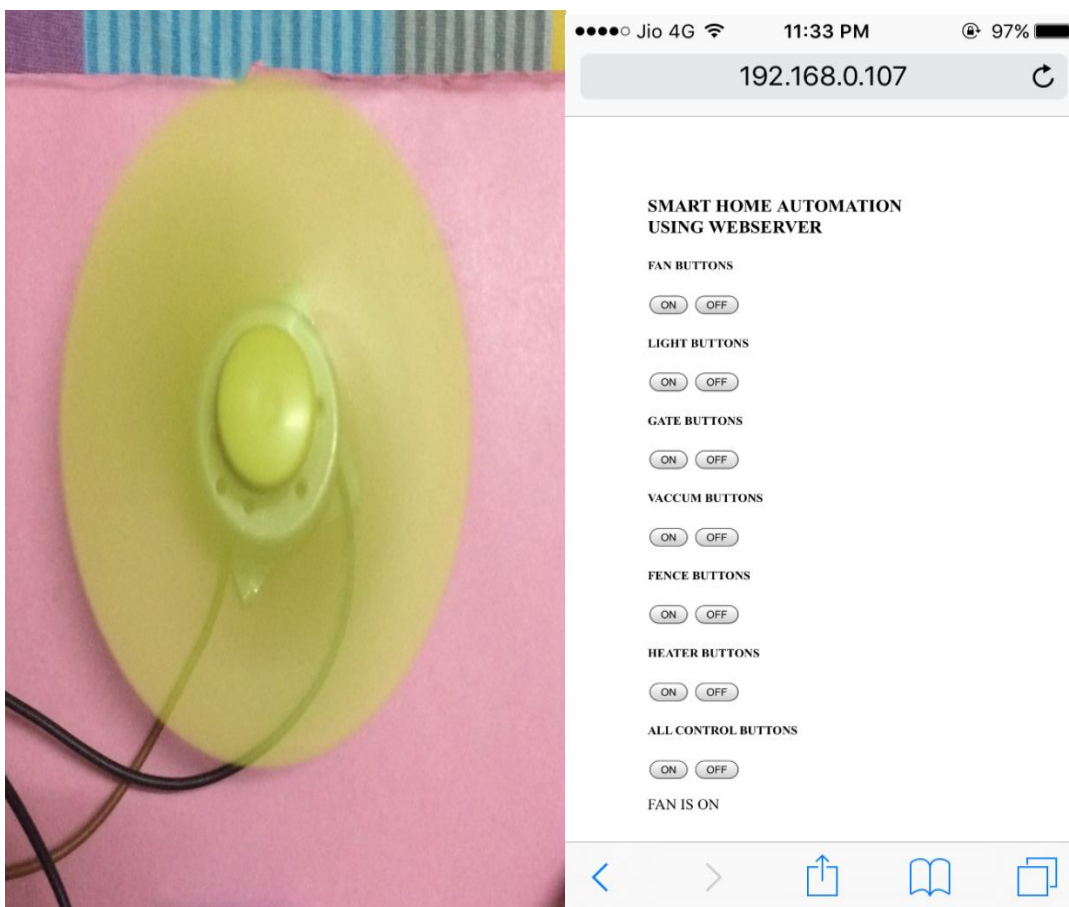


Fig 5 Fan is on when fan button in Smartphone is pressed and screenshot shows the status of Fan showing in ON mode

