Progress Presentation-I

e-Yantra Summer Internship-2015

PC CONTROLLED TWO WHEEL BALANCE BOT

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Overview of Project

- **Project Name** :PC controlled two wheel balanced bot
- **Objective** : To make a two wheel balance bot which can balance itself without any extra support.
- **Deliverables**:
  1. Two wheel balance bot
  2. PC controlled motion
  3. Documentation and tutorials
  4. Sample code

Image

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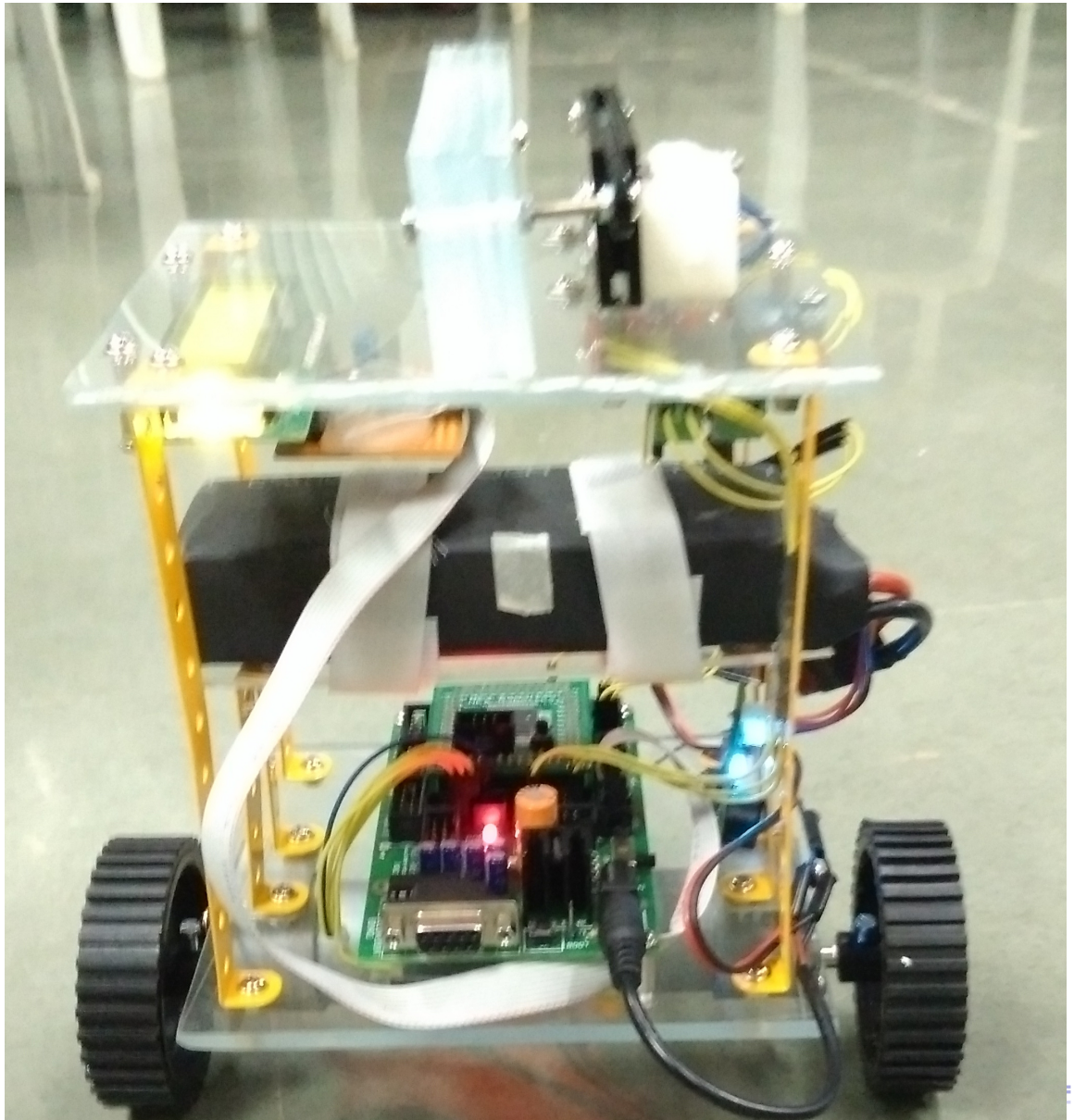

