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HOME AUTOMATION USING AUGMENTED REALITY

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ABSTRACT

As the human life is heading towards busy schedule it becomes necessary to automate our home appliances. Human error is something that cannot be completely erased. With the busy schedule in hand there is defiantly a possibility of missing something that may be trivial to us but can result into a catastrophe. For these reasons home automation can increase efficiency, security and reliability.

With the advent of technology the use of smart devices, laptops, is increasing widely also people are getting more conversant with these technologically advancing gadgets .AR also plays a major role in developing the concept of smart city.

We can control and handle different types of appliances using various applications. One of them is AR which has recently evolved for the automation of various electrical appliances.

Augmented reality (AR) is used to allow virtual pop ups when the camera of the cell phone is pointed towards the element (lamps ,Air conditioners etc) the pop up enables us to turn on or off the supply by simple touch selection thus improving ways of automation .AR uses the concept of image tracking, processing and communicating to control the applications. The remote web control feature is used to enhance the operation of appliances over mobile devices. The control data is sent to th

General Purpose Input Output Pins of microcontroller (GPIO) which triggers the household DC and AC appliances. The status can then be analyzed through the web browser or through mobile web interface and control them using internet. Voice control technique can also be implemented by using speech recognition so that the user can provide the controlling commands via voice. AR automation along with conventional system of remote controlling from anywhere will prove highly beneficial.

Keywords: Augmented Reality, Automation, Microcontroller,smart city, web interface.

I INTRODUCTION

With the day to day technological advancement our expectation for higher living standards is increasing significantly. From higher living standards we mean usage of smart phones, smart watch, smart glasses smart

TVs, highly upgraded laptops etc that ease human life. In this technologically developing era automation is the need of the hour. Home automation aims towards automating human lives. Controlling home appliances with our smart phones, smart glasses and smart watches without the actual usage of conventional switches is home automation. An automated home in simple terms is called a Smart home. Automation increases our work efficiency and comfort. These days most of us are found clinging to our smart phones and smart devices. Hencewiththe help of this smart device and after analyzing the smart device market we can actually automate our personal day to day tasks by personifying our smart phones. The inclusion of AR interface in automation is a major breakthrough as it has proved to be a prominent information visualization and interaction medium.A typical AR interface based implementation scheme would rely on a high-end server communicating with a mobile AR client. The client has to provide a large database containing the information of the potential target objects in the environment. Thus in this paper we propose a model wherein Augmented reality proves to be a user friendly interface for home automation.

Image processing in our model acts as the backbone of the whole system. The AR interface gives us an edge over other systems as it helps us to control machines and appliances in real time environment. Our proposed model is based on Raspberry pi and AR which uses the concept of image tracking and processing with backend server to control the appliances andmachines.

II.PROBLEM ANAYLSIS

The main problem that home automation faces these days is High cost, inefficiency, not so user friendly interface and inflexibility. In our paper we are trying to build a home automation system that is able to control and automate most of our electrical appliances through easy and manageable web interface. The system has great flexibility because of the wifi technology used to communicate between smart device and server also this technology reduces the cost automatically by decreasing the hardware and wired communication.

III.PROPOSED SYSTEM

Our proposed system has the following requirements-:

1) Microprocessor (RaspberryPi board)
2) Controlling panel consisting of relays, thyristors and IR transmitter andreceiver
3) Smartdevice
4) WifiRouter
5) Current amplificationdevice

In our proposed system we use augmented reality as medium of virtual communication. Everyone prefers less messy as well as user friendly interface and hence we are moving towards augmented reality in home automation. AR allows a virtual pop up whenever the user points his/her camera towards the object to be controlled or the switch .Forusing AR, a software development kit (SDK) will be required. SDK is a complementary GUI to (Xilinx Platform Studio) and provides a development to software application projects.

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SDK provides compilation environment and project management. It provides Application build configuration and automatic file generation. Thus we can build our very own AR app which enables virtual image mounted over real time camera image which allows the user to choose ON/OFF option when the camera of the smart device is pointed towards the object. AR uses the concept of image tracking, processing and communicating to control the applications.