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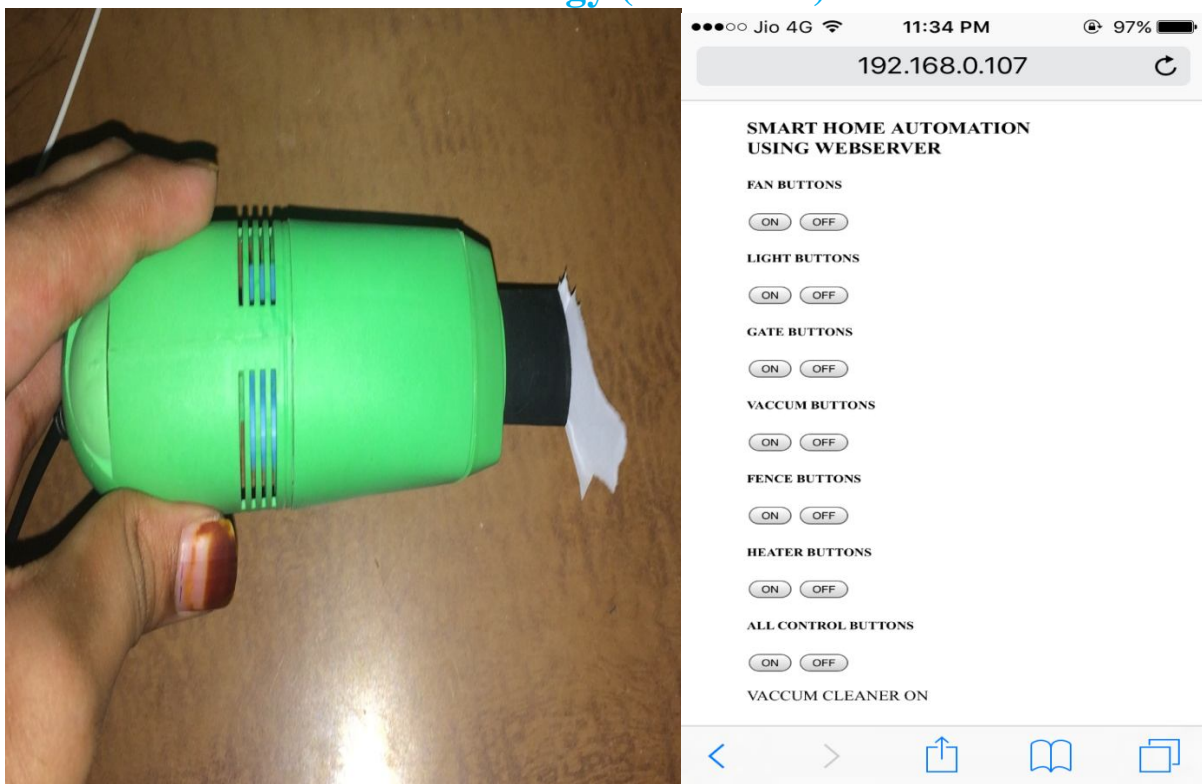


Fig 6 Vacuum cleaner is on when vacuum button in Smartphone is pressed and screenshot shows the status of Vacuum cleaner showing in ON mode

