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Controlling of Motors Using Arduino

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ABSTRACT

The main aim of this project is to control the motion of dc motor and speed control of stepper motor with an arduino board. This is a new technology to control direction of dc motor 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 dc motor through an arduino board by dumping corresponding program. The proposed systems uses an arduino board and an rectified power supply.

KEYWORDS: *Arduino Uno, 2N2222 Transistors, Resistors, Diodes, DC Motor, Stepper motor, Push button, Potentiometer, ULN2003AH-Bridge.*

I. INTRODUCTION

Our is the era of confluence of multiple engineering disciplines and is marked by integration of seemingly disparate technologies. Following this paradigm, in this work, push button and potentiometer to provide visual control of speed of DC motor. It is designed to improve the control and management of electrical machines through Bluetooth and secured wireless technology.

Speaking hardware wise, it is embedded system project comprising of a Arduino Uno, 2N2222 Transistors, Resistors, Diodes, DC Motor, Stepper motor, Push button, Potentiometer, ULN2003A H-Bridge, connecting probes. All this devices are integrated on a PCB. Microcontroller is a programmed with algorithm and can perform speed control of DC Motor and Stepper Motor. The speed and its rotating action can be regulate and monitored through potentiometer and push button. Here, we can provide electricity through main power supply as well as attached arduino through battery. The speed of the DC Motor can be controlled by using an ATMEGA328P-PU microcontroller. The voltage which is applied across its terminals is directly proportional to the speed of the motors. Hence, we can say that if the speed of the motor varies, the voltage varies and vice versa. It is designed in such a way that it can be integrated with robotics, drones, smart buildings etc. using Bluetooth and wireless technology and it is also a user friendly product in itself.

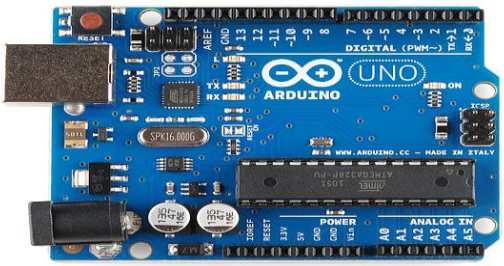
II. HARDWARE COMPONENTS

The various hardware components used in this project are arduino Uno(ATMEGA328P), resistors, diodes, transistors, push button, voltage regulators, printed circuit board(PCB), DC motor, ULN2003A H-BridgeStepper motor, battery(9v), adapter(12v), personal computer.

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, named after the year of manufacture of the board. The UNO is a recent invention in a list of arduino boards being manufactured. There of more similarities between the two so that an arduino UNO can be easily used in the place of arduino duemilanova. Other than that they aren't many notable differences.

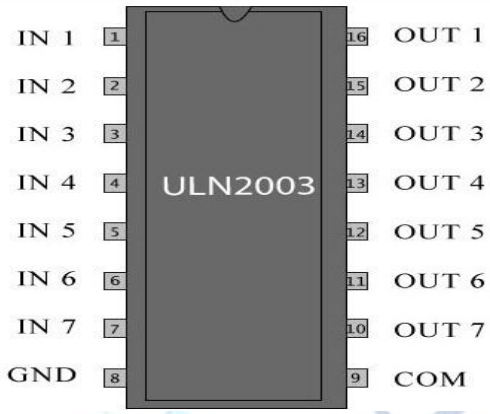
(*i*).ARDUINO:

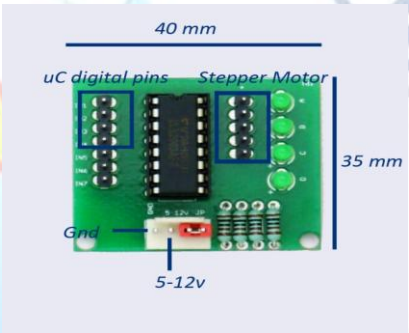
The arduino UNO has power pins, communication channels, programming part enabled in it for use and various utilisations. The power pins are Vin, 5v, 3.3v and ground. Vin is responsible for transmitting input voltage to the arduino board(5v supply) through USB cable, laptop or regulated power supply. 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.



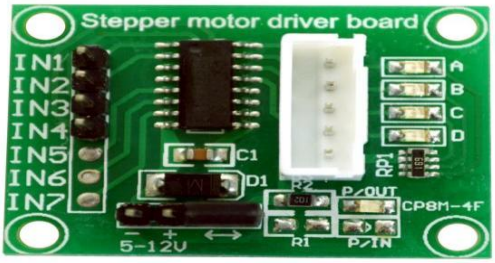
(*ii*).HALF H-DRIVER(ULN2003A):

