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Hand Gesture Recognition System for Controlling Home Appliances

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Abstract: ***Controlling the home appliances (electronic gadgets) through switch and infrared remote control is general. But the same controlling tasks can be done more easily. Primary motive of proposing the new system of hand gesture remote is to handheld free the infrared remote for specific function. The paper presents a good system to control home appliances through hand gesture as a remote control device. It uses real time angles and microcontroller development board, Arduino. The paper proposes a possible solution to control the electronic gadgets for physically handicaps.***

Keywords: Camera, Arduino, Relays, Hand Gesture, Electronic gadgets.

1. Introduction

Nowadays the ability to interact with the environment are basic human needs.Millions of people worldwide suffer from such severe physical disabilities that they cannot even meet these basic needs. Our proposed work uses unique system interface of hand gesture recognition with web camera. Gestures can be recognized by using camera. The detected and recognized hand gestures are used as the command signals for controlling devices, some user interfaces, e.g., icon-based interface or motion-based interface are adjusted accordingly in order to support natural hand control. Hand Gesture Based Remote is a device to replace all other remotes used in households and perform all their functions. Normally in homes, remotes are used for appliances like TV, CD player, Air Conditioner, DVD Player and Music System. Remotes are also used for lights ON/OFF control, Door Opener etc[1].

All these devices can be controlled by one Universal Remote. Though the technology is synchronized for all remote, there is no agreed convention on code format for data transmission. Communication between remote and appliances is established by following a predefined code.

The literature survey conducted provides an insight into the different methods that can adopted and implemented to achieve hand gesture recognition It also helps in understanding the advantages and disadvantages associated with the various techniques.

The use of RGB color detection involves pixel-by-pixel comparison between each color value in the RGB colorspace. In the RGB color space, the red, green, and blue value of a color pixel is compared with a threshold value as the basis of filtering parameter.

Background subtraction is a method in image processing where one can filtered out objects from stationary objects. The algorithm works as follow: the system takes two pictures at two different times and compares both of the images [5]. Then, the system will replace any unchanged pixel color values with the black color. The result of the comparison and filter will show objects that have changed or moved.

In image processing, calculating the histogram of an image will show the distribution of colors inside an image. The histogram can be built for both RGB and HSB color space. By calculating the histogram inside a picture, it will show the number of pixels that have colors in the fixed color range that spans the image's specific colorspace. This method is particularly useful such that a cluster of related color, in this case, the skin color, can be calculated inside the region of interest (ROI) and be used as the color value for the threshold filter.

2. Methodology

2.1 Materials used

1) Camera
2) Arduino uno with ATMegha328
3) Relays
4) Electronic gadgets
5) Matlab software
6) 8GB RAM

2.2 Experimental Setup

An experimental setup is developed in this study to control the home appliances or electronic gadgets through hand gesture.

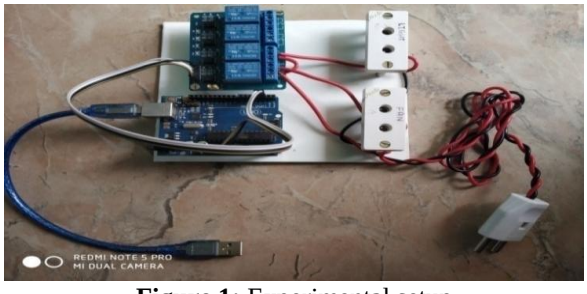

Figure 1: Experimental setup

The automatic hand gesture system is designed to continuously take the input(hand gesture) through the camera and detect the angle of the gesture based on the angle the appliances are controlled.

2.3 Architecture

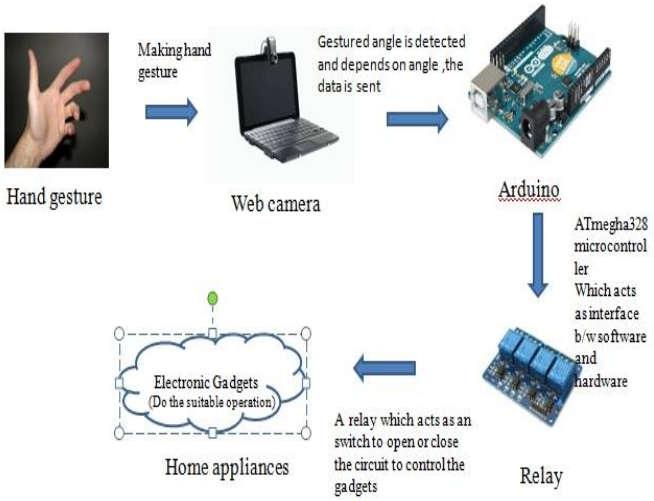

Figure 2: Architecture diagram of Hand gesture based remote control

2.4 Modules

Four modules are used for controlling the home appliances by hand gesture.

2.4.1 Hand Gesture

Instead of using hand held remote by making hand gesture, like moving hands or by making gesture by fingure which will detect the angles.

2.4.2 Image Segmentation Module

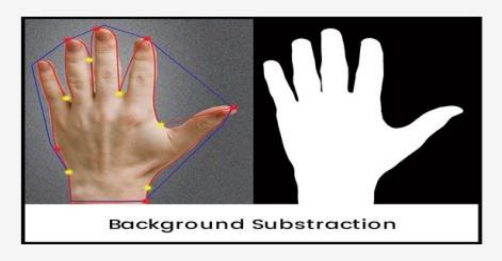

Figure 3: showing back ground subtraction

To reduce the computational time needed for the processing of the image and only the outline of the sign gesture has to be process. After conversion of the image into binary, the outline of the vector (x,y) coordinators, assuming that the hand gesture covers left corner of the image.

