# EW PROJECT

Project-Two Wheel Balanced Bot
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Group Number-21
Project Number-16

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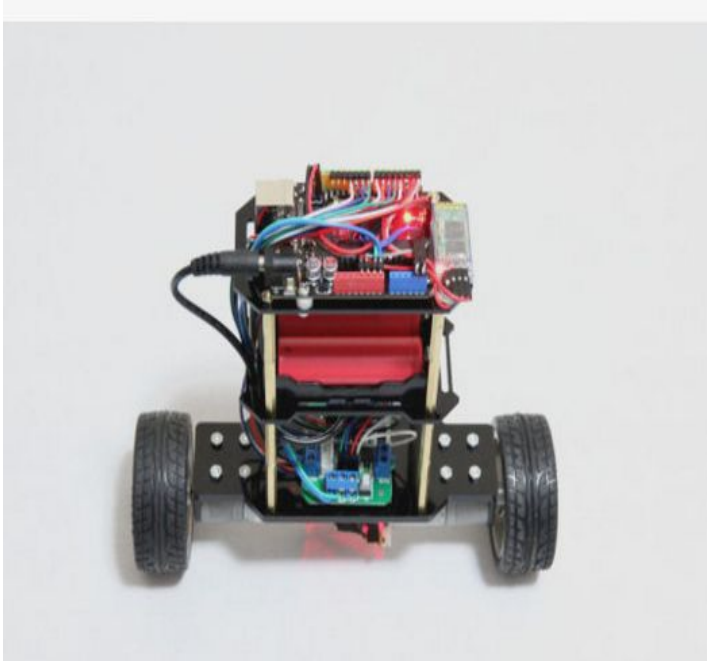
# Project description

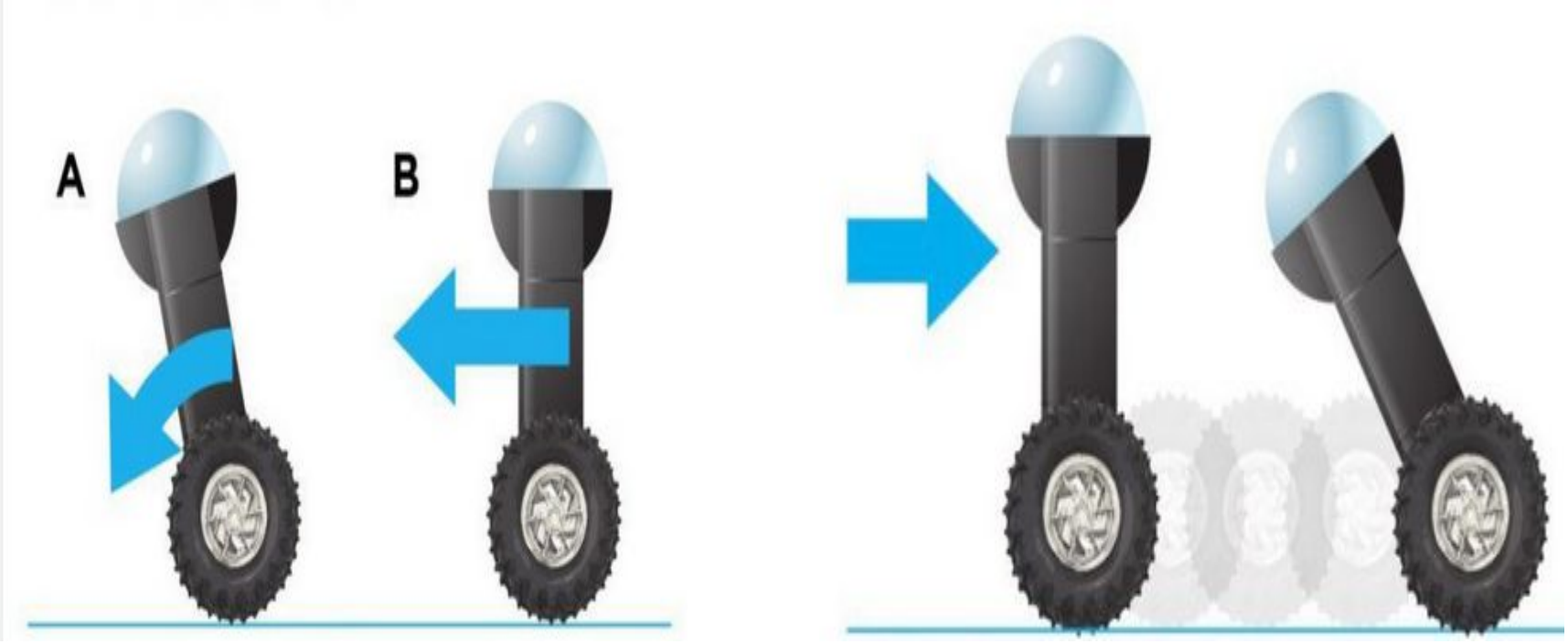
A two wheel balancing robot should be constructed without toppling through motion of wheels in the direction of the tilt.



