Arduino Based Speed Control of Stepper Motor

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ABSTRACT

The main aim of this project is to control the motion and speed control of stepper motor with an arduino board. This is a new technology to control direction and speed control of stepper motor. We control the motor manually which may cause manual errors. It becomes very difficult for the elderly or physically handicapped people to operate them. This system is enhanced to control the stepper motor through an arduino board by dumping corresponding program. The proposed systems uses an arduino board.

1. INTRODUCTION

Speed is controlled using Arduino UNO. Stepper Motor is a type of brushless rotates in control Stepper Motor Control using Arduino is a simple project where a unipolar Stepper Motor motion and discrete steps. These steps are controlled by arduino, we can get precise position and speed that converts electrical pulses into distinct mechanical movements i.e. the shaft of a stepper motor.

Stepper motor have many applications in many fields of industrial, commercial and other activities, such as robotics, automobiles, servomechanisms etc. The electric drive systems used in many industrial applications require higher performance, reliability, variable speed due to their ease of controllability. The speed control of a steeper motor is crucial in applications where precision and protection are essential. The purpose of a motor speed controller is to take a signal representing the required speed and to drive a motor at that speed. Microcontrollers can provide easy control of a steeper motor.

2. HARDWARE COMPONENTS

The various hardware components used in this project are arduino Uno(ATMEGA328P), voltage regulators, printed circuit board(PCB), ULN2003A drive circuit , 28BYJ-48 Stepper motor, battery(9v), personal computer, jumper wire.

In this paper we focus on ATMEGA328P microcontroller installed on arduino Uno board. These devices are manufactured and made in Italy. It has many features such as reset button, six analog input pins, USB connection, power jack, ICSP connection, 16MHz crystal oscillator, 14 digital input and output pins with six PWM output pins. It is just required to be connected to a computer with the help of USB cable. Moreover we can start it through a ac to dc adapter or battery. “UNO” is derived from Italian word.

