Lab 03 - Servo Motor / DC motor / Stepper Motor Tinker CAD Arduino

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Performance of Experiment	Journal Submission	Total Marks	Remarks	Instructor Sign

Aim: To interface simple actuators such as DC/ Servo / Stepper motor, relays etc. with Raspberry Pi/ ESP8266 boards / Beagle board/ TinkerCAD Arduino Uno.

Journal content- Theory and frequently asked questions and experiment

Objectives:
1. To understand actuators interfacing with development boards
2. Servo Motor / DC Motor or Stepper motor control Rapsberry pi3 / Arduino TinkerCAD

Theory: and FAQ to be written in Lab Journal
- Explain use of Various motors in IOT Applications.
- Compare Servo Motors, DC motors and Stepper motors
- Describe use of drivers such as LN298 for motors
- How to specify stepper motor while you purchase it?
- What are the various driver modules you may use to control motors?

Lab Sketch : Prepare labeled Lab sketch with TinkerCAD
Program Code
Conclusions

1. Explain use of Various motors in IOT Applications.

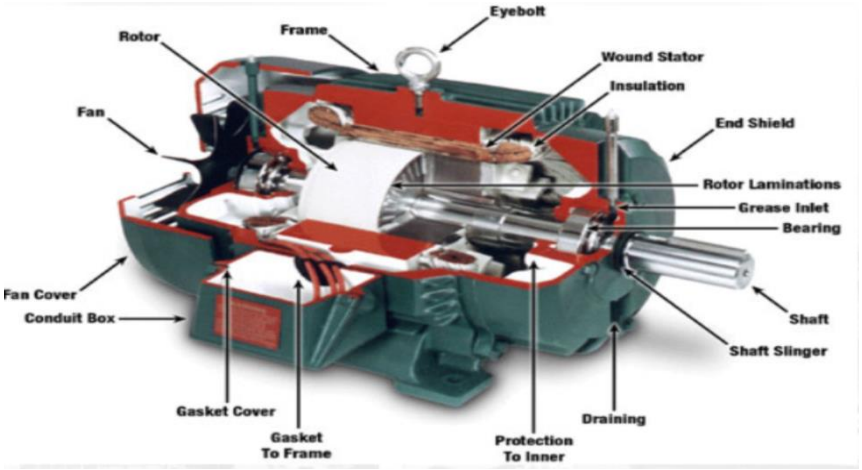
- The largest electric motors are used for ship propulsion, pipeline compression and pumped-**storage** applications with ratings reaching 100 megawatts. Electric motors are found in industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives.
- High performance BLDC **motors** can provide the levels of performance and economy that today's demanding **applications** require. This includes **applications** ranging from the appliances in a smart home, to self-propelled **IoT** devices, to industrial shop floors to 'down hole' in oil and gas drilling and extraction operations.
- The **stepper motor** is used for precise positioning with a **motor**, such as hard disk drives, robotics, antennas, telescopes, and some toys. **Stepper motors** cannot run at high speeds, but have a high holding torque.
- Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for **steel** rolling mills.

2. Compare Servo Motors, DC motors and Stepper motors

Selecting the right motor for different applications depends on some design criteria such as positional accuracy requirements, cost, availability of drive power, torque and acceleration requirements. Overall, the motors like DC, servo, and stepper motors are best for different applications.

