

Physics 524 Week 5 Homework Exercises

Due: Tuesday 9/26/2023 at 10am

Due date reminder, etc.

Please email your completed assignment to the course TA by Tuesday, 10 am of next week. Assignments that are late by at most one week will receive at most 50% of full credit. We will not grade anything submitted more than one week late.

Your homework submissions—code, cell phone photos, etc. must include enough identifying information for us to tell who you are!

1. *Inertial navigation*

By integrating the acceleration twice, it is (in principal!) possible to determine the change in position of an object initially at rest. Code up, to run on your Arduino, an algorithm that will sample the LSM9DS1 acceleration at a high rate, determine the time interval between measurements, and figure out how much it has moved during the course of a few seconds of being pushed around in a horizontal plane.

Note: (1) You will need to subtract off the acceleration due to gravity, and (2) take into account that the coordinate axes of the sensor are in general changing with time. Also be aware that the sensor uses a left-handed coordinate system!

2. *VL6180 On-the-fly parameters*

Modify the VL6180X example code to accept an integer input from the serial monitor's input field and use this on the fly to illuminate the Arduino's red LED when the distance is found by the VL6180X to be less than the input value.