830 Project 2

* Look up sensor, cost, wiring and power requirements.
* Python controlled manual inputs with WSAD. = Framework between high level controller and low level controller
* Gitub Repo. – I will use. ino so I can be open up with other systems.

Product characteristics

* The robot must controllable
* The robot must have autonomous mode.
* The robot must be inexpensive.
* The robot must be precise turning.

Functions

* Locomotion
* localization for autonomous modes
* Error correction - closed loop feedback
* Start and stop toggles.

Variables to track to achieve these product characteristics and functions.

* Pose of the robot (position and orientation) – Displacement and angles from start origin
* Awareness of its surroundings (Map) – relatives distance from self to surrounding elements
* Effectiveness of actuation input (motion) - angular displacement

Sensors to monitor variables:

Pose

* IMU
  + GY-521 (MPU-6050)
  + LSM9DS1 - Adafruit 3387
  + GY-91 (MPU-9250 + BMP280)
  + BNO055 - Adafruit 2472

Map

* Ultrasonic + servo (Sonar System)
  + HC-SR04 + (SG90) |Eleego kit parts | Current: 15mA + 250mA
* 2D Lidar | provide my professor.

Actuation efficiency

* Encoder
  + KY-040 | 4$ | Current: 10-20mA
* Optical Flow Sensor
  + ThoneFlow‐3901U |UART | Power: 3.3~3.6V Current: 10mA | $ 10 -20
  + PIM453| 6mA typical current draw | SPI | $ 10 -20

IMU comparison

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Feature | GY-521 (MPU-6050) | LSM9DS1 - Adafruit 3387 | GY-91 (MPU-9250 + BMP280) | BNO055 - Adafruit 2472 |
| Sensors | Accelerometer, Gyroscope | Accelerometer, Gyroscope, Magnetometer | Accelerometer, Gyroscope, Magnetometer, Barometer | Accelerometer, Gyroscope, Magnetometer |
| Axis | 3-axis each for Accel/Gyro | 3-axis each for Accel/Gyro/Mag | 3-axis each for Accel/Gyro/Mag, 1-axis for Barometer | 3-axis each for Accel/Gyro/Mag |
| Communication | I2C | I2C/SPI | I2C/SPI | I2C/UART |
| Price | Around $5 | Around $15-$20 | Around $10-$15 | Around $20-$35 |
| Lead time | 3 days | 1 week | 1 week | NA |
| Community Support | Extensive | Good | Moderate | Good |
| Power Req.  Voltage 5V | Current: 3.8mA | Current: 6.4mA + 1mA for the magnetometer | Current: 3.2mA | Current: 12mA |
| Additional notes |  |  | Altitude (from barometer) | (built-in sensor fusion), data formatted output Quaternion |

Control options

* Joystick wired.
* Ps2 control wired or Bluetooth.
* Serial communication