

ALGORITHM OF GESTURE BASED INTERACTION ROBOT

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ABSTRACT: Interaction between human beings and machines is changing from day to day. In olden days used to control machines with big gears and buttons, after remote controllers are used .now controlling of machine with physical interaction of human beings. So many ways to control the machine like voice, and gestures ...etc.to achieve gesture robot, can use accelerometers but the circuit become complex, using image processing can built gesture based interaction robot. This paper talks about machine can be control by any interfacing objects with help of hand gestures using different algorithms

KEYWORDS: Robot vision, Image processing, Gesture recognition, Resolution segmentation, Image detection, Gesture controls , Gesture control robot

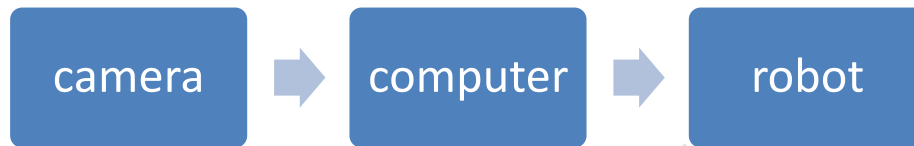
1 INTRODUCTION:

Interfacing between humans and machines is very difficult processes for example take a personal computer which is loaded with any operating system and user software like word 2010 etc...Without operating system cant access the user software, here operating system acts as an interface between user and computer. Same thing in the machines also, we need a interfacing object to control the machine. in olden days we need to control the machines with gears ,big switches and well trained persons .next generation was using remote controllers (wired and wireless).now machines are controlled by human interactions like voice ,gestures and mood etc .this paper concentrates on gestures only .gesture means passing information from a person to person or thing by movements of hands .so many ways for designing gesture robot like using accelerometers ,image processing and artificial neural networks .out of all this image processing is easy design for this kind of robots. Image processing based algorithm helps to overcome the controlling of robot by specific device .we can control robots with any interfacing object like pen, wallet, hand louse or bare hand.

Requires 3 basic hardware components they are

1. Camera
2. Computer
3. Robot with circuit

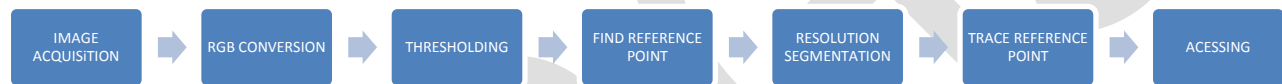
Camera and robot connected to computer as shown below



Camera acts as an input, robot acts as a output and computer serves as a processing unit

2 ALGORITHMS:

This paper deals machines can control by any interfacing object with the help of hand gestures
There are 7 simple steps to achieve gesture recognition ,these simple steps as shown in below



BLOCK DIAGRAM OF STEP BY STEP PROCESSES

2.1 IMAGE ACQUISITION:

Acquisition means fetch the data or own the data. Image acquisition means fetch the data in image format, nothing but take a snapshot or picture. This can be achieved by CCD (charge coupled device) cameras, even web cams perform better for basic operations.

2.2 RGB CONVERSION:



Figure 1

Figure 2

There are so many formats of image like black and white, grey; YCBCR (luminance chroma blue chroma red) and RGB. each format have their own storage capacity. Figure 1 show ycbcr format it holds less information to processing the data. Figure 2 shows rgb format of same image but it holds more information of data .by using more information, processing of data is very easy. Normally rgb is the best format for image processing.

2.3 THRESHOLDING:

In past 2 steps we gave vision to machine but it doesn't have capability of recognition. Thresholding helps to identify the object which is to be interfaced object. It can be explained below by help of figure 2.