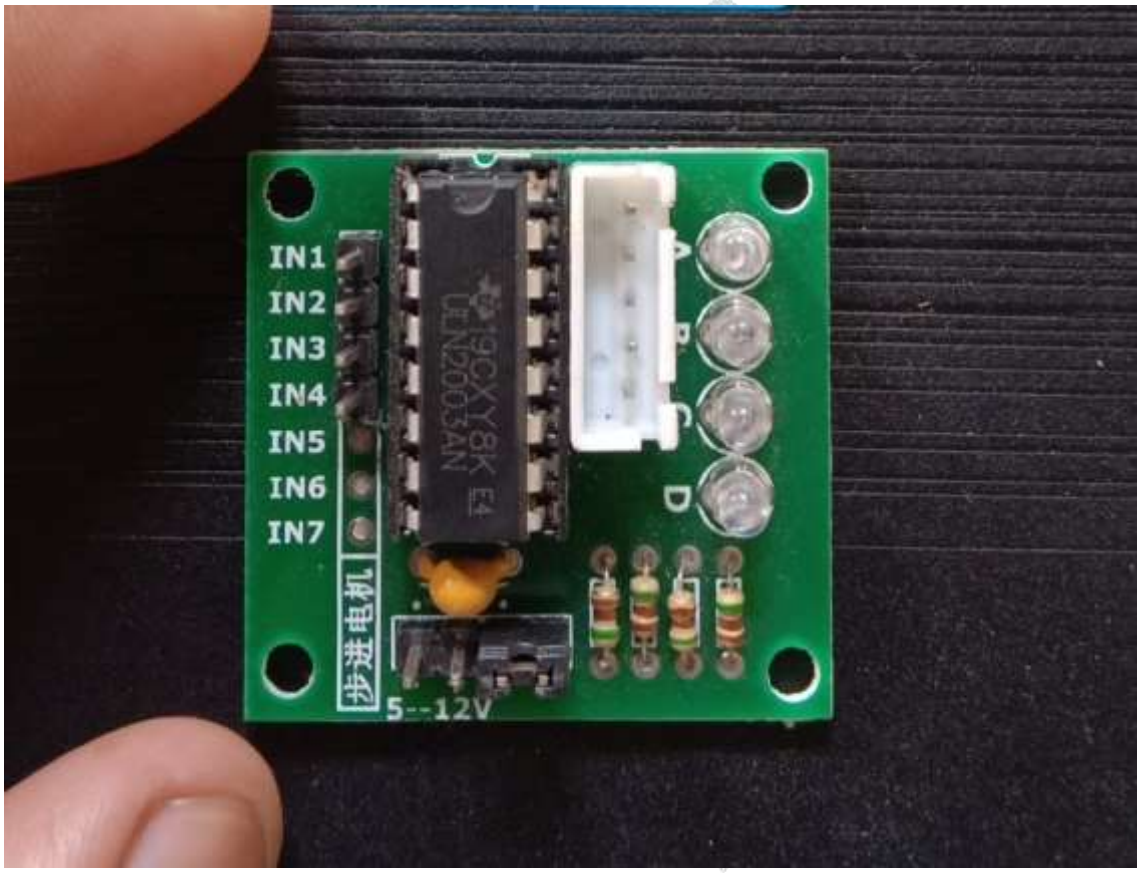
(i). ARDUINO

The arduino UNO has power pins, communication channels, programming part enabled in it for use and various utilizations. The power pins are Vin, 5v, 3.3v and ground. Vin is responsible for transmitting input voltage to the arduino board(5v supply) through USB cable, laptop or regulated power supply. It can supply regulated and desired voltage by using this particular pin. 5v is the controlled supply which can power the microcontroller and rest of he components present on the board. The device ATMEGA328P comprises of 32kb memory out of which 2kb is used up by SRAM and 1kb is utilised by EEPROM. The highly efficient Atmel 8-bit AVR RISC microcontroller has about 32kb of flash memory with various capabilities such as 22 general purpose working registers, read-while-write methodology, three flexible counters, internal interrupts, external interrupts, USART (serial compilation), SPI serial connection, serial interface, A/D converter (6-channels in QFN or MLF packets), programmable counter, software selectable oscillator, and is equipped with various power saving modes memory, input/output pins, this equipment can operate between 2.0-6.5v of power supply

(ii). ULN2003A DRIVE CIRCUIT

The ULN2003A is a quadruple high current half-H driver designed to provide bidirectional drive currents upto 1A at voltages from 4.5v to 36v. the device is designed to drive inductive loads such as relays, solenoids, dc motors, bipolar stepping motors, as well as other high-current/high-voltage loads in positive supply applications.

All inputs are compatible with TTL-and low-level CMOS logic. Each output(Y) is a complete totem-pole driver with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabling in pairs with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs become active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in a high-impedance state. With the proper data inputs, each pair of drivers from a full-H reversible drive suitable for motor applications. Here we are using for stepper motor.



(iii).STEPPER MOTOR

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical moments. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.

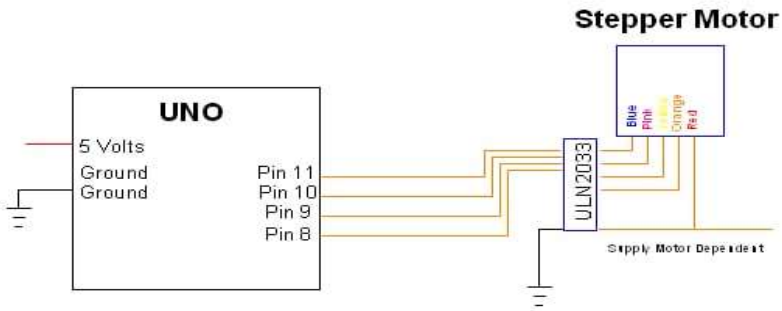
A stepper can be a good choice whenever controlled moment is required. They can be used to advantage in applications where you need to control rotation angle, speed, position and synchronism. Because of the inherent advantages, stepper motor has found their place in many different applications. Some of these include printers, plotters, hard disk drives, fax machines, medical equipment, automotive and many more.

