

AN INNOVATIVE USER INTERFACE BASED ARDUINO PROGRAMS TO CONTROL ELECTRICAL MOTORS FOR NON PROGRAMMERS

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ABSTRACT

DC motor control, stepper motor control and servo motor control are necessary to understand for engineering and polytechnic students (irrespective of departments) to do robotics and its related projects. The problem comes when the non-programmers want to write the programs to control the motors as per their need. Here, we have given a unique solution to the above problem by developing a server for the above motors using Arduino microcontroller (which is more common controller to engineering and polytechnic students). The user interface developed will ask some of the predetermined questions to users based on their selection of motors. The user is in need to answer those questions in the user interface. Finally by clicking "GIVE THE PROGRAM" button in the user interface, the program based on the need will be given to the user. User can get different Arduino programs for controlling the 'speed and direction' in DC motor, 'step angle, speed and direction' in stepper motor and, 'degree of rotation' in servo motor. Moreover, website will also have tutorials which will explain all the functions used in the programs. So, it can also be used as an educational tool to learn programs easily by comparing the programs and the tutorials all in one website.

1. INTRODUCTION

In India with a survey claiming that 95 per cent of engineers in the country are not fit to take up software development jobs. According to a study by employability assessment company Aspiring Minds, only 4.77 per cent candidates can write the correct logic for a programme a minimum requirement for any programming job. Over 36,000 engineering students of over 500 colleges took Automata a Machine Learning based assessment of software development skills and over 2/3 could not even write code that compiles. The study further noted that while more than 60 per cent candidates cannot even write code that compiles, only 1.4 per cent can write functionally correct and efficient code. Moreover, programming skills are five times poorer for tier III colleges as compared to tier 1 colleges. China comes at no. 1 for the best performing computer programmers on Hacker Rank overall. When it comes to specific types of challenges, China is the best performing country in data structure, mathematics, and functional programming. In India there are so many students with a dream of making

robots. They know what the robot should do, but they don't know how to program it. Getting programs from internet is not understandable for the non-programmers. To make it simple and easy we have developed a server which contains programs to control motors based on the human needs. With this server they can learn how to program.

II. PROPOSED SYSTEM

A. Hardware section

The Arduino microcontroller shown in fig(2) is used to control motors. Based on the motors the input is given to the pins A-,A+ or B-,B+. The DC motor, Stepper motor and the Servo motor is controlled using Arduino.

1. DC motor

The speed and direction of the DC motor is controlled using Arduino and L298p shield. The direction of the DC motor can be only controlled by the L298p shield shown in fig(3). The shield is placed in the Arduino shown in fig(4) and the input is given from the shield to the motor. The program is inserted through the cable to the Arduino from the server to

control the DC motor. Based on the needs of the user the motor can be controlled.



Fig(2)Arduino UNO

2.L298p shield

The L298p shield contains a H bridge shown in which controls the direction of the DC motor.



The input V_{in} is given, if the switches s_1, s_4 is in closed position the DC motor rotates in forward direction. If the switches s_2, s_3 is in closed position the motor rotates in reverse direction.

2.Stepper motor

The speed, direction, step angle of the motor can be controlled using Arduino program. The input is given as same as the DC motor. Based on the needs the stepper motor is controlled.



3.Servo motor

In servo motor the speed and the degree of rotation can be controlled using the programs from the server. Shield is not necessary for the servo motor.



B. Server Section

website will give the requirements in terms of software and hardware to control the above parameters of the every motors. Tutorials will be

given, which will explain all the functions used in the programs. So, users can also be used as an educational tool to easily learn programs by comparing the programs and the tutorials all in one website.

User Interface Design

[Home](#) / [Login](#)

Login

Please fill out the following fields to login:

Username

Password

Remember Me

If you forgot your password you can [reset it](#).

Login

After Login

Choose the motor to control

DC Motor

Brushless DC Motor

Stepper Motor

Servo Motor

What you want to do with DC Motors?

Need To Control the speed and direction

Requirements: 5V DC motor, Arduino board, L298P Arduino shield & Arduino IDE software

What you want to do with Stepper Motors?

Need To Control the step angle, direction, speed and number of steps

Requirements: Bipolar Stepper motor, Arduino board, L298P Arduino shield & Arduino IDE software

What you want to do with Servo Motors?

