Pick & Placer Balance Robot

Guide
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Group members
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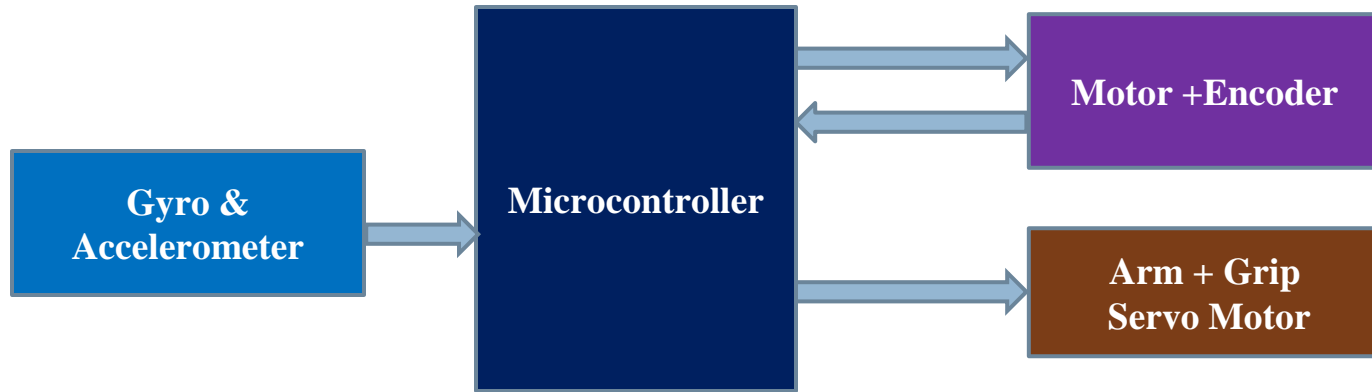- Dhananjay K Sharma(173050046)

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Problem Statement

❑ To design two wheel self balancing robot with pick and place capability

 ▪ Robot must maintain balance and stand upright during movement or lifting object by robotic arm

 ▪ Design complete control system to provide stability
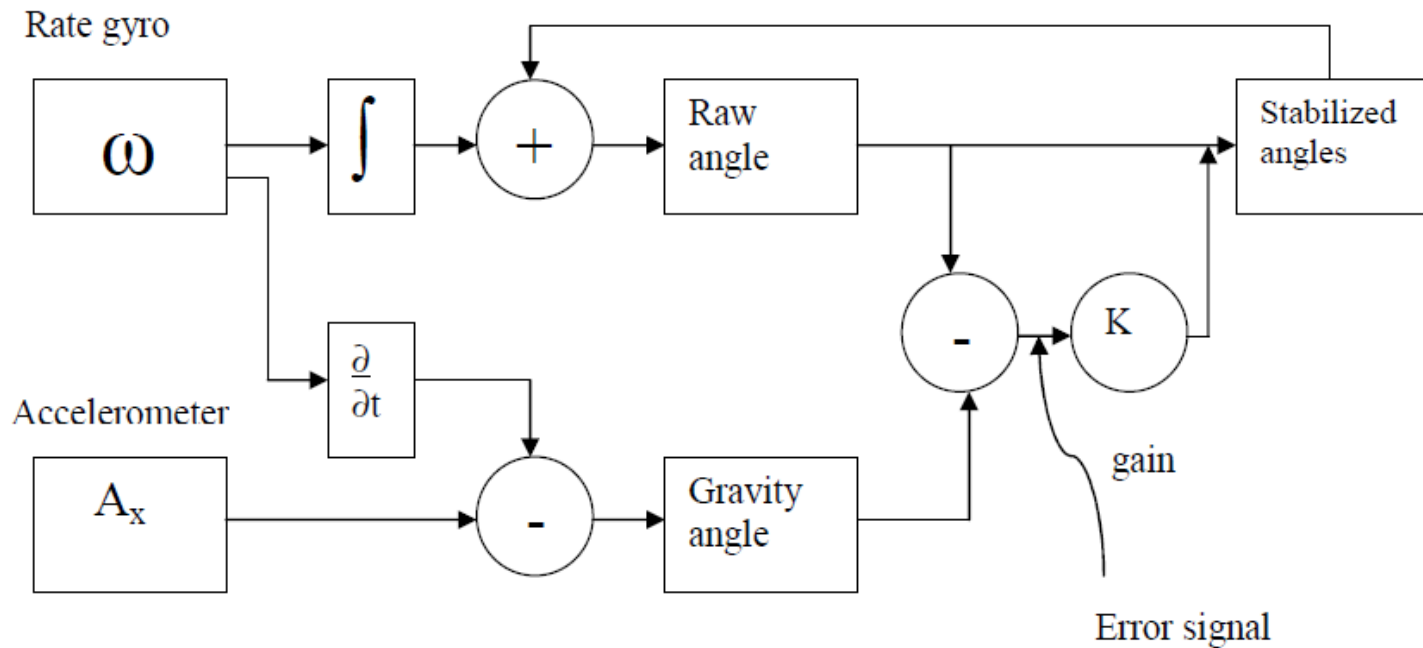
Challenges