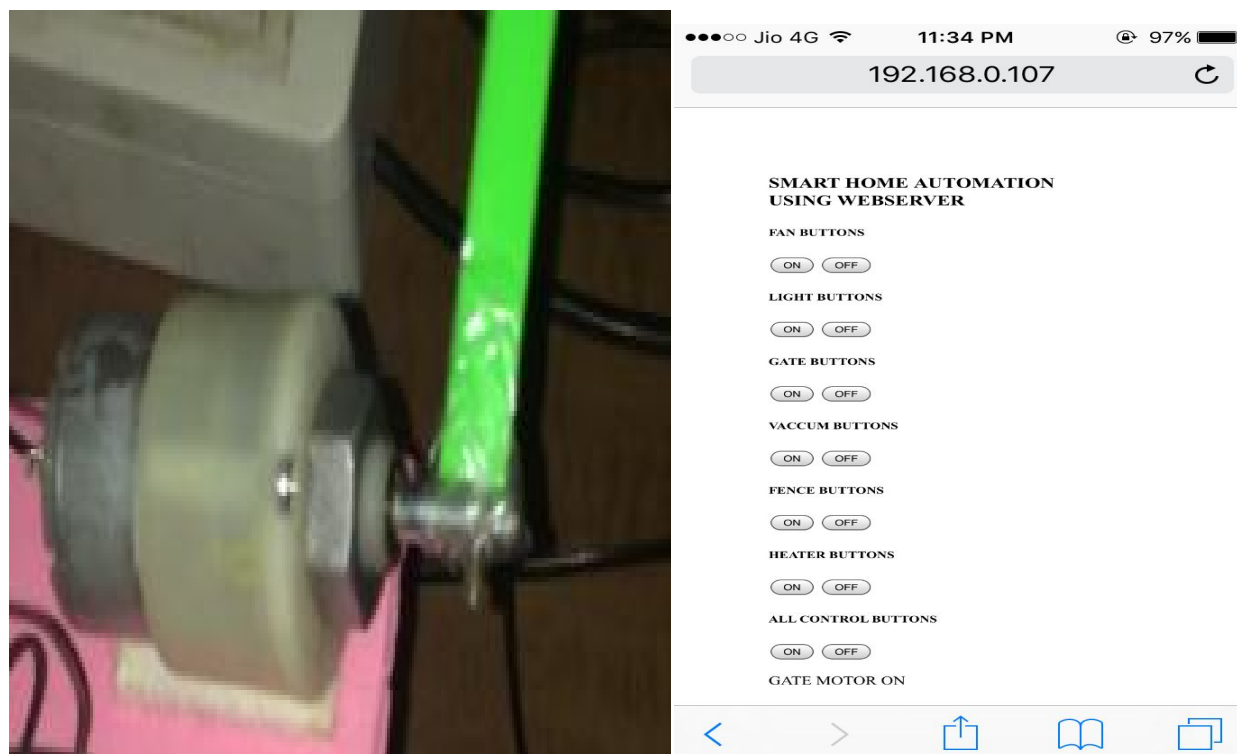


Fig 7 Gate motor is on when Gate button in Smartphone is pressed and screenshot shows the status of Gate motor showing in ON mode

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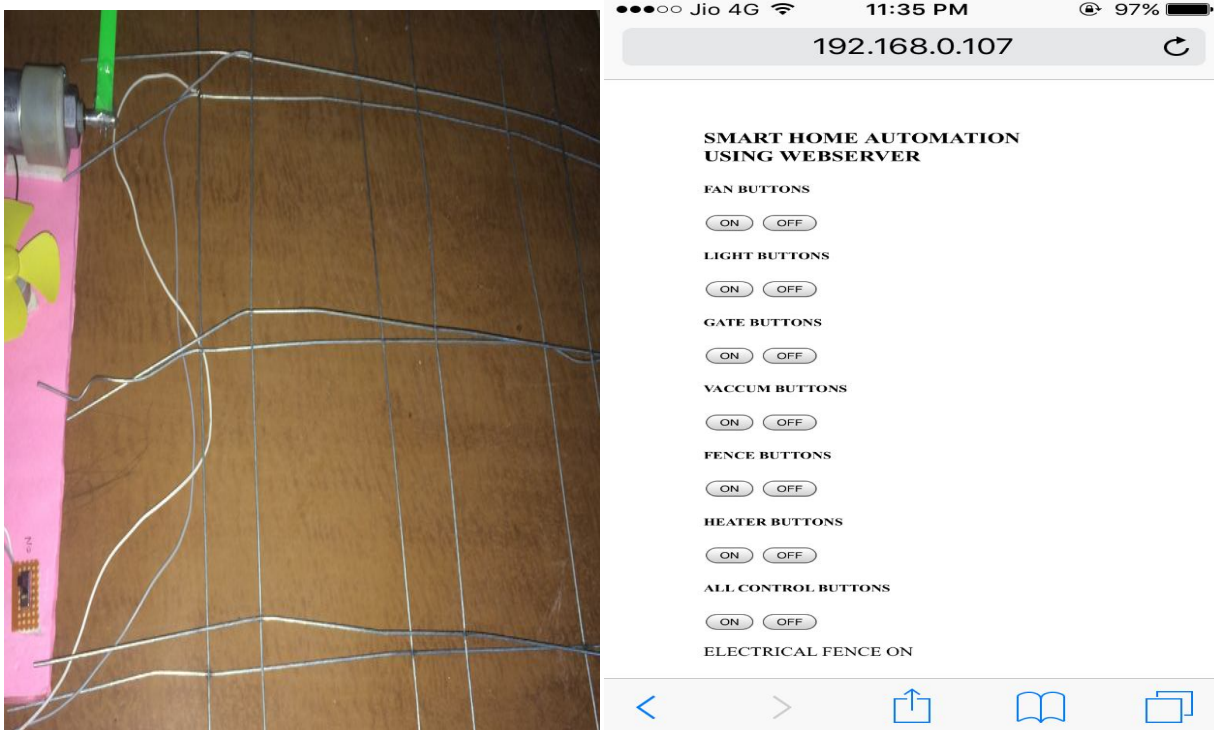