Figure 2 description: a black pen in front of white wall

In rgb format each pixel hold 3 different values belong to red, blue and green. Each unique color has unique values so white wall has their unique values and black pen has their unique values. designing a program which detect only rgb values of black pen ,resulting the values which hold by pixels are same according to code is projected as white and remaining pixels projected as black as shown in figure 3.now successfully completed the detecting the interfacing object

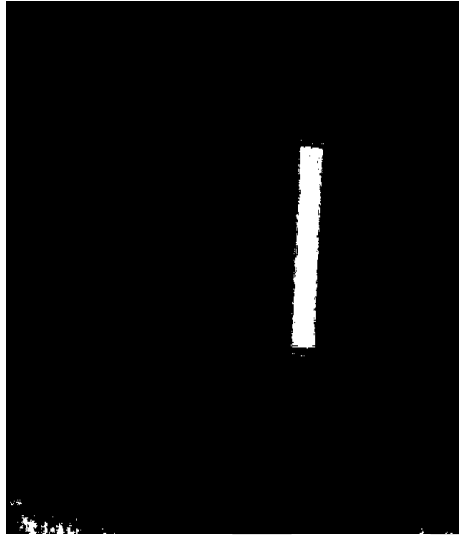


Figure 3

2.4 FIND REFERENCE POINT:

After detecting the object need a reference point of detected object to control the machine reference point may or may not be a centroid.to find out reference point a simple formula in the figure 3 diagram find the coordinates of top and bottom most and left most and right most of white pixels. Now calculate the mean for top and bottom gives vertical mean same procedure for left and right most gives horizontal mean mutually both means give reference point.

According to figure 4, reference point (horizontal) $= (360+380)/2=370$

Reference point (vertical) $= (190+260)/2=225$

Mutually together (370,225) is reference point as shown in figure 4

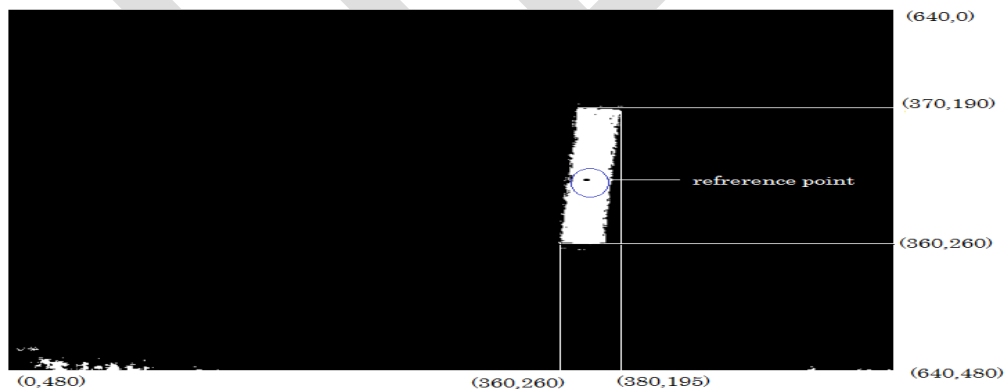


Figure 4

2.5 RESOLUTION SEGMENTATION:

For precision results resolution segmentation is best .resolution segmentation is a method of divide the screen pixels into set of boxes. it is shown in figure 5

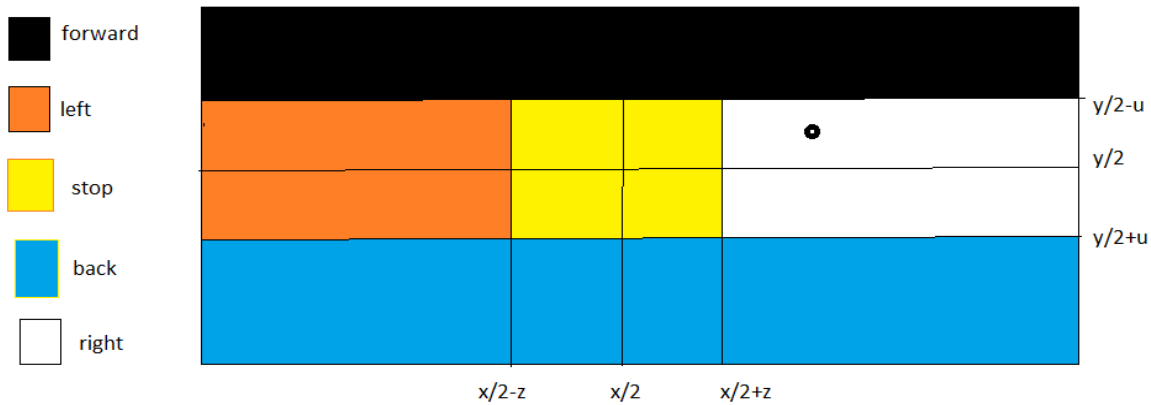


Figure 5

In figure 5 (x, y) is coordinates of center pixel in resolution z and u are number of pixels apart from center pixel these values are user defined. In this paper total resolution is divided into 5 segments.

