



IoT Based Home Automation System

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Abstract - One of the emerging technologies that can be used in smart systems is IoT (Internet of things). IoT is a concept that envisions all objects around us as a part of the internet and includes a variety of objects like home appliances, sensors, security systems, microcontrollers. With the increasing popularity of IoT and devices getting smarter day by day, in this proposed system we aim at making a generalized automation and security system, which can be used in our homes, offices, schools, etc. It allows users to monitor, access, control the home appliances remotely simply via a web application thereby providing convenience, efficient energy usage, enhanced security.

Key Words: IoT, GUI, Raspberry Pi, USB, GPIO, micro-SD, CCTV, OS.

1. INTRODUCTION

To enhance the lifestyle of people through the provision of different services, a smart home or automated home [1] comes into the picture. It aims at providing leisure and ease of work. To achieve this automation systems are developed in recent years using emerging technologies in the electronics world. With the advancement in Internet technology lifestyle of every person is changing. IoT is a concept where we can connect distinct physical objects and control their operation through the internet to make life easier and more comfortable. Its application varies from simple remote control of light to controlling complex industrial processes where human intervention is not permitted.

Internet of things is a growing network of everyday object-from industrial machines to consumer goods that can share information and complete tasks while you are busy with other activities. A home Automation using IoT [2] is a system that uses computers or mobile devices to control basic home functions internet remotely from anywhere around the world via the internet. It is meant to save human effort.

Smart automation [3] makes use of this technology to provide convenience, comfort, energy efficiency, security to the users. With the introduction of IoT, the implementation of such systems [4] is getting more popular. Various devices,

appliances to name a few like fans, lights, air conditioners can be accessed remotely via the internet and be controlled, monitored to maintain certain desired parameters.

2. COMPONENTS

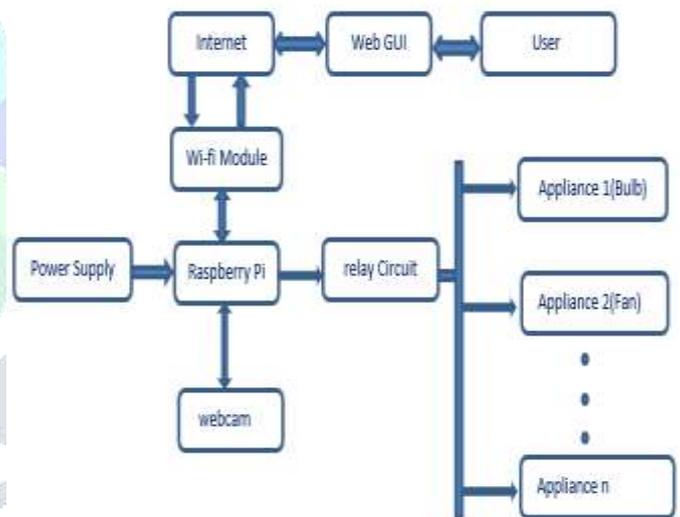


Fig 1- Block diagram of the system

2.1 Raspberry Pi

The Raspberry Pi is a versatile, small size portable, low-cost computer being used in several embedded based applications [5-10]. It has USB (Universal Serial Bus) ports to provide its connection with the different peripherals such as a memory stick for storage or a Wi-Fi module for internet connection. It can be connected to a computer or television via an HDMI cable and port. The Raspberry Pi needs an Operating System (OS) to run. Raspbian OS was being set up for the proposed project, The OS is downloaded to a micro-SD (secure digital) card and mounted to the Raspberry Pi's SD memory reader. It also has an Ethernet port that allows its connection to the internet through an Ethernet cable from a router. The Raspberry Pi is being fed with a 12Volt DC power supply.

2.2 Web Application

The web application could be accessed via a smartphone or a personal computer. through which users can access, control the appliances or devices interfaced with Raspberry Pi. (Users need to specify credentials in order to get access to the web application). The application will have a GUI (Graphical User Interface) wherein the user can view all the home appliances, their status and could turn them on or off via a single button click.

2.3 Webcam

The webcam interfaced with raspberry pi provides live CCTV surveillance, captures and stores the images on the micro-SD card mounted on raspberry pi at the specified regular interval, this live stream and images can be accessed via a web application.

2.4 Home appliances

The required devices or appliances to be remotely controlled like a bulb, fan, air conditioner, etc. could be interfaced with Raspberry Pi using jumper wires, to its GPIO (General-purpose input-output) pins via a relay. The relay circuit acts as a switch to turn on/off a particular appliance as per command received from the user via a web application.