Need To Control the degree of rotation

Requirements: Servo motor, Arduino board & Arduino IDE software

Basic UI Model for DC motors

1. To which [L298P shield] pin you are connecting?

A+ and A-

A. Choose the direction of DC motor to rotate

Forward

B. Enter Duty cycle

1

C. What DC motor should do?

Rotate Continuously

Give the Program

```
//Pin assigned for MOTOR A (A+, A-) in L298P arduino shield
int pwm_pin_A=3;
int direction_A=12;
int brake_A=9;

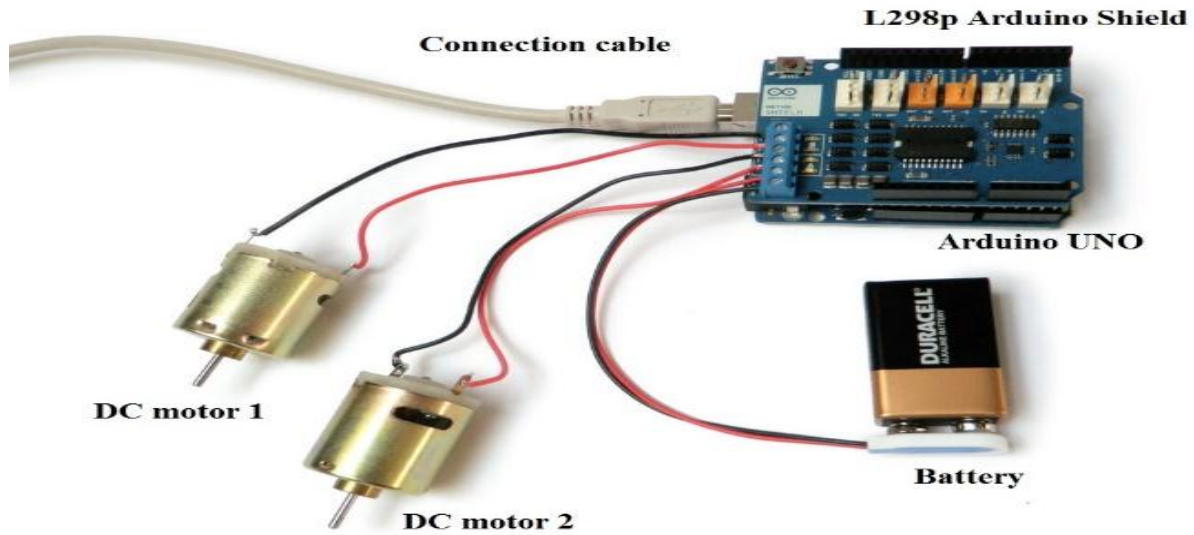
//LOOP1 USER INPUTS for motor (loop1 duty cycle)
float loop1_duty_cycle_A=1;

//Calculate the speed for motor
float loop1_speed_A=loop1_duty_cycle_A*255;

void setup()
{
    //Configuring the arduino pins
    pinMode(pwm_pin_A,OUTPUT);
    pinMode(direction_A,OUTPUT);
    pinMode(brake_A,OUTPUT);
}

void loop()
{
    // LOOP1
    digitalWrite(brake_A,LOW);
    digitalWrite(direction_A,HIGH); // Forward direction
    analogWrite(pwm_pin_A,loop1_speed_A); //Rotate the motor at the given speed
}
```