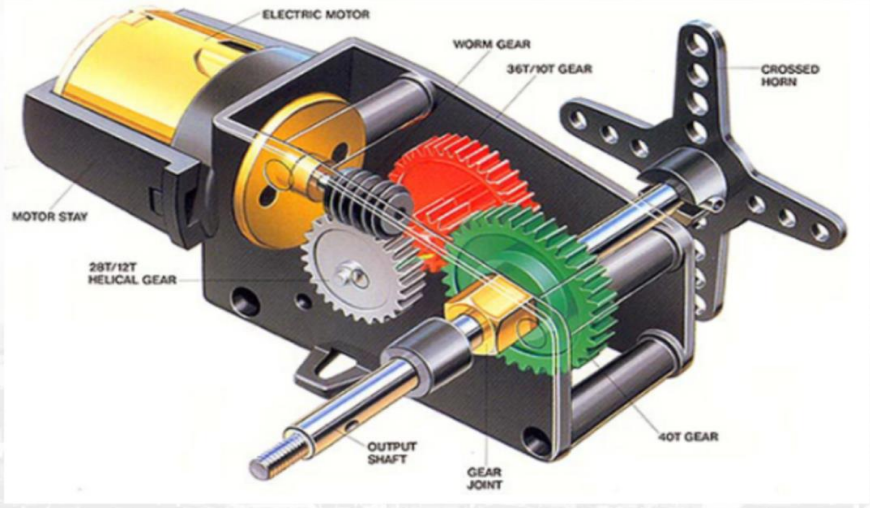
DC Motors:

1. DC Motor is a two wire continuous rotation motor and the two wires are power and ground.
2. When the supply is applied, a DC motor will start rotating until that power is detached.
3. Most of the DC motors run at high revolutions per minute (RPM)
4. Examples are, fans being used in computers for cooling or car wheels controlled by radio.
5. The DC motor speed can be controlled by using PWM.



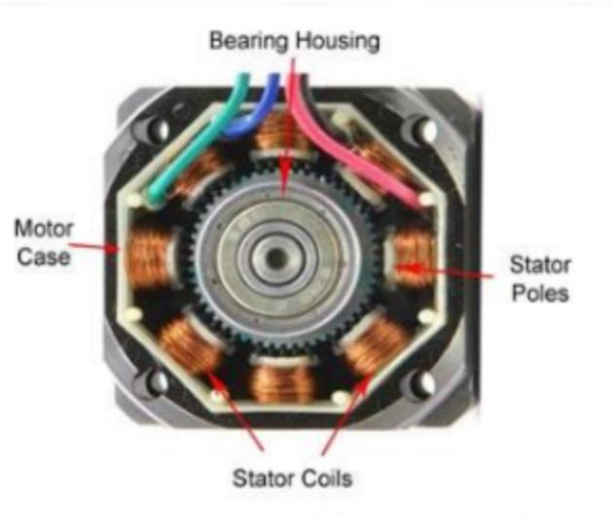
Servo Motors:

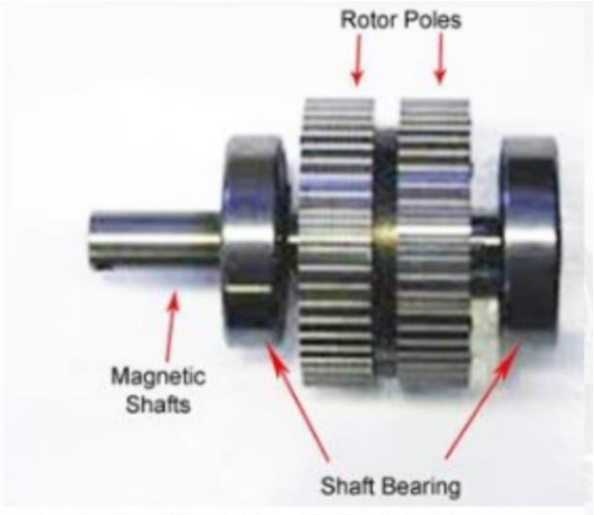
1. The servo motor is an association of four things, namely a DC motor, a control circuit, a gearing set, and also a potentiometer usually a position sensor.
2. They have three wires like power, GND, and control
3. These motors are designed for more exact tasks where a motor position needs to be clear precisely like moving a robotic arm or controlling the rudder on a boat or robot leg within a particular range.
4. PWM (pulse width modulation) is used to control the signal of a servo motor.



Stepper Motors:

1. A stepper motor is fundamentally a servo motor that uses a different method of motorization.
2. It utilizes multiple notched electromagnets arranged around a central equipment to describe the position.
3. Stepper motor needs an exterior control circuit to separately energize each electromagnet and make the motor shaft ON
4. Stepper motor is well suited for high holding torque and lower acceleration applications.

