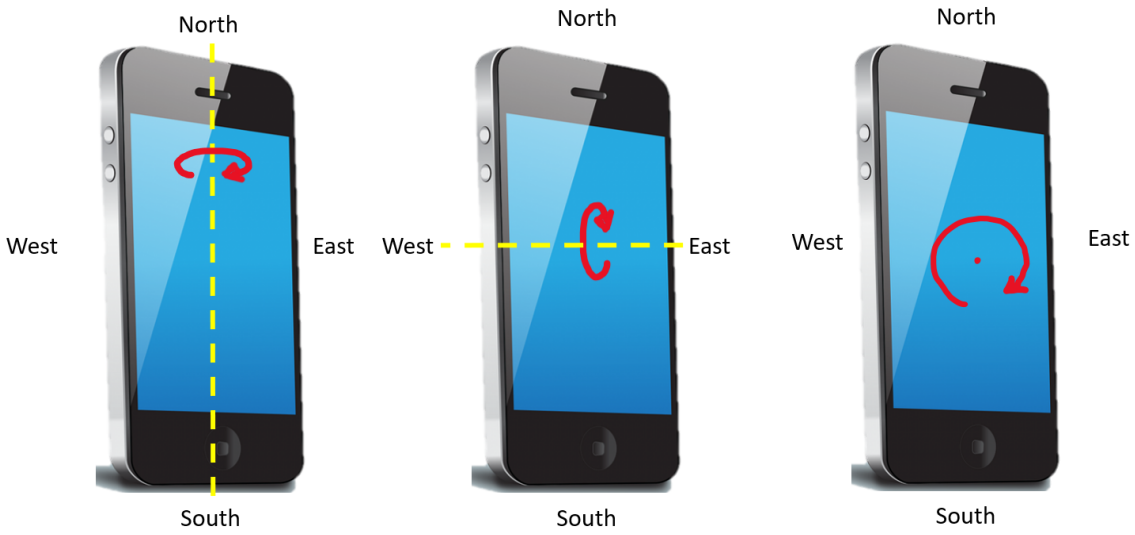
Writing Pressure and Magnetometer Data to the SD Card

Due Jun 23 by 11:59pm **Points** 0 **Submitting** a file upload **File Types** pdf

The objective of this assignment is to program the Raspberry Pi Pico to write pressure (altitude) and magnetometer data to an SD card. The format of the data on the SD card should match the format of the data collected using the Multi Record feature on the app "Physics Toolbox Sensor Suite", or **for I-Phone or I-Pad users, the MATLAB Mobile app.** In this assignment, you will need to tape or otherwise attach your flight controller to your cell phone to collect data. The data from your flight controller will need to match the data from the phone.



Writing Pressures and Geomagnetic Data to the SD Card

Connect your Raspberry Pi Pico, your 10 DOF IMU sensor, and your SD Card Module to your PCB (Printed Circuit Board). Program the Raspberry Pi Pico to create a .csv file and write pressure (altitude) and magnetomter data to the SD card. The .csv file should have the following headers:

time	gFx	gFy	gFz	wx	wy	wz	p	Bx	By	Bz	Azimuth	Pitch	Roll	Latitude	Longitude	Speed (m/s)

Build on the program from the previous assignments. Program the Raspberry Pi Pico to write the time to the .csv file under the "time" column in units of seconds. Program it to write the accelerometer data under the gFx, gFy, and gFz columns in units of g-force. Write the gyrometer data under the wx, wy, and wz columns in units of rad/s. Write the pressure under the p column in units of mbar (hPa). Write the geomagnetic components under the Bx, By, and Bz columns in units of microteslas. Write zeros under all the other columns. For example, the .csv file should look something like this:

time	gFx	gFy	gFz	wx	wy	wz	p	Bx	By	Bz	Azimuth	Pitch	Roll	Latitude	Longitude	Speed (m/s)
0.00	0.0049	-0.0413	0.988	0.0037	0.0183	0.0031	866.8751	-16.26	-10.74	-44.4	0	0	0	0	0	0
0.001415	0.0049	-0.0413	0.988	0.0037	0.0183	0.0031	866.8751	-16.26	-10.74	-44.4	0	0	0	0	0	0
0.011223	0.0049	-0.0413	0.988	0.0202	0.0379	0.0024	866.8275	-16.26	-10.74	-44.4	0	0	0	0	0	0
0.014867	-0.0205	-0.0169	0.9657	0.0202	0.0379	0.0024	866.8275	-16.26	-10.74	-44.4	0	0	0	0	0	0
0.019046	-0.0205	-0.0169	0.9657	0.0202	0.0379	0.0024	866.8275	-16.26	-10.74	-44.4	0	0	0	0	0	0
0.020739	-0.0205	-0.0169	0.9657	0.0202	0.0379	0.0024	866.8275	-16.26	-10.74	-44.4	0	0	0	0	0	0

0.022488	-0.0205	-0.0169	0.9657	0.0202	0.0379	0.0024	866.8275	-16.26	-10.74	-44.4	0	0	0	0	0	0

Compare with Phone

Your flight module should now consist of your Raspberry Pi Pico, your 10 DOF IMU, and your SD card. After programming the Raspberry Pi Pico, disconnect it from your computer. Instead, power it with your LiPo battery. Tape, or otherwise attach, your flight module to your phone. Collect data both on your phone and with your flight module. Plot each data signal from the flight module on the same graph of the data from the phone. Demonstrate that the signals match. If they do not match, you may need to calibrate the data on your flight module. The chapter ***Sensor Setup and Calibration*** in the AutonomousFlight.pdf book explains the basics of programming the Raspberry Pi Pico to read measurements from the IMU sensor. It also provides some magnetometer calibration examples to remove various forms of bias.

What to Submit

To get credit for this assignment, demonstrate your working code to the instructor. Also, create a document and do the following:

1. Copy and paste the graphs comparing the phone signals to the flight module signals for the pressure and magnetometer signals.
2. Copy and paste your Raspberry Pi Pico code into the document.
3. Save the document as a .pdf file and submit it.

The instructor should be able to run your code to verify that it works.