Overview of Task

Task No.	Task	Deadline
1	Selection of components, sensors and actuators	week 1
2	Design and fabrication of bot	week 1
3	Designing of circuit,power management and interfacing	week 1
4	Algorithm and code implementation for balancing	week 2,3
5	Algorithm and code implementation for locomotion via PC communication	week 4,5
6	Analysis and documentation	week 6

Task Accomplised

TASK1:Selection of components,sensors and actuators

1. ATmega 2560 Development board
2. DC Motor(300 RPM)
3. Linear Actuator(150 RPM)
4. L293D and L298N Motor driver
5. 16x2 LCD Display
6. GY-80(Accelerometer and Gyroscope module)
7. 3 cell Li Po battery 11.1 Volts
8. Xbee module and adapter

Task Accomplished

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TASK2:Design and fabrication of bot

1. Fabricating materials
2. Weight Shifting mechanism
3. Center of gravity
4. Protection from falling

Task Accomplished

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TASK3:Circuit design,power management and interfacing

1. L293D and L298N Interfacing
2. LCD(16x2)
3. GY-80(ADXL345 and AGD8) Interfacing
4. Protection circuit for battery

L293D Interfacing

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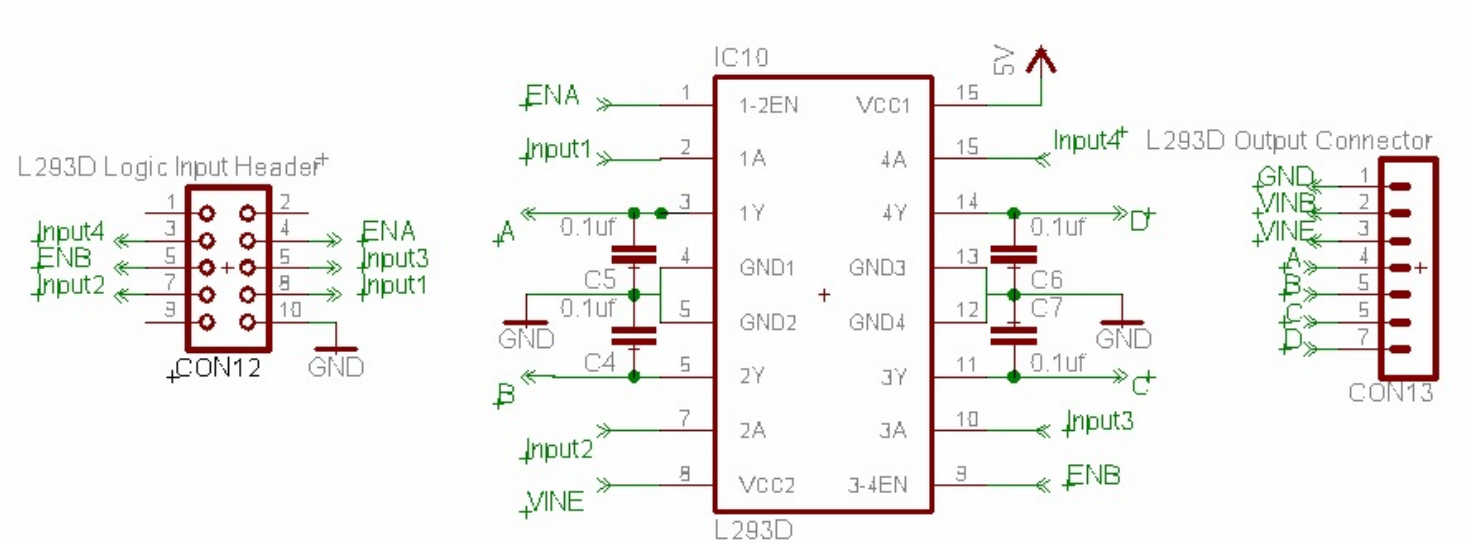