2.4.3 Interfacing software and Hardware

Detected gesture angle is computed and sends to the Arduino and it is connected to the Relay which acts as an switch depends on angle the electronic gadgets are controlled.

2.4.4 Electronic Gadgets

Depends on the angle detected, the function of the gadgets takes place, different gadgets having different functions and angles.

2.5 Steps for Implementation

Step 1: Start and run the process by executing the code.
Step 2: Make a hand gesture**.**
Step 3: Check the gesture angle value.
Step 4: Computed value is sent to the Arduino which acts as interface b/w software and hardware
Step 5: Depends on the angle value, signal is sent to the relay.
Step 6: Relay which acts as an switch.
Step 7: Depends on angle value the home appliances are controlled
Step 8: Stop

3. Applications

- It can be used by patient suffering from Paralysis.
- It can be used to play simple video games.
- It can be used to control various home appliances.
- It can be used in home theatre system where
- Suitable for physically challenged people to
- operate the devices within room.

4. Results

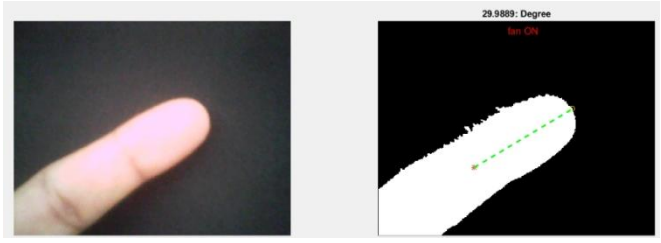

Figure 4.1: The gesture angle is >20

Above gesture can be used to control the fan by sending a digital to the Arduino through Relay, which acts as a switch that turning it to on. As we have put a condition that if the angle is between >20 &&<40 FAN should be ON.

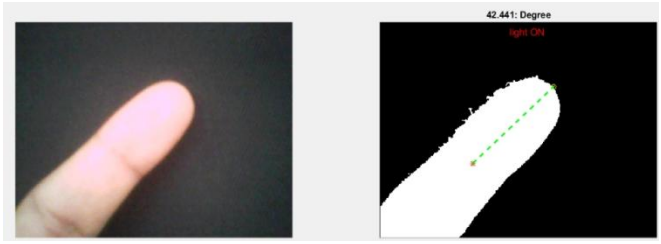

Figure 4.2: shows gesture angle is >40

Above gesture can be used to control the light by sending a digital or analog signal to the Arduino through Relay, which acts as a switch that turning it to on. As we have put a condition that if the angle is between >40 LIGHT should be ON.

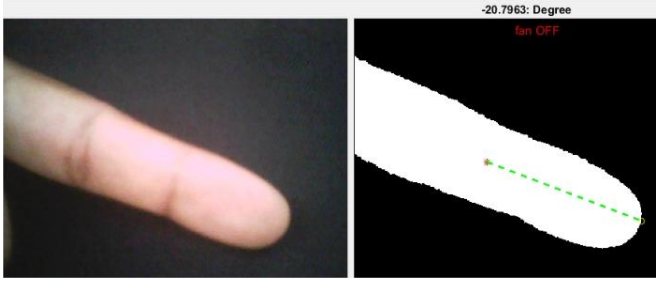

Figure 4.3: shows gesture angle is <-10 &&>-30

In the same way if the angle is between <-10 &&>-30 as shown in Fig:6.3 the FAN will turn ON.

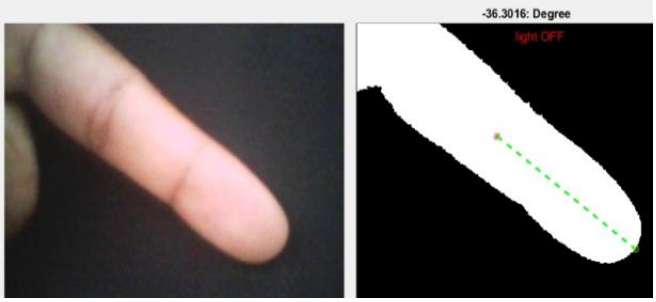

Figure 4.4: shows gesture angle is < -30

Finally, as shown in above Fig: 5.4 if the angle is <-30the LIGHT will turn OFF.

4. Conclusion and Future Scope

Our proposed system is to help physically impaired to control home appliances by hand gestures. Our proposed system provides comfort and convenience for common as well, especially in home theatre. This technology is also used for home automation for physically impaired.

The scope for future study is without using hand held remote or IR remote by using only hand gesture we can control the home appliances which will help a lot to the person who are suffering from physically disabled. The person who are physically disabled instead of going to the nearer to the switch or pressing the button they can easily control the things by sitting their only by hand gesture.

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Author Profile

Sheik Imran received the B.E. degree in Computer Science and Engineering from UBDT college of Engineering in the year 2006 and M.Tech. degree in Computer Science from Bapuji Institute of Engineering and Technology in 2010. Since 2006, working as Assistant Professor in Bapuji Institute of Engineering and Technology.