UI connection of DC motors



Basic UI Model for stepper motors

A. Choose the direction of Stepper motor to rotate

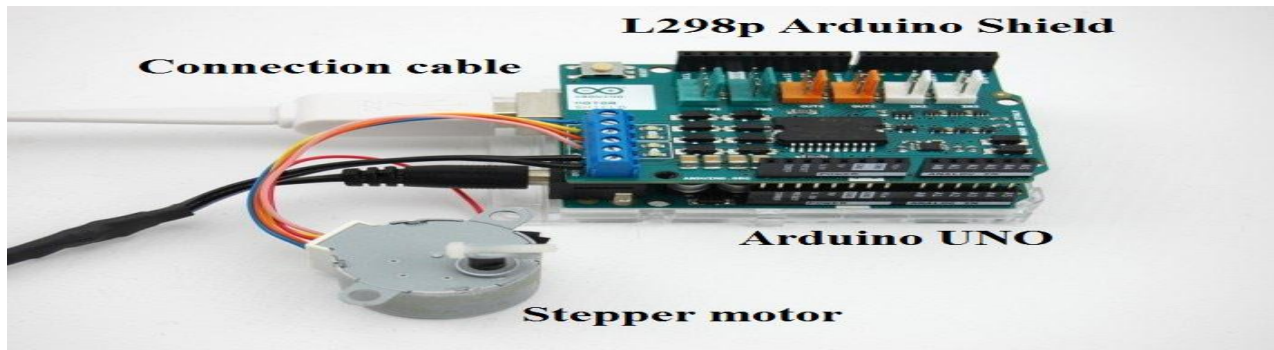
B. Enter the speed of Stepper motor

C. Enter the step angle of Stepper motor

D. How many steps the Stepper motor should rotate?

E. After the above steps of rotation What Stepper motor should do?

Give the Program



Basic UI Model for Servo motors

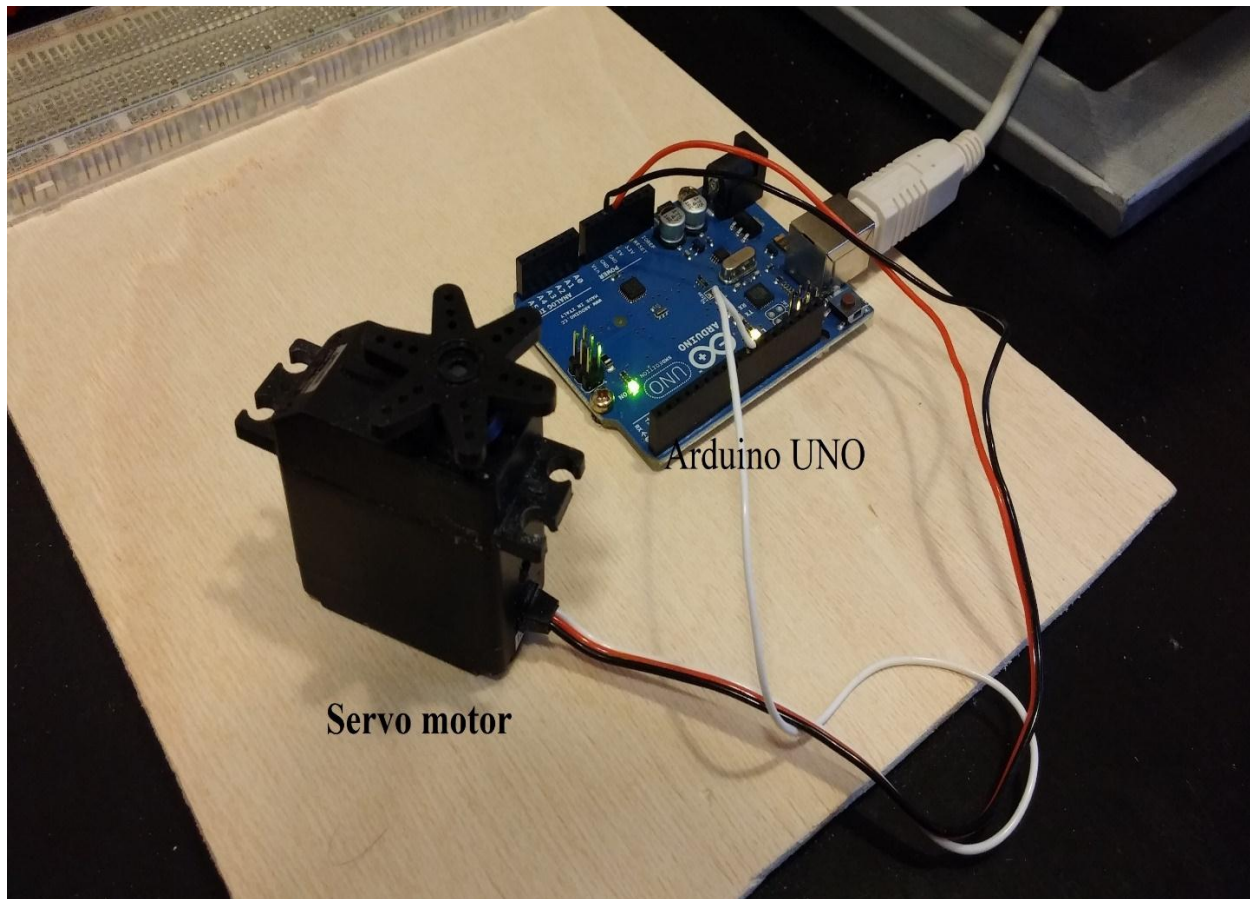
1. To which Arduino pin you are connecting the control wire(orange) of servo motor?

2. How much degree the Servo motor should rotate from initial zero degree?

3. How much time the servo motor should take to reach the given degree?

4. After above degree of rotation what the servo motor should do?

Give the Program



CONCLUSION

The non-programmers find it difficult to control motors based on their needs. In this paper we have given a unique solution for the non-programmers to control motors by creating a server which contains programs to control based on their needs. It also provides tutorials for the functions used in the programs so that the users can learn how to write an Arduino program. This helps students to bring out more robotic projects.

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