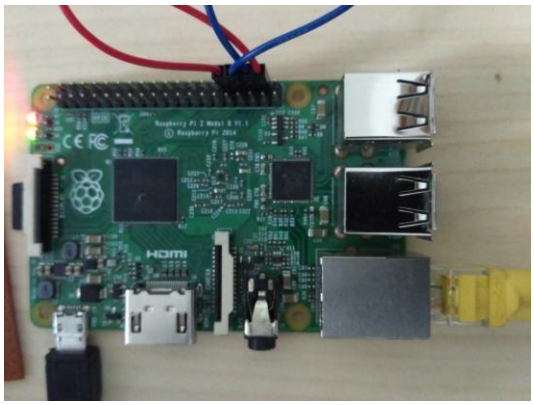
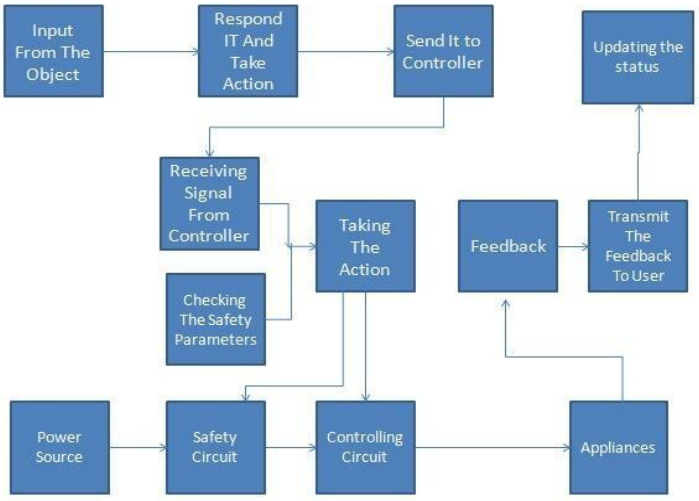


Fig- Microcontroller (Raspberry pi)

A remote web control feature is usedto enhance the operation of the appliances over the mobile devices. Control data is sent to server to activate the General Purpose Input Output (GPIO) pins which will then trigger the household DC or AC appliances (E.g. On/Off). The status of the appliances can be checked through web browser or through mobile web interface and control them usinginternet.[3]

IV.BLOCK DIAGRAM



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V.SYSTEM DESIGN

Raspberry Pi provides interface between the electrical equipments and mobile devices, it plays a crucial role as a backend processing unit .Raspberry pi is connected to the relays that will operate our electrical equipments, also it has an IR transmitter attached that has the same frequency as the operating remote for that particular electrical device and can be used for the increment and decrement of a particular function (controlling of temperature in Air conditioners). Raspberry Pi also acts as the web host, MySQL and GPIO server. Raspberry Pi is a small computer capable of running Linux based operating system and can be linked with the external world using a software called WebIOPi.[3] After installing WebIOPi and running the proper source code it generates a Web link that has to be fed to our smart device which finally ends our linking process. Now it is the webIOPi that will control the GPIO pins of our Raspberry Pi.Relay is used to switch power the power socket and is controlled via Raspberry pi. The appliances connected to the socket can be controlled from the user interface and the status can also be monitored.

One more feature that we can add to our system is voice recognition. Voice control technique is also implemented which uses android speech recognition so that the users can control the appliances through the voice commands. For voice control user only has to select the option of the appliance and control Status through voice commands. The voice is captured through themicrophone. Once the voice is captured, the input voice is compared with the data stored. The output of the comparison is the voice matched with any of the command trained and certain signal is produced as the input for controlling system.