(iv). CODE EXPLANATION

```
▶ //includes the Arduino stepper Library

  # include< cheapstepper.h>

    const int stepsPerRevolution = 2048;

// Creates an instance of stepper class

 // Pins entered in sequence IN1-IN2-IN3-IN4 for proper step sequence Stepper myStepper = Stepper(stepsPerRevolution, 8, 9, 10, 11);

    ▶ void setup() { // Nothing to do (Stepper Library sets pins as outputs) }

    ▶ void loop() { // Rotate CW slowly

  myStepper.setSpeed(15);

 myStepper.step(stepsPerRevolution);

    delay(1000);

// Rotate CCW quickly

   myStepper.setSpeed(15);

myStepper.step(-stepsPerRevolution);

delay(1000); }
```

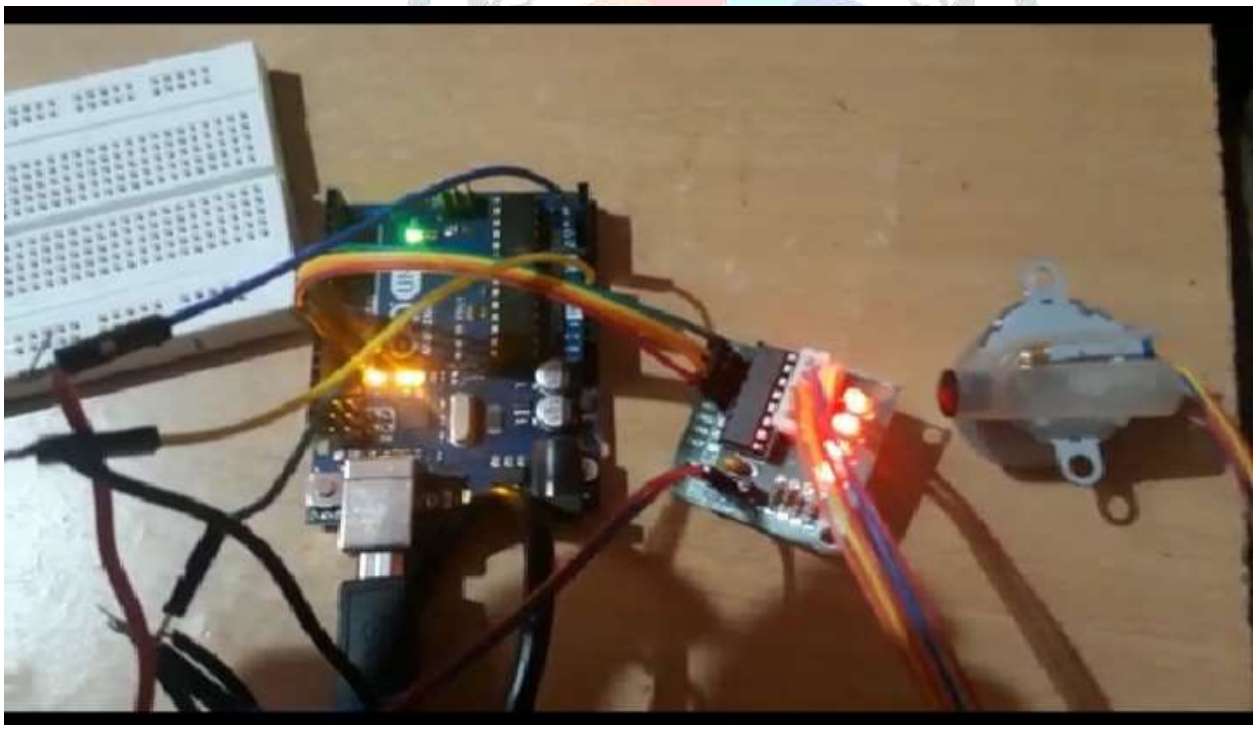
3. IMPLEMENTATION

The arduino uno board is connected USB cable through stepper motor and stepper motor driver. Arduino uno board is a hardware. this is used to control the all process. this is very simple programming language and simple haedware.USB cable is used to communication of arduino uno board and stepper motor, stepper motor driver. 28BYJ-48 stepper motor driver is used in this concept.



4. CONCLUSION AND RESULT

We demonstrate and integrated system which consists of electrical, electronics, programming (encryption and coding). Arduino compiler was used to operate and control the switching actions of dc motor and also stepper motor.The speed of dc motor and stepper motor varies from maximum to minimum and also the direction of dc motor is changed.



5. FUTURE SCOPE

This project can be used as a proto type further development and growth and can provide impetus to the cutting edge technology. This device can be integrated with robotics, drones, cameras, house doors, lockers, smart systems and buildings. It lays emphasis on eliminating the need and use of multiple remotes for each individual object using with bluetooth or wireless communication. Using pulse width modulation output of an arduino microcontroller controls the speed of dc motor that simulates a treadmill machine

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