Homework 1 [3-D orientation detection]
CMSC 628/491
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Date: 02/16/22 Due
Date: 03/11/22

Problem Statement

The goal of this assignment is to understand the use of sensors on the smartphone to design an app that produces the 3-D orientation of the phone when placed in your pocket. The key is to use a combination of the accelerometer, gyroscope, and compass on the phone to find the 3-D orientation of the device. The User interface design for the assignment is up to you, but try to be creative in illustrating the 3D orientation of the device. You need to follow the requirements mentioned below.

Requirements

- The app should collect accelerometer, gyroscope, and magnetometer data in an Activity.
- The Activity should also define the UI to display the 3D orientation of the device.
- The Activity should also implement the algorithm that takes in the three sensor streams, and generates the 3D orientation of the device.

Resources

An important component of the assignment is the algorithm that converts the sensor data to the orientation. It would be useful to survey research papers in this area to get an idea of challenges in converting noisy IMU data into 3D orientation. Please use Google scholar to look for papers in this area. It is a very well researched area.

Submission Instructions

- You source code should be converted into a .zip file
- An apk for your implementation.
- A word doc describing the algorithm that converts the sensor streams into 3D orientation.
- A single zip file that combines the source code with the doc file and the .apk. Call that .zip file assign1.zip
- Use Blackboard submission to submit the assignment.
- The rubric for the assignment is the following: Algorithm for 3D orientation (3 points); App component for collection of the sensor data (3 points); UI component (2 points); Following proper conventions for app lifecycle (2 points).
- If the orientation error is less than 5%, an extra credit of 2 points will be awarded.

Late Policy

For every late day submission, there would be a 20% penalty. For example, if you get 5 points out of 10, and you submit a day late, you will get 4 points.