3. WORKING

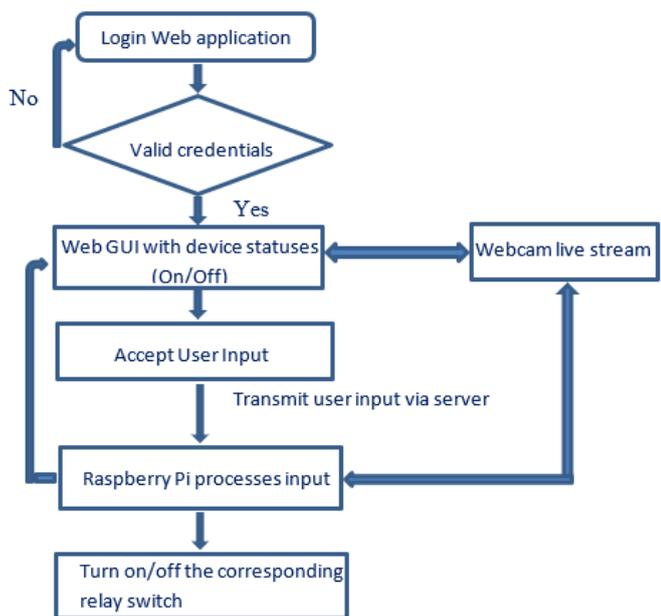


Fig 2- Flow of system

The user login the web application and once the credentials are validated, the user will be redirected to GUI wherein they could monitor their home appliances status and turn ON or OFF the corresponding appliance as per the need via a single button click, this user command would be transmitted via server to the raspberry pi which processes it and switches ON or OFF the corresponding relay to which appliance is interfaced.

Users will also be able to have live webcam surveillance and view the images being captured. The images captured are stored micro-SD card mounted on the raspberry pi.

4. RESULTS

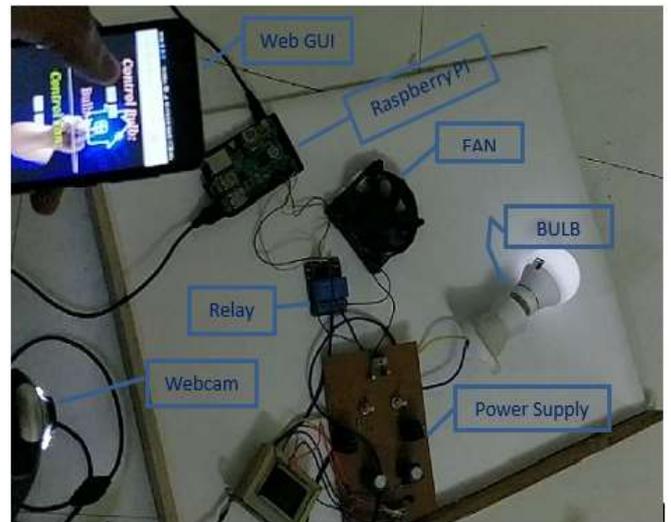


Fig 3- Hardware Assembly

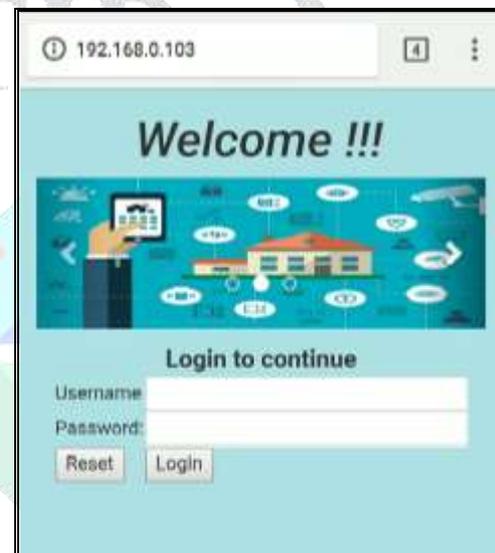


Fig 4- Web Application



Fig 5- GUI to control home appliances

Figure 4 shows the web application accessed via a mobile phone, wherein the user is required to specify credentials for

authentication, and Figure 5 shows the GUI (Graphical user interface) through which the user can control the appliance,

By clicking the 'ON' or 'OFF' button the corresponding GPIO pin of the raspberry pi will be set to high or low which in turn switches the appliance ON or OFF respectively.

The user could also live stream via a webcam interfaced with Raspberry Pi and access the images being captured.

5. ADVANTAGES

a) Ease and convenience: Home appliances could be accessed, controlled remotely anytime, anywhere.

b) Energy efficient: There is a great energy crisis in most parts of the world, people often forget to turn off the light sources and home appliances while leaving their home, thereby using this automation system they can turn off these devices even while away from their home, thereby saving the energy.

c) Security: By making use of live webcam surveillance users can monitor their belonging, property while being away from home.

6. CONCLUSION AND FUTURE WORK

We were able to access, control the home appliances interfaced to raspberry pi remotely via a web application, also webcam live surveillance, and image capture at a specified regular interval worked well.

The system can be expanded to include various other functions like a gas leak, fire detection via sensors, and alerting the user. Proximity and motion sensors can be interfaced to identify if a thief tries to enter your home and would automatically turn on the alarm and inform the police.

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