L298N Interfacing

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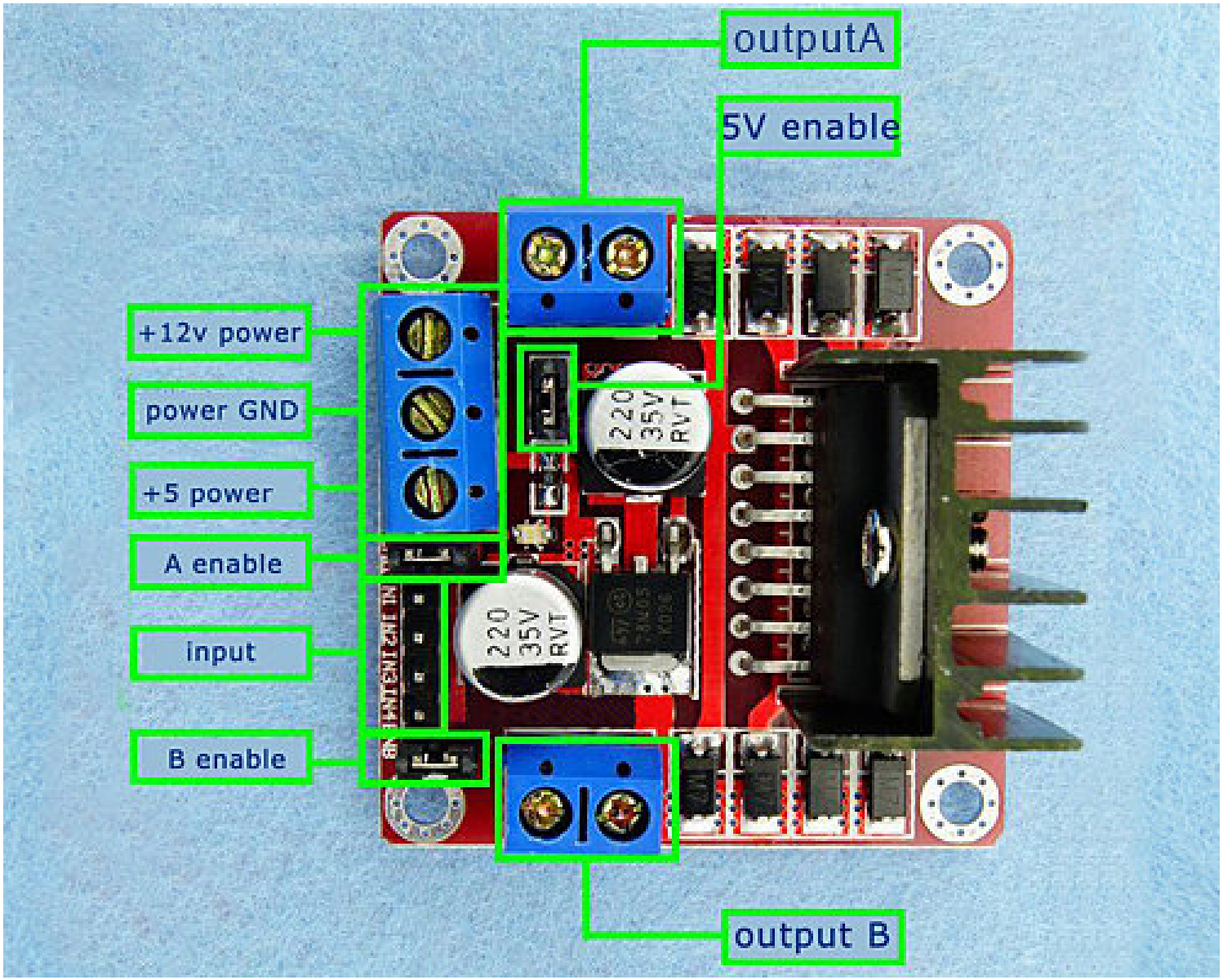

LCD Interfacing

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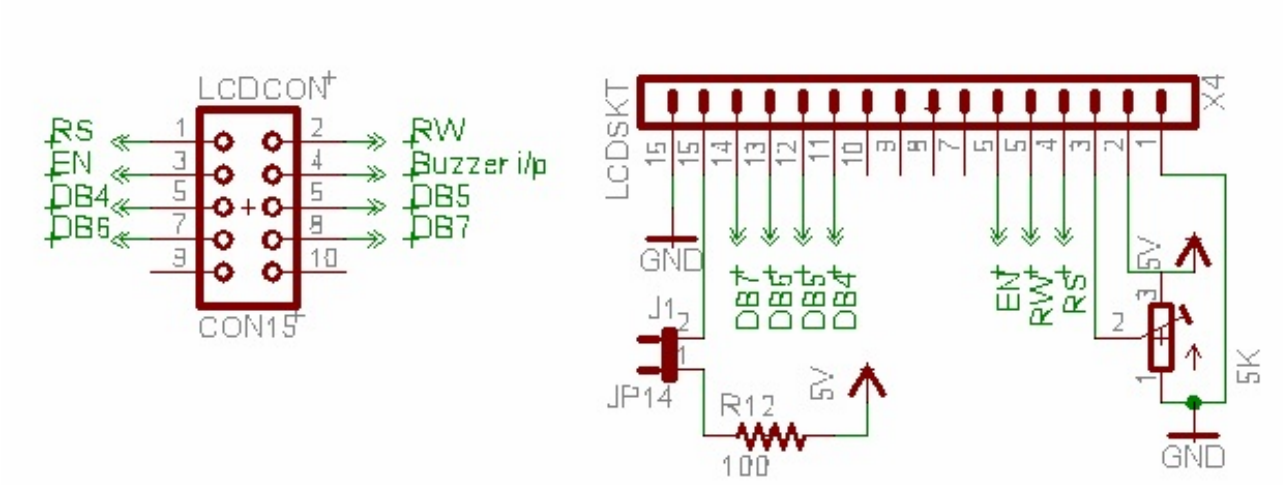

