

DC Motor Movement Controlled by Gesture Orientation Using ARDUINO

^[1]Arijita Das, ^[2]Bansari Deb Majumder, ^[3]Dibyendu Sur, ^[4]Susmita Das, ^[5]Kaushik Pal, ^[6]Mugdha Mondal
^{[1][2][3][4][5]}Electronics and Instrumentation Engineering Department
Narula Institute of Technology
Kolkata, India
jitts86@gmail.com, ^[3]dibyendumalay@ieee.org

Abstract: The paper aims to create a ‘DC Motor controlled by gesture orientation’. The gesture orientation of a monochromatic red color is captured as a video input. The gesture orientation controls the direction of the movement of the motor. The movement of the motor is governed by the position of the video captured of the monochromatic red object. If the red object is moved towards left then the motor rotates anti clockwise and if the object is detected towards right then the motor moves clockwise. The relative movement of the object is detected on the basis of the co-ordinate change. The controlling of the motor is done by ARDUINO programming. The logic of the work is set through the MATLAB domain.

Keywords—Arduino, Gesture orientation, Image blob analysi, L293D driver, Median filter, Relative movement tracking, Video

I. INTRODUCTION

Optimization of electric and electronic devices is a major challenge in modern world. In this paper a method has been designed in order to drive a dc motor through an efficient way. The motor is controlled by an embedded system called arduino board. It is specially designed to drive motors through in an efficient programmed way. In this paper, it will be demonstrated that the motor will be driven the changes of co-ordinates of an object moving through matlab environment. The microcontroller based embedded system will monitor the gesture variation in order to drive the motor in specified way.

II. OBJECTIVE

The two main objective of our project are:

1. To track the movement of the object in a real time basis.
2. Then the result of the above task in turn drives a motor.

III. METHODOLOGY

This project is mainly based on the principle of image processing and for this purpose a real time image of a red object is captured from a running video frame.

To locate the required object in different video frames at first the motion of that object is detected through matlab coding. Matlab output which is in the digital domain

is fed to the arduino-uno which drives two dc motors using a motor driver chip l293d.

The logic of the movement is like when the red object moves though the video its real time image is captured. At that very instant the co – ordinate values of that image is captured through matlab code. Then the centroid of those co-ordinates is calculated. Then when the object moves to another position a new centroid is obtained. In this way after acquisition of consecutive set points their relative displacement is calculated through matlab. On the basis of this relativity the direction of the object movement is traced. And this logic is fed to the microcontroller embedded in the arduino with the help of c language programming. The arduino is connected with l293d driver circuit which drives the dc motor according to the relative direction of the movement.

IV. HARDWARE PLATFORM

A. Arduino is an embedded system containing a high end microcontroller IC. It is a platform based on flexible prototyping electronic circuits, easy to use for interfacing between hardware and software. It has capability of receiving inputs from different types of sensors and it has the ability to predict effects and then it acts accordingly. The major uses of ARDUINO are like glowing LED, driving motor, etc, but not confined within it [1, 2, 5].

B. The permanent magnet DC motor has an armature winding. These types of DC motor are mounted on the inner dimension of the stator core. It helps to generate the

flux. The rotor consists of dc armature with commutator segments and brushes [3,4].

C. L293D is a high current half-H driver. It is designed to produce an output current of 1 A. Necessary power supply is 4.5 V to 36 V. The input output logics are separate. This driver chip works following the Totem pole driver circuit. The inputs are highly immune from noise effect. Peak output current can have a value up to 2 A.

The pin diagram of motor controller is given in Fig. 1. There are two Enable pins on L293D: pin 1 and pin 9. To drive the DC motor, pin no. 1 should be logically high. For the purpose of driving the H bridge, pin 9 must be high. A low value to either pin 1 or 9 will suspend the action.

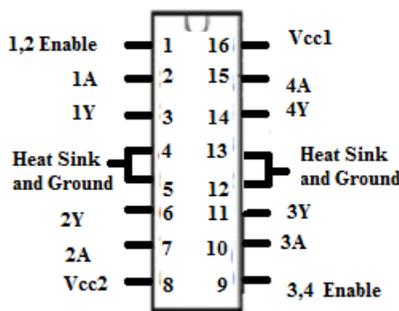


Fig. 1. Pin diagram of L293D

TABLE I. MOVEMENT OF THE MOTOR DEPENDING ON PIN 1 AND PIN 9 STATUS OF THE L293D

	A	B
Stop	LOW	LOW
Clockwise	LOW	HIGH
Anticlockwise	HIGH	LOW
Stop	HIGH	HIGH

V. SOFTWARE PLATFORM

The image processing is done using MATLAB platform. MATLAB is a high level technical language and a code based signal and image processing domain. With MATLAB video can also be processed. This feature of MATLAB is used in this work. [6, 7, 8].

