

Design and Development of Universal Motor Control Unit Using MATLAB and Aurdino

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Abstract - The device functions can be adjusted in a wide range to cover the needs of different industries. Key words – motor, bus The Universal Motor Controller (UMC) is an intelligent motor controller for 3-phase AC induction motors combining the two classical functions of motor protection and motor management in a single device .It offers diagnostic and field bus communication

Introduction

Tuning a controller on physical prototype hardware can lead to hazardous operating conditions and damage the hardware. It includes acquiring data, identifying linear and nonlinear plant models, designing and simulating feedback controllers, and implementing these controllers on an audrino for real-time testing.

So, the controlling of motor become more and more precise and this perception of drive also provides the ease of use[1]. The motor require higher-current control signal which is get from low current control signal using a motor driver circuit. When DC motors are used in many applications, the use of drives is very necessary for the smooth running and operation of these motors. The DC motor drives are mainly used for good speed regulation, frequent starting, braking and reversing [2]. This entire task can be achived using L293d H-Bridge motor drive[3].

The drive components are assembled and programmed through Arduino board using algorithm developed. The desired motors are connected; and external power supply is required to power the relay cards and also the drive [4][5]. Figure 1 indicate the block diagram of universal motor control

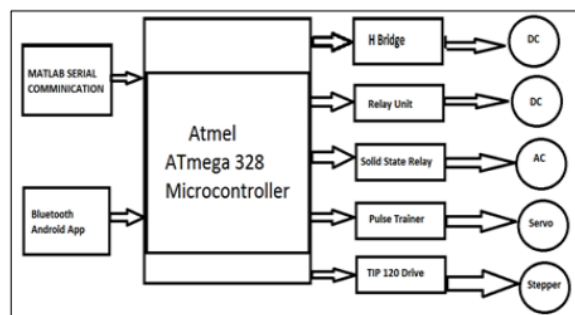
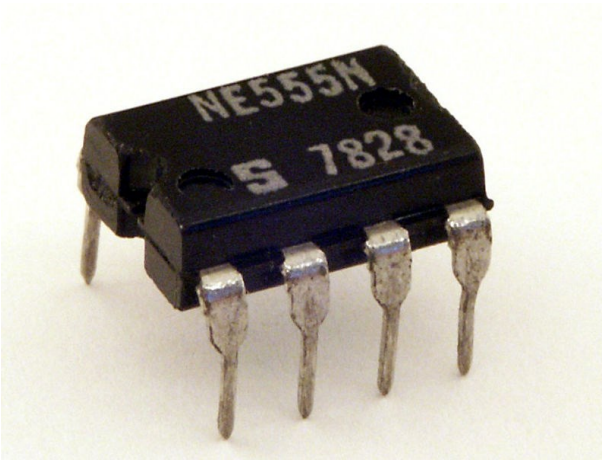
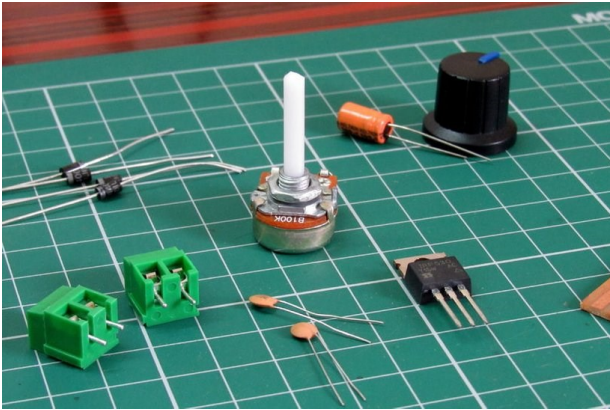


Figure 1 the block diagram of universal motor control

The following components are necessary to design a universal motor control.

NE555 timer ,Resistance 10k ,Pot 100k: 0.1uF Ceramic Capacitor ,100 uF Electrolytic Capacitor
IRF530 link, Heat sink optional,Diodes



The physical system is a DC motor connected to an Arduino[®] Uno board via a motor driver (Figure 3). Then main aim is design a feedback controller for motor to track a reference position. The controller will create the appropriate voltage command based on the motor position orientation data. When practically applied to the motor, this voltage will cause the motor to create the torque that turns the motor shaft. The potentiometer is used to calculate the angle of rotation of the motor shaft, and feed this angle back to the controller.

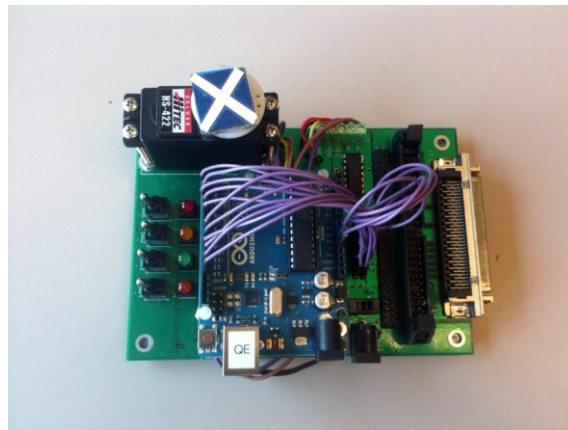


Figure3. Arduino Board connected to the DC motor.

The motor driver integrated circuit (IC) increases the current capacity and can drive the motor in both directions. The motor position data received through an Analog Input pin on the Arduino board and calculate the error between the reference and actual data (the controller input). The voltage command (the controller output) send to two Analog Output pins on the board as PWM signals. These signals are feed to the driver IC that gives the motor with the appropriate drive currents. The controller must keep the system stable and provide fast reference tracking with minimal steady-state error and overshoot.

CONCLUSION

The drive can control different motors i.e. two DC motors and an AC motor using the single hardware drive. This drive is simple to function and has various modes of operation. It controls the motors and can be operated manually using MATLAB GUI and wirelessly using Bluetooth on an Android platform. and provides the most convenient It is power efficient and compatible. It can operate under different atmospheric conditions. It is most useful for low budget starts-ups and serves as reliable equipment to control different sets of motors, their direction and speed at instant.

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