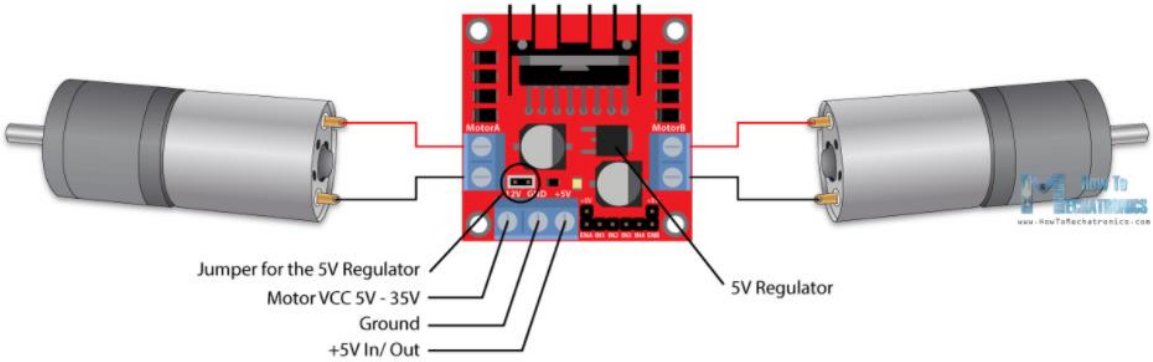




3. Describe use of drivers such as LN298 for motors.

The **L298N** is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A.

Let's take a closer look at the pinout of L298N module and explain how it works. The module has two screw terminal blocks for the motor A and B, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output.



4. How to specify stepper motor while you purchase it?

First, define the motion profile. This includes such parameters as required positioning time and acceleration/deceleration time. Related factors include the required positioning increments as well as the application's necessary accuracy and resolution.

Second, calculate the speed, load inertia, acceleration torque, and load torque requirements with a safety factor. The acceleration torque calculation sometimes tends to be omitted. However, it is a critical factor to consider.

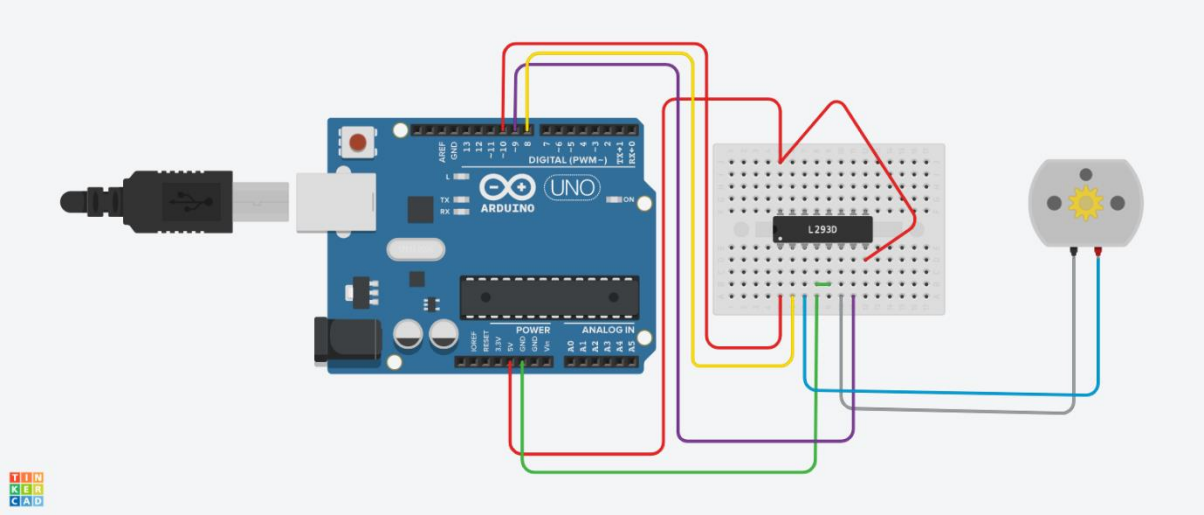
Third, select a motor based on the torque and speed requirements by referring to the motor's torque-speed curve. Unlike other motors, stepper motors are not rated in wattage. Motor windings can have different current ratings even with the same dimensional size, and the output torque and power varies depending on the winding and speed.