VI. PROPOSED ALGORITHM

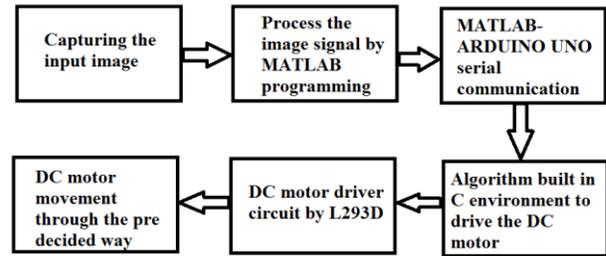


Fig. 2. The Block Diagram of the work

VII. SEQUENTIAL FLOW OF THE WORK

The blocks present in the above block diagram are hereby explained below.

- ❖ The video frames using the video input function are captured.
- ❖ The property of video object is set.
- ❖ The video acquisition gets started.
- ❖ A loop is set which starts after the acquisition of six such frames.

The loop has the following steps:

1. The snapshot of the current frame is captured. Now to track the red objects in real time the red component is subtracted from the gray cell image
2. A median filter is used to filter out noise.
3. The resulting gray scale image is converted into a binary image.
4. All the pixels which are less that 300 are removed.
5. All the connected components are labeled in the image to perform image blob analysis. Here a set property of each labeled region is obtained. The image is displayed.
6. Again a loop is used to bind the red object in a rectangular box.
7. Then after that the video acquisition is stopped

VIII. RESULTS AND ANALYSIS

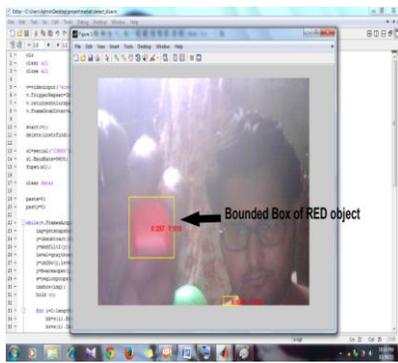


Fig. 3. Capturing of the real time image of the red object in the Matlab window

TABLE II. TABLE SHOWS THE AXES VALUE AT THE DIFFERENT

Sl. No.	Position	Bounded box value	comments
1		X=200 Y=300	Red object detected in the upper screen
2		X=300 Y=200	Red object detected in the lower screen
3		X=500 Y=300	Red object detected in the right screen
4		X=300 Y=500	Red object detected in the left screen

The image detection takes place in the MATLAB domain. When the image is being captured its axes values are obtained in the bounded box. Then the difference between two consecutive axes values is calculated along with their direction vector. This direction drives the motor through L293D driver circuit.



Fig. 4. Motor moving in the forward direction as it detects the co-ordinate values from the frame



Fig. 5. Motor moving in the backward direction as it detects the co-ordinate values from the frame.

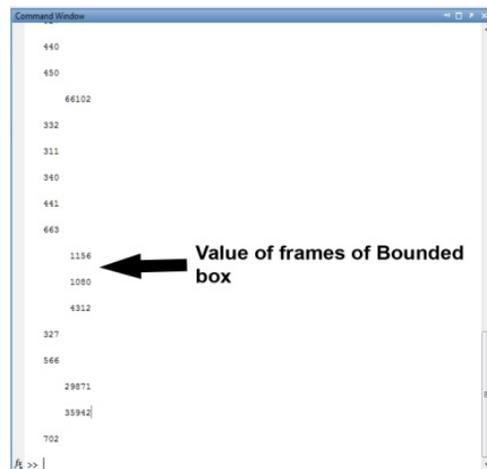


Fig. 6. The results of the bounded box frame values are taken from the MATLAB

IX. CONCLUSION

After the completion of the work it was observed that the motor works properly on the basis of gesture recognition. The gesture is recognized as the relative change in the co-ordinates of the different video frames captured of the red object.

ACKNOWLEDGMENT

The authors want to thank the faculty and technical staffs and students of Electronics and Instrumentation Department, Narula Institute of Technology for their help towards the work

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