

Gesture Controlled Home Automation

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Abstract— under the recent developments of image processing, home automation system is a trending technology which facilitates the users to operate the home appliances in a convenient way which is void of switches. This project deals with home automation which runs on the gestures detection. The relay circuit is controlling the electrical devices driven by the gestures recognition which are further controlled by Raspberry pi through the camera.

Key words: Arduino Board, Banana Pi, Raspberry Pi, Gesture Controlled Home Automation

I. INTRODUCTION

In recent times, the use of home automation has been on a rise and made easy for a common man to use this technology on a daily basis. Home automation basically, controlling the simple house hold appliances such as turning off light without using switches, but by using hand gestures or using a cell phone anytime and from anywhere. This is done using wireless home automation devices with Z-Wave technology, for controlling all the aspect of home environment without use of single wire. There was a time once when home automation were only installed in luxury houses, but in recent times, home automation technology has been advanced and is made easy for a common man to afford it and making one's life easier and saving energy at the same time. Benefits of home automation are many such as easy convenience, saving electricity, saving money, security and control. It can also make the life of senior citizens and disabled people to have control over the appliances just by using their gestures. In our paper, we are making a user friendly and low cost home automation control with the help of hand gestures and sensors, and we have considered. The gestures are used to control simple house hold appliances such as fan, bulb, buzzer etc.

II. EXISTING SYSTEM

Home automation system is a trending technology which can be implanted through ways, which includes using an Arduino board, Banana pi, Raspberry pi etc. Each processor has its own specification and support to the programming languages. Most of the automation systems are developed either as an android application using Arduino board or Raspberry pi connected through Bluetooth or IOT based automation which is nothing but a web application.

III. PROPOSED SYSTEM

This system is developed using a Raspberry pi which controls the relay circuits that are used to drive the peripheral devices connected to it (such as fan, bulb etc.). Hand gestures are captured by the camera connected to a Raspberry pi. The port numbers of Raspberry pi that are connected to relay circuits are included in the python script written in the Raspberry pi. The Raspberry pi toggles the respective port recognised

according to the hand gestures which affects the state of the relay circuit (i.e. on/off). This makes the devices connected to relay turn on or off.

IV. SYSTEM DESIGN

In this paper, a home automation system is designed based on gesture control, i.e. hand gestures. The hand gestures are recognised by the camera which is connected to the raspberry pi. The whole system revolves around this raspberry pi. Relay circuits are used in this system which drives the electrical appliances (such as fan, bulb, buzzers etc.) connected to the raspberry pi. The raspberry pi board uses the AVR microcontroller with a clock speed of 1.7 Ghz. It has 40 GPIO pins for I/O communication.

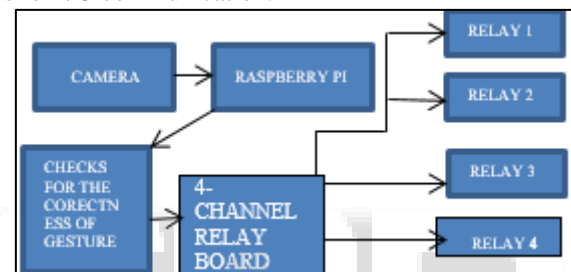


Fig. 1: System Design

From the above block diagram, gesture recognition is the major part since real time image capturing is a complex part to achieve. The hand gestures are shown in front of the camera. The calculations involved in the python script detects the gesture (a concept of edge identification algorithm is implemented) and controls the GPIO pins of Raspberry pi associated to the code which is connected to the relay circuits. The relay circuit basically is a switch which toggles the state of the devices i.e. off or on state.

The algorithm below shows the detection of convex points (edges), convexity defects. Convex points are at the tip of the fingers. But other convex points also exist to find the convexity defects which are the deepest point of deviation in the contour. Through this we can find the number of fingers extended and perform the intended functions.

A. Algorithm: Finding convex points, convexity defects and normal angle value

```

for i in(defcets.shape): //To find the convexity defects
s,e,f,d→defects[i,0]
srt→tuple(cnt[s][0])
nd→tuple(cnt[e][0])
fr→tuple(cnt[f][0])
m→math.sqrt((nd[0]-srt[0])**2+(nd[1]-srt[1])**2)
n→math.sqrt((fr[0]-srt[0])**2+(fr[1]-srt[1])**2)
o→math.sqrt((nd[0]-fr[0])**2+(nd[1]-fr[1])**2)
ang→math.acos((b**2+c**2-a**2)/(2*b*c)) * 57 // ang is
calculated between two fingers
  
```

Angle is detected from the above code. A normal is drawn to the angle detected which detects the edge. A counter

variable is used with a time stamp. When the angle detected is 0, the counter variable stops updating. The counter variable is compared with a predefined number which corresponds to a particular hand gesture and the respective relay circuit associated to the gesture gets toggled. The below code snippet shows the above operation:

```
if light1>maxii_counter:
```

```
    Turn the pin 2 of Raspberry pi to high i.e. the GPIO pin 2 as high
```

```
    light_status=1
```

```
else:
```

```
    Turn the pin 2 of Raspberry pi to low i.e. the GPIO pin 2 as high
```

```
    light_status=0
```

This process is repeated for all the other GPIO pins 3,4,17 respectively.

V. CONCLUSION

The project report entitled "Gesture Controlled Home Automation" based on the principle of pattern recognition and image processing is developed in an efficient manner is being implemented.

The system will be developed with more care that it is error free and at also it is efficient and consumes less time.

Home appliances control through static new improvements was needed in the field of home automation pattern recognition and will be implemented efficiently.

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REFERENCES

- [1] <http://www.instructables.com/id/Raspberry-Pi-Projects/>
- [2] <http://ijcrme.rmodernresearch.com/wp-content/uploads/2015/06/CP-004.pdf>
- [3] <http://opencv.org/>
- [4] <http://ijiere.com/FinalPaper/FinalPaper201532874046379.pdf>
- [5] <http://www.vipul.xyz/2015/03/gesture-recognition-using-opencv-python.html>