5. What are the various driver modules you may use to control motors?

- The L298N motor controller
- The L293D motor controller

6. Prepare labeled Lab sketch with TinkerCAD

DC MOTOR:-

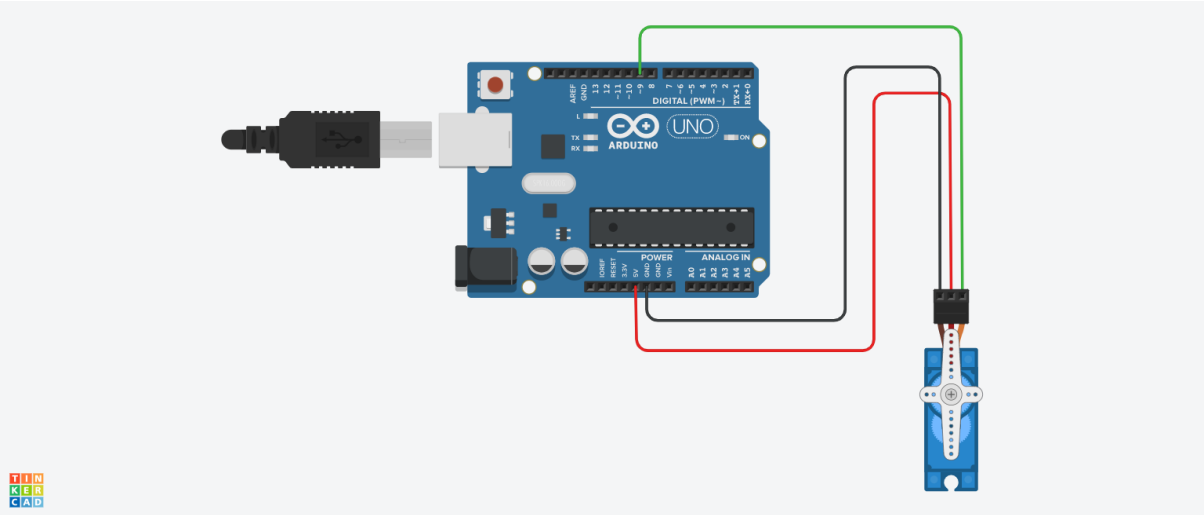


DC MOTOR CODE WRITTEN BY :- PD 33 Divyang Bagla

```
void setup()
{
  pinMode(8,OUTPUT);
  pinMode(9,OUTPUT);      // pins 11 and 9 are used for output.
  pinMode(10,OUTPUT);
  digitalWrite(10,HIGH);   // enable the IC L293D only once.
}

void loop()
{
  digitalWrite(8, HIGH);
  digitalWrite(9, LOW);
  delay(3000); // Wait for 3000 millisecond(s)
  digitalWrite(9,LOW);
  digitalWrite(9,LOW);
  delay(3000);  // wait for 3000 millisecond(s)
}
```

SERVO MOTOR :-



SERVO MOTOR CODE WRITTEN BY :- PD 33 Divyang Bagla

```
#include<Servo.h>

int ang = 0;

Servo servo_9;

void setup(){
  servo_9.attach(9);
}

void loop(){
  for(ang = 0;ang <= 360 ;ang +=2){
    servo_9.write(ang);
    delay(10);
  }
    for(ang = 360;ang >=0  ;ang -= 2){
    servo_9.write(ang);
            delay(10);
  }
}
```

CONCLUSION :-

Learned about different motors and their applications in IOT.