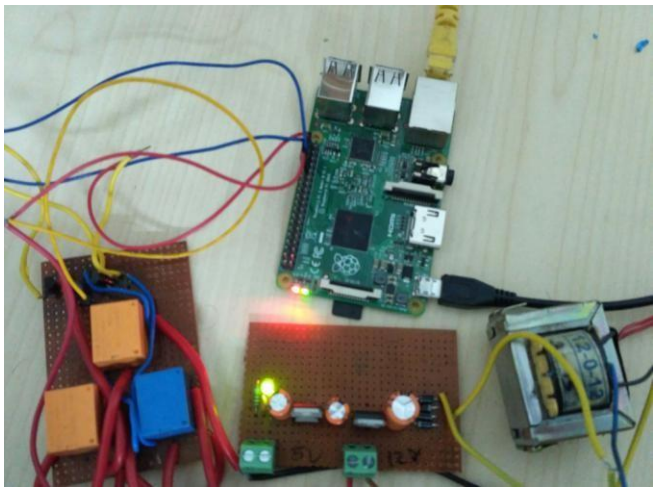

Fig-: Relays connected to the Microcontroller

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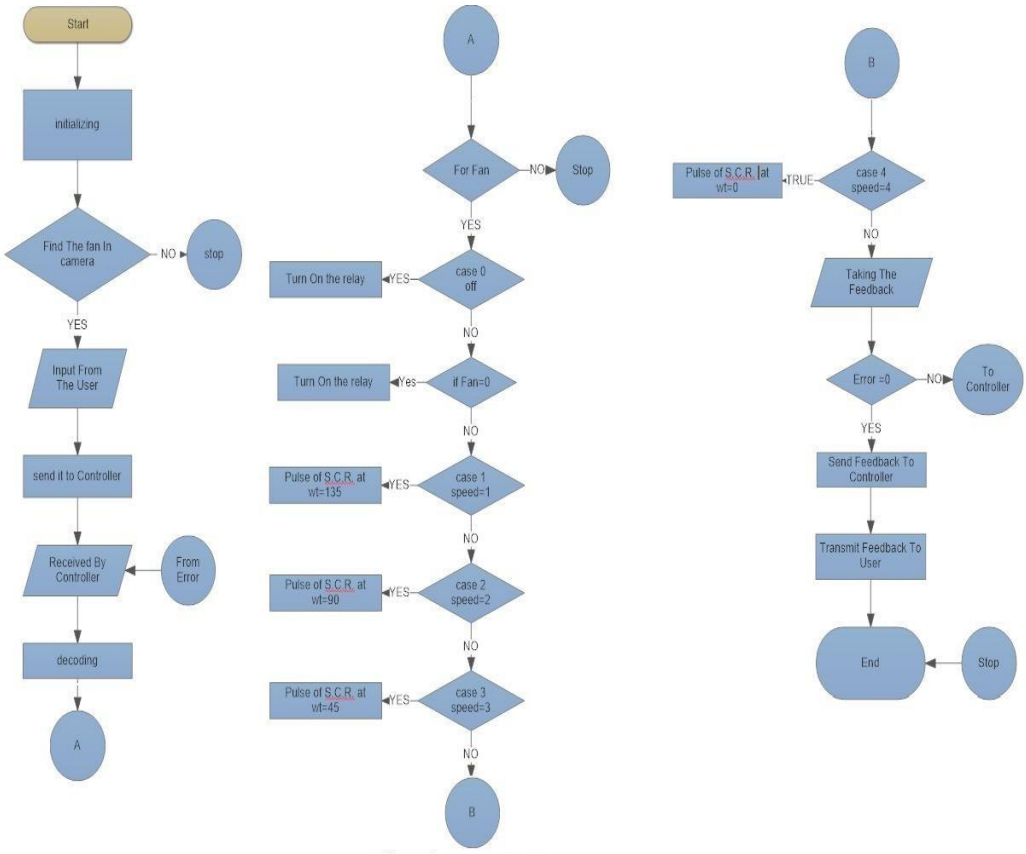
FLOW CHART FOR THE AUTOMATION OF FAN



Flowchart For Fan

VI.WORKING

As soon as the user points smart device towards the electrical equipment system will show a virtual pop-up switch which has two options (ON/OFF). If the system has multi input like brightness control or temperature control then system will give slider (for increment and decrement). The app then sends theinput data to the system. Controller will sense the data and then take appropriate decision like turning on or off the relays, giving appropriate triggering to the Thyristor (for controlling the speed) and transmitting the RF signal with the help of RF transmitter. It also continuously measures the safety parameters like current and voltage and take the required steps. In our system we use raspberry pi.

Which act as a host and the smart gadgets are linked with it via wifi or net connectivity.

WORKING OF A FAN:

There are 5 types of input for Fan

i) case0: to turn off the fan: just change the contact ofrelay.

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ii) Case1: To run the fan at speed of first level. The speed control can be done by changing the supply voltage. wherethyristor is triggeredatwt=135.

Average Voltage Va=*(1+cos α)

($\alpha=wt$)

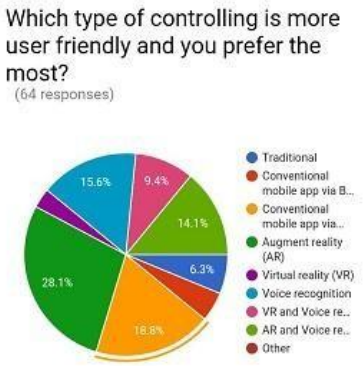
iii) Case 2: Triggering at wt=90.

iv) Case 3: Triggering at wt=45

v) Case 4: Full speed operation hence no need of thyristor. The controller will take feedback from the fan and checkfor error and fan will take appropriate decision And the status of fan will be updated. For other the appliances the process will be somewhat similar but the case and its action may vary.

VII.SURVEY RESULTS

In a survey conducted in our college 28% people preferred augmented reality and 14% preferred AR with voice recognition as the most user friendly interface .Which together makes it 42%.



VIII.CONCLUSION

Our paper describes the use of augmented reality for the automation of our day to day electrical appliances like fan, tube lights, air conditioners etc.

Augmented reality as suggested by the survey results proved to be the most user friendly method for automation. The system is mainly designed for specially challenged and elderly people. (User friendly interface). It is also helpful for the less educated cluster of people as the interface is very user friendly. The technique can be used in our day to day life to control and monitor our electric power consumption as well as to avoid any hazardous situation. Can be used in industrial maintenance and to aid patients in hospitals. Considering all aspects an ideal system should be available to the user from anywhere and in real time and our proposed model is the eligible candidate for the same.

Augmented reality when introduced in other smart devices like google glass, smart watchetc will not only increasethe market of these products but also evelop our standards. Currently In major cities home automation is increasing rapidly but still this is less than 30% of the total number.Tomake it more popular

among people the AR concept should be made cheaper and affordable for common people.

In future we hope to develop even smarter homes by introducing motion sensors, temperature sensors, light sensors and provide automatic toggling of the output based on the conditions sensed by the sensors.

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