Fig 8 Fence is on when Fence button in Smartphone is pressed and screenshot shows the status of Fence showing in ON mode

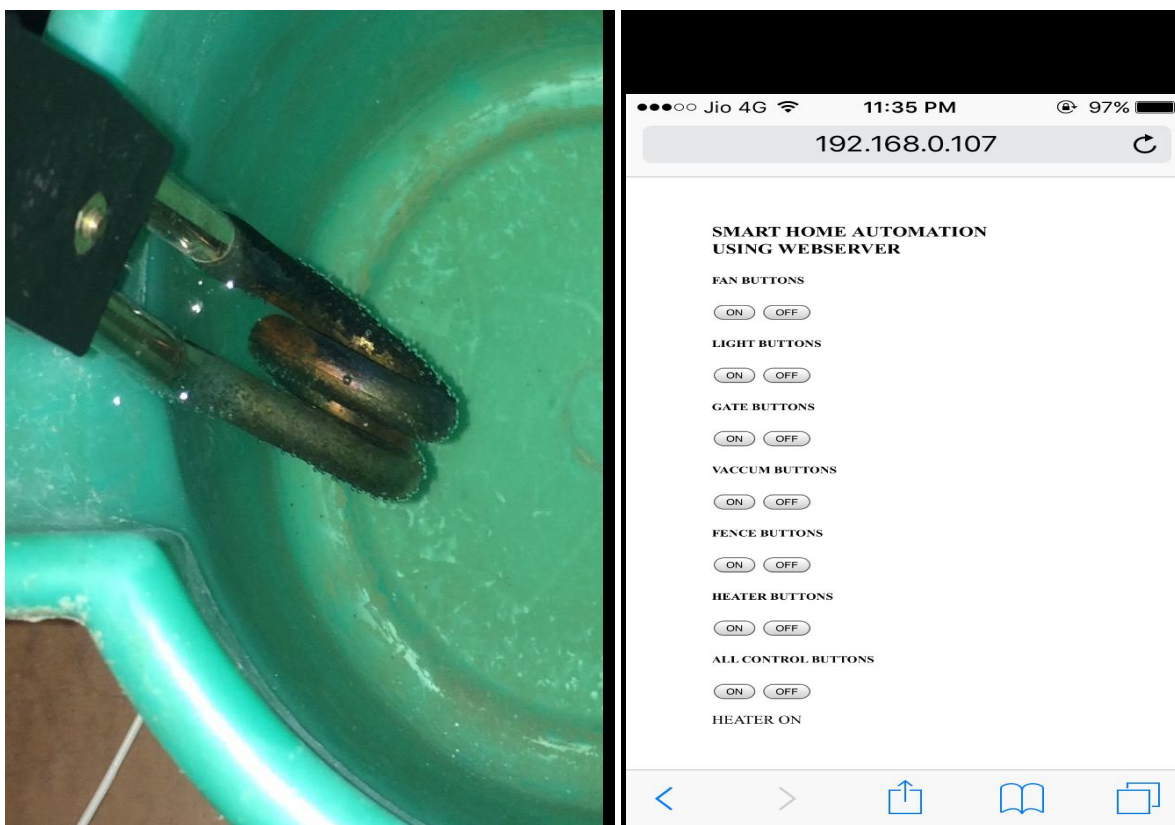


Fig 9 Heater is on when Heater button in Smartphone is pressed and screenshot shows the status of Heater showing in ON mode

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V. CONCLUSION

In this paper, a novel architecture for low cost and flexible home control and monitoring system using Smart phone is proposed. Any android/ios based mobile can be used to control different devices using web server. Such project can be very useful for old and physically disabled people. It also provides security and saves energy. As we are accessing devices by web-server, we can access it even if we are far away from home where the Wi-Fi is available.

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