# Introduction

- Uses the concept of inverted pendulum.
- Robot will have a wooden plank above the wheels.
- When plank tilts in the direction, the wheels move in the same direction to counteract the fall of plank and makes it upright.
- During the tilt the plank experiences a pseudo force which gives a torque in the direction opposite to the tilt.
- Sensors(gyroscope) will be used to detect the tilt angle.
- PID controller will be used to stabilize the outputs.

# Introduction



# Applications

Segway/Hoverboard

- Two wheeled,self-balancing vehicle
- Designed to mirror walking

# Applications

Rocket propeller

- Works on the principle of inverted pendulum.
- For maintaining center of mass position constant during takeoff and landing it uses the concept of inverted pendulum.

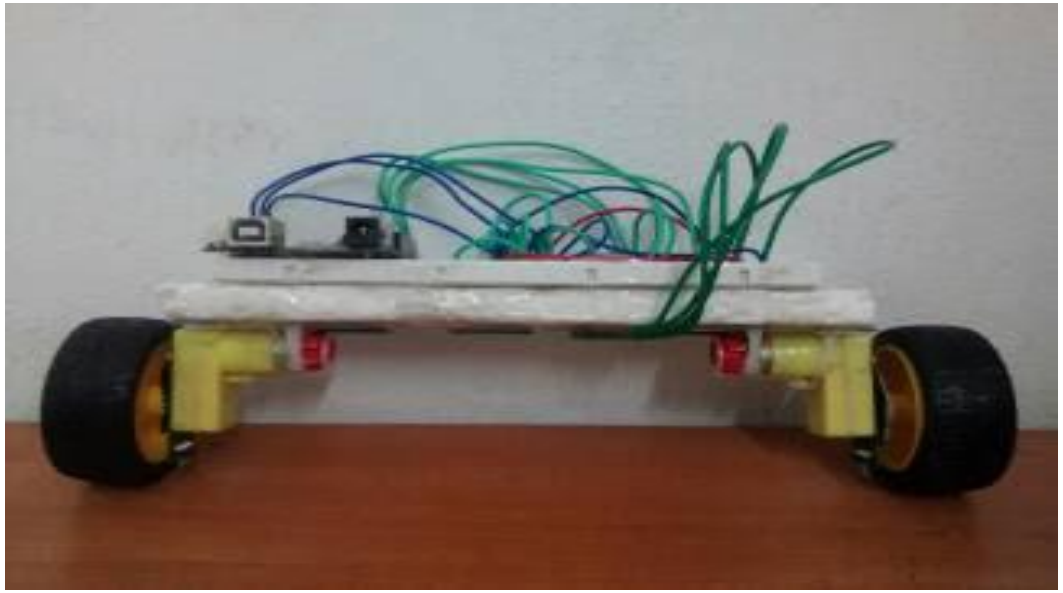
# Goals in parts

- A bot need to be constructed
- Controlling sensor for tilt
- Integrating sensors and motors.
- Controlling rotation speed of motors.
- Stabilizing the movement.
- Handling mechanical problems of robot.

# Components

- Wheels
- L-shaped motors
- Plank for support
- MPU6050 sensor
- L293D chip
- Arduino
- PID