Schematic of LCD interfacing

GY-80 Module Interfacing

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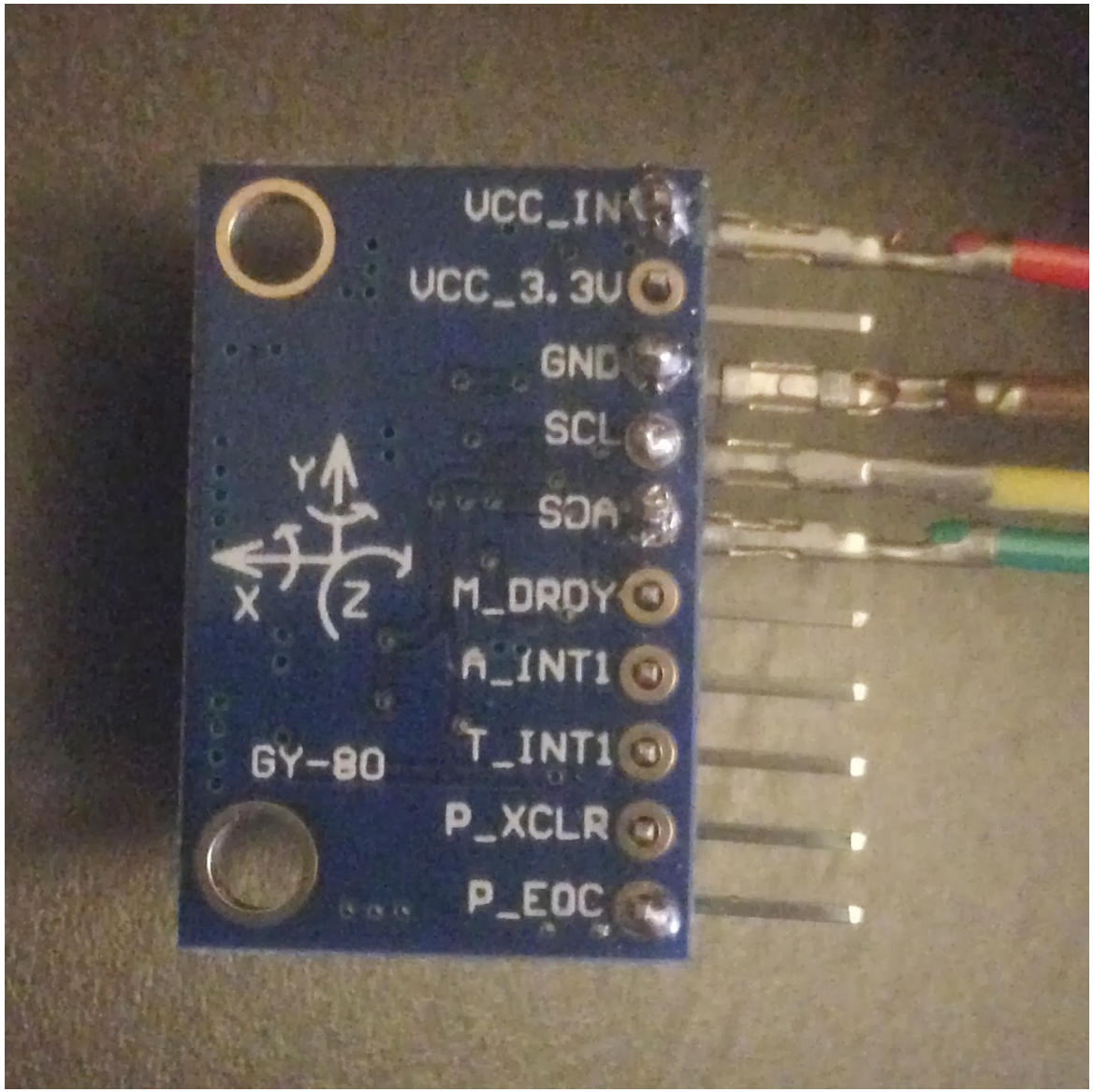

