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Human Hand Gesture Recognition Using Robotic ARM

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ABSTRACT

These days robots are being integrated into working functions for replacing humans and performing various tasks. The main of our project is to create an interaction between human hand and a Robotic arm. Arm is to be controlled by using Human hand gestures with the help of Image Processing techniques. This idea introduces the technology used to control the Robotic Arm for different activities. We are using non-contact type of mechanism for different hand gestures which is to be recognised by Matlab Software using RGB color strips. In our project we are using real time application in that whatever action performed by our hand the exact action will get performed by robotic arm using Arduino.

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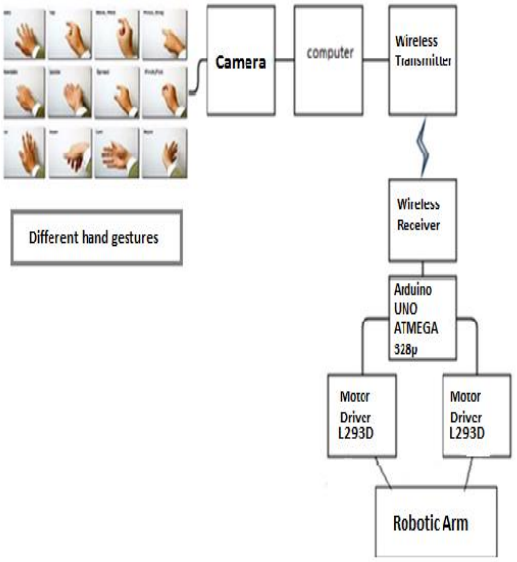
I. INTRODUCTION

Recently many Robotic arms are used in industries which are trained in accordance to the program. In our Project we can function whatever we want to do without much change in machine interface and virtual environments. We are implementing it, using MATLAB through which we can calculate the distance and angle between X and Y axis .For each position of our hand there are color strips to detect its position that is from shoulder to elbow .These colors will get detected by MATLAB and give position to our Robotic Arm depending upon the axis defined for the video screen .These axis locations will be captured and interfaced with the controller .The controller will give the command to the robot then particular robotic servo motor will move which is placed in the axis of robotic arm.

II. PROPOSED SYSTEM



In this area two types of techniques are used:

1. Contact type
2. Non-Contact type

1. Contact type:

In Contact type technique Arm circuitory are in contact with the human hand. Such devices uses sensors which will send the signal to controller to receive the data.

2. Non Contact type :
In Non Contact type technique our hand is not in contact with any type of devices.

III.WORKING

A.Sensing Gesture

Input may be taken as a video signal of the human hand and analysis is done to track the different color strips on our hand at different locations. Video signal may be taken by a laptop camera or a camera build on robotic arm itself, which will make it portable and efficient for handling.

1. Tracking of colors
Tracking of colors contain three types of RGB color strips, assigned to the human hand. These colors are assigned from shoulder to elbow with one color strip, from elbow to wrist the second and ahead of wrist is the third one. For conversion of image from normal image to gray image the 3D image will get converted to 2D image.

2. Angle calculation
Angle position from the axis is calculated using the simple trigonometric equations. These angles will tell how much our hand is rotated and is in which direction. The three axial position gives the rotation of arm in any direction to give the direction for the robotic arm and to perform the functions. For the movement of the robotic arm the angle signal is transmitted from MATLAB to the micro-controller and process the signal. The processed signal is then transmitted to the robotic arm to perform various actions. By using following eqations we can calculate the angle between X and Y axis.

$$tan\theta = |\frac{m1 - m2}{1 + m1 * m2}|$$

where,

m1= slope of first line

m2= slope of second line

tan Θ = angle between the joint

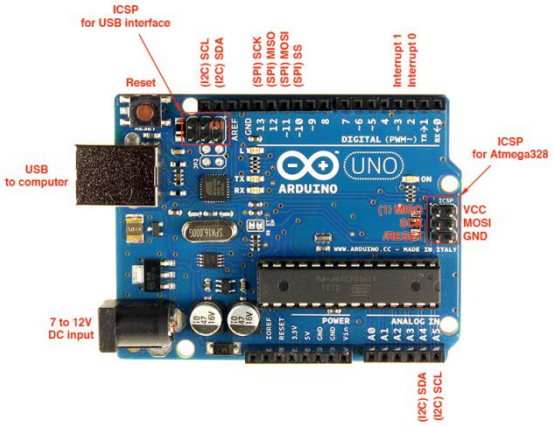
B. Machine to Machine Interface

In computing ,an interface is a shared boundary across which two separate components of a computer system exchange information. The exchange can be between software, computer hardware, peripheral devices, humans and combinations of these.

1. Video camera
A video camera feeds or streams its image in real time to computer to computer network. When captured the video stream may be saved, viewed or sent on to the other networks via systems using USB cable.

2. MATLAB Programming
MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment. We have used MATLAB because it allows us to perform Matrix manipulation, plotting of functions of data and also implementation of algorithms and creation of user intreaface is easily possible.

3.Arduino Interfacing



An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming. Arduino connects to the PC using an USB port which acts like a Serial connection and The Arduino IDE uses it to upload our programs .

C .Actuation of Robotic Arm

A Robotic arm is programmable, with similar functions of a human arm.This type hand can be used to perform any type of application such as welding, gripping etc. The robotic arm contains different servo motors for different axial rotation of hand. Different functions corresponding to each meaningful hand gesture are written and stored in database for controlling the robotic arm. Whenever a gesture is matched with a meaningful gesture from the database, the instruction set corresponding to that gesture is identified and passed to robot for execution. In this way the robotic system can be controlled by hand gesture using live camera.

IV.CONCLUSION

In this project the implementation of human hand tracking using robotic arm is shown. The arm is controlled by the human hand and it will listen all the instructions of the human hand. This technique can be used even if the user is dumb or deaf that is it listen the instructions of hand only.

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