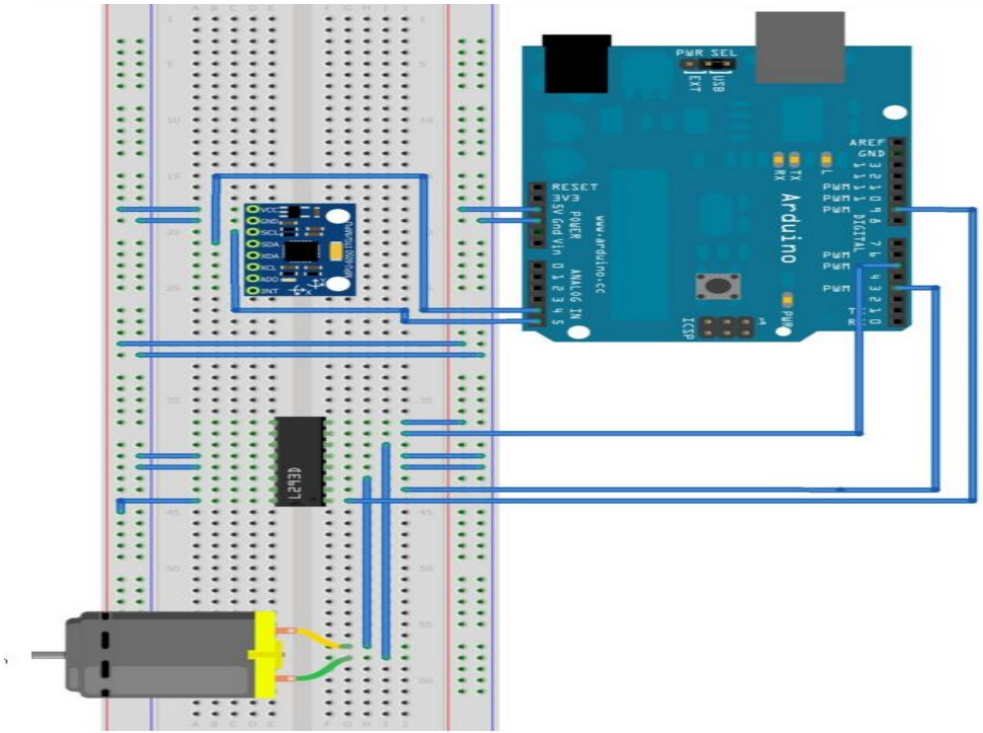
# Bot



# MPU6050 Sensor

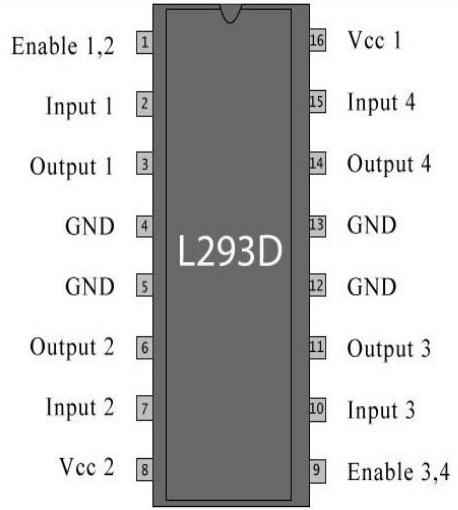
- MPU6050 sensor is used for calculating the tilt values.
- It contains both accelerometer and gyroscope and captures x,y,z channels at the same time.
- It uses I2c bus to interface with arduino.
- The SDL and SCA pins will be connected to I2c bus and it always acts as slave to the arduino.
- Gyroscope measures the angle of tilt and accelerometer measures the acceleration.
- Based on these tilt values motor rotation will be decided.

# Controlling motor through sensor



# L293D

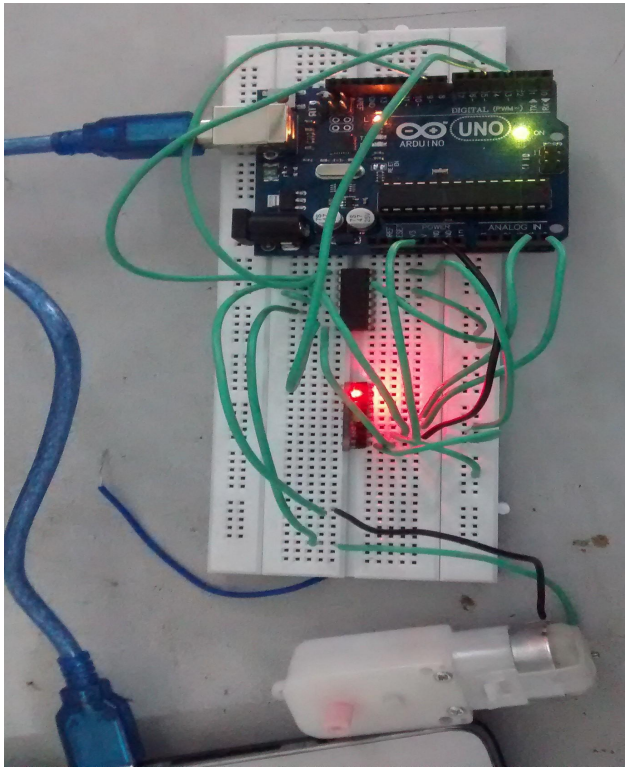
- It is motor driver which is used to drive motors in desired direction.



# Controlling motor through sensor

Components used for this are:

- MPU6050
- Arduino
- Motor
- L293d(motor driver)



# Controlling motor through sensor

- In the above circuit,the direction of rotation of motor will be decided by the tilt value of the sensor,both motor and sensor direction should be same according to the principle.
- This can be used for controlling the motor whether to move front or back for balancing the bot

# PID

- It includes proportional integral and differential values for stability
- In proportional state output will be directly proportional to the error, we multiply with some gain to the error to get the output.
- $K_P$,$K_D$,$K_I$ are coefficients of proportional,integral and differential

terms respectively.

# Complications faced till now

- Fixing plank on the desired motors.
- Maintaining weight on plank.

# Things need to be done

- Placing kalman filter to get filtered values from MPU so that it reduces the reaction time while balancing.
- Mechanical part of bot.

# Motivation

- The idea of two wheel balancing robot comes under the application of inverted pendulum which is used in control systems.
- And this inverted pendulum was a problem for engineers as it is a part of central design in seismometers.

# Block diagram