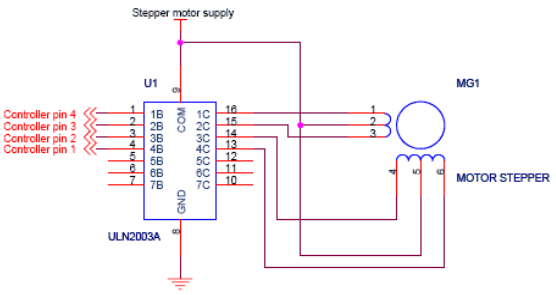
The ULN2003A is a quadruple high current half-H driver designed to provide bidirectional drive currents upto 1A at voltages from 4.5v to 36v. the device is designed to drive inductive loads such as relays, solenoids, dc motors, bipolar stepping motors, as well as other high-current/high-voltage loads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





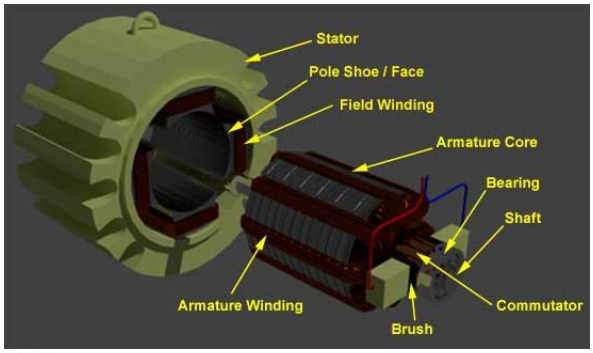
All inputs are compatible with TTL-and low-level CMOS logic. Each output(Y) is a complete totem-pole driver with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabling in pairs with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input 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*).DC MOTOR:

A DC motor is based on a fact that similar poles (magnetic poles) repel and dissimilar poles attract each other. An electromagnet field is generated in a coil of wire in a current passes through it and is focused at the centre of the coil. When the current changes its direction or intensity or switching action on and off in the coil, the magnetic field can be changed be reversed by 180 degrees are can simply generate switching magnetic field. In a dc motor a stator has a stationary magnets and armature has windings wring around the insulated stacked around iron pole commonly known as stack teeth with ends finishing at the commutator. Armature consists of bearings which are mounted at the middle of the motor and connections of commutator. The windings is winded around armature and is known as armature winding which uses conductor(single or parallel) wires which are wrapped around stack teeth. EMF's strength depends on several factors such as current in coil, size of the coil and material ringed around the coil. Direction of EMF depends upon number of turns and sequence of turns in a coil. By removing and injecting the coil inside and a great control over the dc motor can be establish by designing the dc motor in such a way that the magnetic fields generated by the stator fields using electromagnets. A dc motor has linear torque-speed relationship. Here, load and speed are inversely proportional to each other.



(*iv*).STEPPER MOTOR:

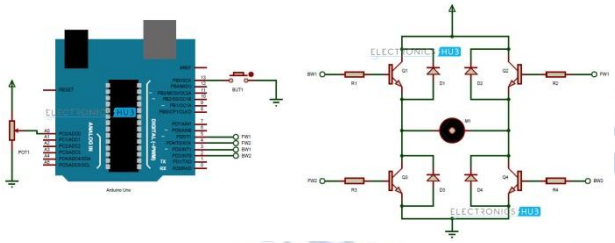
A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical moments. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct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

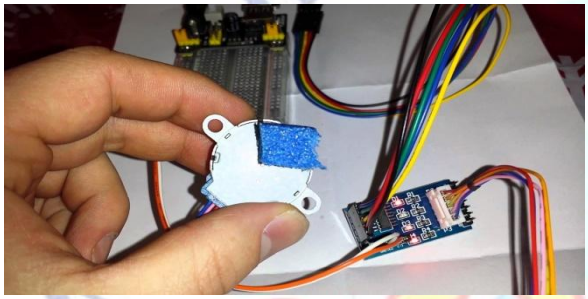
A stepper can be a good choice whenever controlled moment is required. They can be used to advantage in applications where you need to control rotation angle, speed, position and synchronism. Because of the inherent advantages, stepper motor has found their place in many different applications. Some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

III. IMPLIMENTATION

Arduino is the main processing unit of the project. The wiper terminal of the POT is connected to the Analog Pin (A0) of the Arduino. The other terminals are connected to Vcc and GND. Four transistors are connected as shown in the circuit diagram. With the load i.e. a dc motor in the centre, they form an H-bridge. Transistors Q1 and Q4 form the backward direction path while transistors Q2 and Q3 form forward rotation path. The inputs to the transistors are given from the Arduino. The pins 3 and 2 of the Arduino are connected to the base of Q1 and Q4 respectively. Pins 5 and 4 are connected

to base of Q2 and Q3 respectively. All the connections are made through four 1kΩ resistors.A DC motor is an inductive load and can produce back EMF when we are changing the direction. In order to eliminate the effect of any back EMF. Four diodes are connected across the collector and emitter of each transistor.





IV. 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.

V. FEATURE 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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