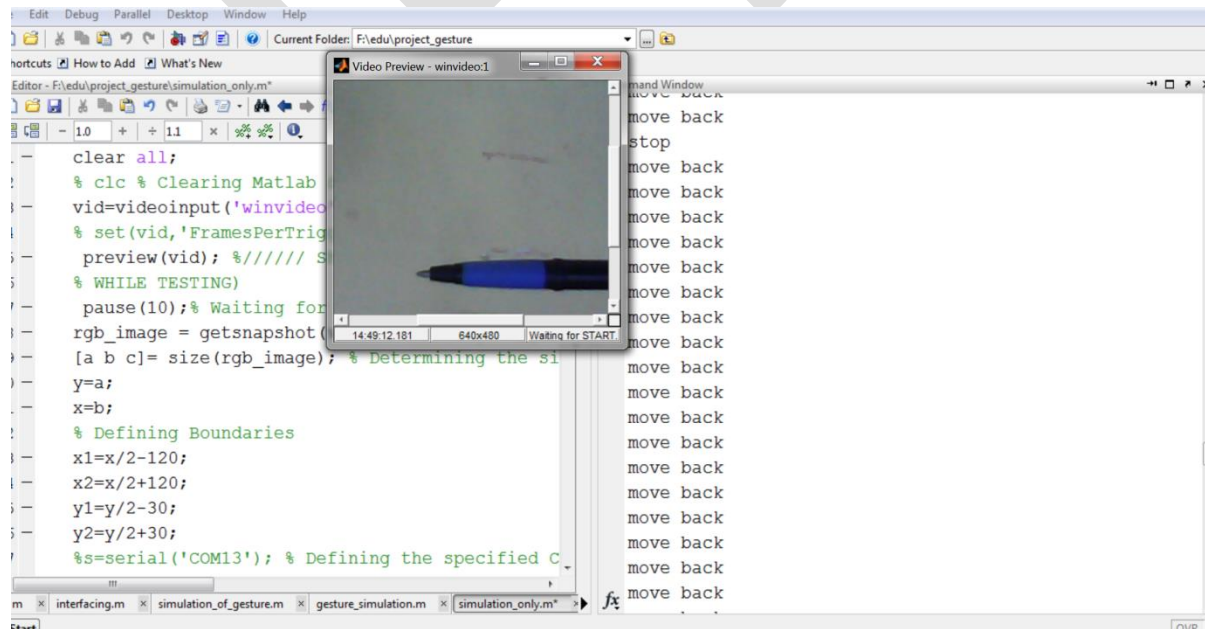
2.6 TRACE REFERENCE POINT AND ACCESSING:

The position of reference point is plays important role here .a black ring in figure 5 is reference point of detected object. Now check the position of reference point in which segment it belongs. According to reference point position access the robot by passing commands.

For example in figure 5 reference point position is in white color portion (segment) so pass the command to robot turn RIGHT. if reference point position is in black portion (segment) access the robot by passing command to move FORWARD

3 RESULTS:

Simulation result had been attached below.



Matlab has been used for simulation, above image pen has be recognized in below segment of resolution so according to algorithm it shows output as "move back" in result window (right half of the image)

4 CONCLUSION:

Briefly robots can also response for gesture interactions by take any object and make vision to find the object and recognize the position of reference point of the object then passing commands to the machine or robot. Designing of the gesture interaction module is very easy by using image processing and design complex increases when the degree of freedom of robot increases.

Main advantage of gesture recognitions increases the interaction and precision of robots

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