Task Accomplished

TASK4:Algorithm and code implementation

1. I2C protocol for accelerometer and gyroscope
2. PWM(10bit Fast PWM or Phase Correct PWM) for controlling velocity of motors
3. Timers for PWM and PID calculations
4. PID Algorithm for balancing the bot

I2C Protocol

- It is a synchronous data transfer protocol and uses master/slave technique.
- Maste initiates the communication .
- Slave works according to the master.
- Multiple devices can connect at the same time,each having a unique 7-bit address.
- Two bidirectional lines used for communication are:SCL(Serial clock) and SDA(Serial Data)

I2C software protocol

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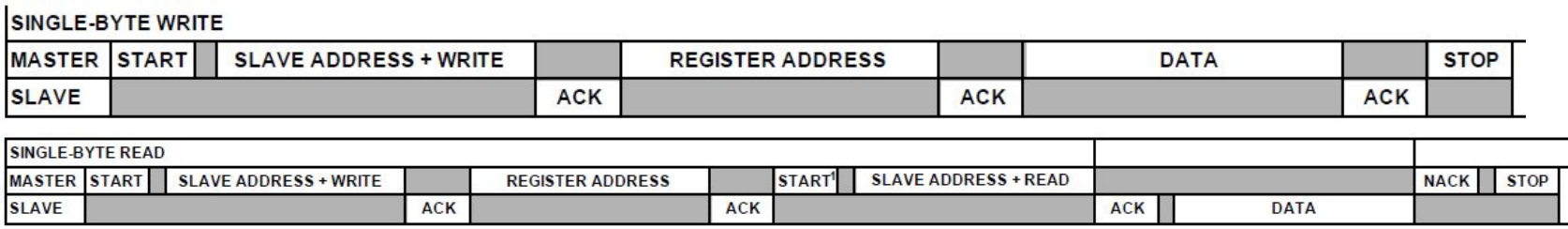

PID algorithm for the bot

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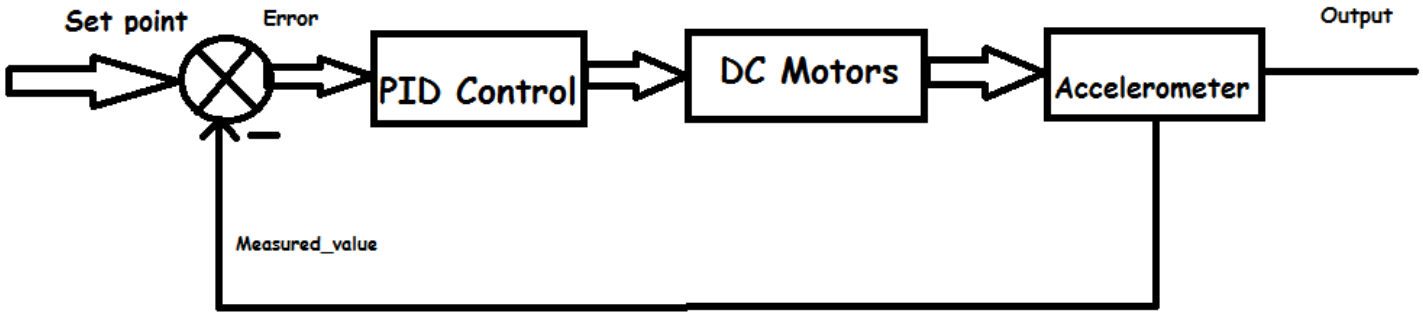

PID equation:

$$\text{Output} = K_p * \text{error} + K_i * \int \text{error} + K_d * \frac{d}{dt}(\text{error});$$

Challenges Faced

- Maintaining Center Of Gravity(COG) while fabricating the bot
- Understanding and Implementing I2C protocol
- Converting accelerometer values to angles in degrees
- Erroneous reading from accelerometer
- Generating time function using 16 bit timer
- PID tuning

Future Plans

- PID implementation for balancing and moving the bot
- Integrating gyroscope values using Complementary filter
- Xbee interfacing

Thank You

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THANK YOU !!!