- Determination of Electrical & Kinematics parameters

- Sensor noise suppression

- PID implementation and tuning

- Control algorithm development and implementation

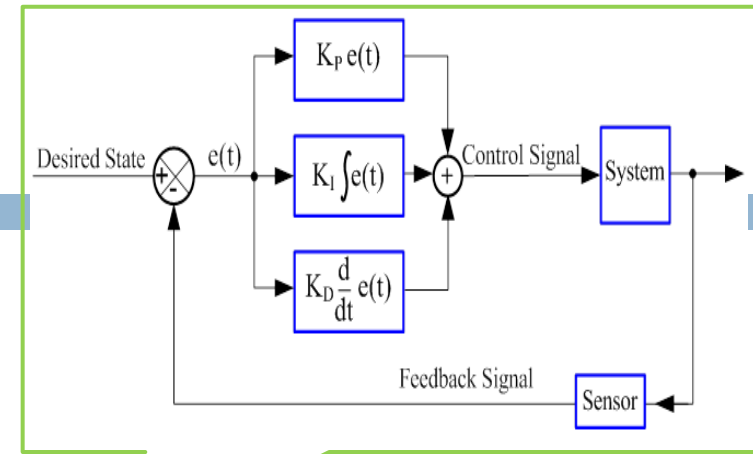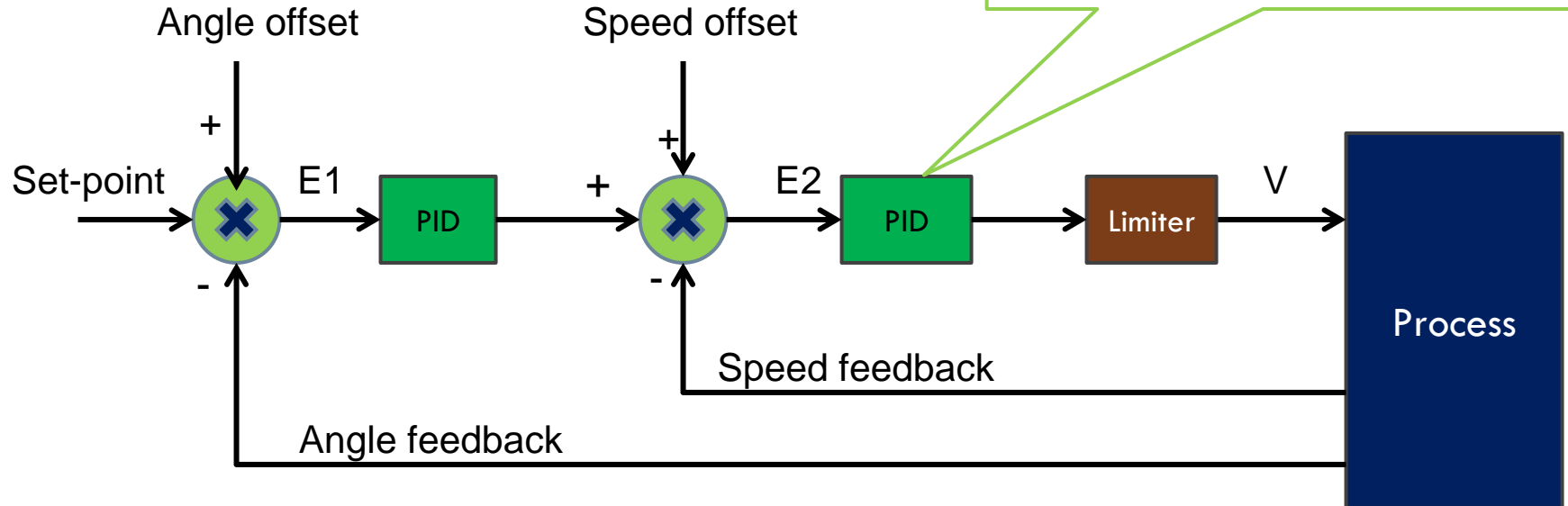- Balancing with robotic Arm movement

Hardware Block Diagram

```
                    ┌──────────────────┐        ┌──────────────────┐
                    │                  │  ───▶  │                  │
                    │                  │  ◀───  │  Motor +Encoder  │
┌─────────────┐     │                  │        └──────────────────┘
│  Gyro &     │ ──▶ │ Microcontroller  │
│Accelerometer│     │                  │        ┌──────────────────┐
└─────────────┘     │                  │  ───▶  │    Arm + Grip    │
                    │                  │        │   Servo Motor    │
                    └──────────────────┘        └──────────────────┘
```

Angle Determination

PID Block diagram

Software Processes

Process-1

- Read Sensors (Gyro+Acc)
- Complementary filter
- Angle Calculation

Process-2

- Read encoder
- Moving average filter
- Find Speed and direction

Process-3

- Calculate set-point
- Compute PID
- Drive motor

Process-4

- Read cmd via Xbee
- Operate Arm and Gripper

Deliverables

- Self balanced robot with Arm.

- Source code

- Documentation

Future Scope

- Additional PID loops are required for real-time set point adjustment during ARM operation
- Proper fixtures required to mount Arm assembly to avoid undesired vibration & instability.
- Development of android application for robot operation via cell phone.
- Arm should be of min. 4 DOF with object detection for proper pick and place.

Commited Timeline

PHASE-1	(Duration- 1 week)	By: 22-03-2018	Remarks
▪ Literature survey			√
▪ Sensor & Actuator Interface study and integration			√
PHASE-2 (Duration- 1 week) By:29-03-2018			
▪ Development of control algorithm			√
▪ Implementation and testing of simple balancing robot without Arm.			√
PHASE-3 (Duration- 2 week) By:12-04-2018			
▪ Study, analyze and test for alternate solutions to get optimum performance.			√
▪ Implementation, testing and fine tuning of balancing robot with Arm.			√

Final demonstration: 19-04-2018(Proposed)