Tutorial – Positioning (UAVPB)

In this tutorial, you will be working with 3 sensors. The sensors are accelerometer, gyroscope and compass.
Your tasks are to

1. Characterize the sensors.
2. Propose an application of your choice (optional).
3. Write a short (and clear) report explaining the experiment setup and results with supportive graphs and equations.

Characterization:

For all sensors:

1. Download the sensor datasheet.
2. Connect the sensor to the correct power supply.
3. Connect the sensors to an Arduino board using an I^2C connection.
4. Apply the correct setup to the sensor if necessary.
5. Read sensor values and save them on a computer. (Duration depends on your experiment)
6. Find the following characteristics of each sensor:
    a. Bias
    b. Drift
    c. Noise variance
7. For each sensor run a measurement experiment as following and find the measurement errors:
    a. Accelerometer: for each axis, move the sensor for exactly 1 meter and calculate the distance from the sensor measurement.
    b. Gyroscope: for each axis, rotate the sensor for exactly 180° and calculate the angle from the sensor measurement.
    c. Compass: for each axis, hold the compass towards the west and read the sensor value.
8. Does the measurement result change depending on the measurement axis?
9. For accelerometer and gyroscope, does the accuracy change if the speed of movement or rotation changes?

Application (optional):

1. Propose an application where you can use these sensors (any combination is acceptable. You can also add other sensors if needed).
2. Clearly define the inputs and outputs of the proposed system.
3. Clearly define the input-output relations (using mathematical equations is preferred)
4. Draw the system block diagram.