WESTERN NEW ENGLAND UNIVERSITY
SPRINGFIELD, MASSACHUSETTS

DEPARTMENT OF MECHANICAL ENGINEERING

ME 455-41 APPLIED MECHATRONIC SYSTEMS
ME 656-41 ADVANCED MECHATRONICS SYSTEMS

Instructor: Dr. Vedang Chauhan

Project 3 Reading and Displaying Mobile Robot Acceleration and Orientation using IMU

Objective: Building on the previous Smart Mobile Robot work, the objective of this project is to read IMU data using the onboard IMU sensor and display them on the Serial monitor. This project will enhance your understanding of sensor integration and data logging, providing valuable insights into your robot's dynamics.

Figure 1 Smart Mobile Robot with the on board IMU (image course: *ELEGOO UNO R3 Smart Robot Car Kit* Amazon.com)

Reading IMU Data (Don’t run motors).

You're all set with your assembled mobile robot and connected IMU sensor. The next step involves writing an Arduino program to read and serially print the robot's acceleration and orientation data using the onboard IMU sensor. An IMU (Inertial Measurement Unit) is a device that measures motion and orientation using a combination of sensors. IMUs are used in various applications like drones, smartphones, and robotics to provide accurate motion and orientation information. They’re like the GPS for movement, keeping everything on track.

IMU Internal Sensors:

Accelerometer: Measures linear acceleration along the X, Y, and Z axes. It detects changes in velocity due to motion or gravity.

Gyroscope: Measures angular velocity around the X, Y, and Z axes. It detects changes in orientation or rotation.

Magnetometer (optional): Measures the magnetic field to help determine orientation relative to the Earth's magnetic field.

You'll need to initialize the IMU, read the acceleration and orientation data, and then print these readings to the Serial Monitor. Once your code is ready, upload it to the Arduino and observe the real-time data on your computer.

Instead of running the motors on the robot, manually move the robot along the X, Y, and Z axes while it's tethered to the computer and held in your hand. Read the IMU data to display the robot’s acceleration in the X, Y, and Z directions, as well as its rotational angles Gx, Gy, and Gz using the gyroscope, on the Serial Monitor (see Figure 2).

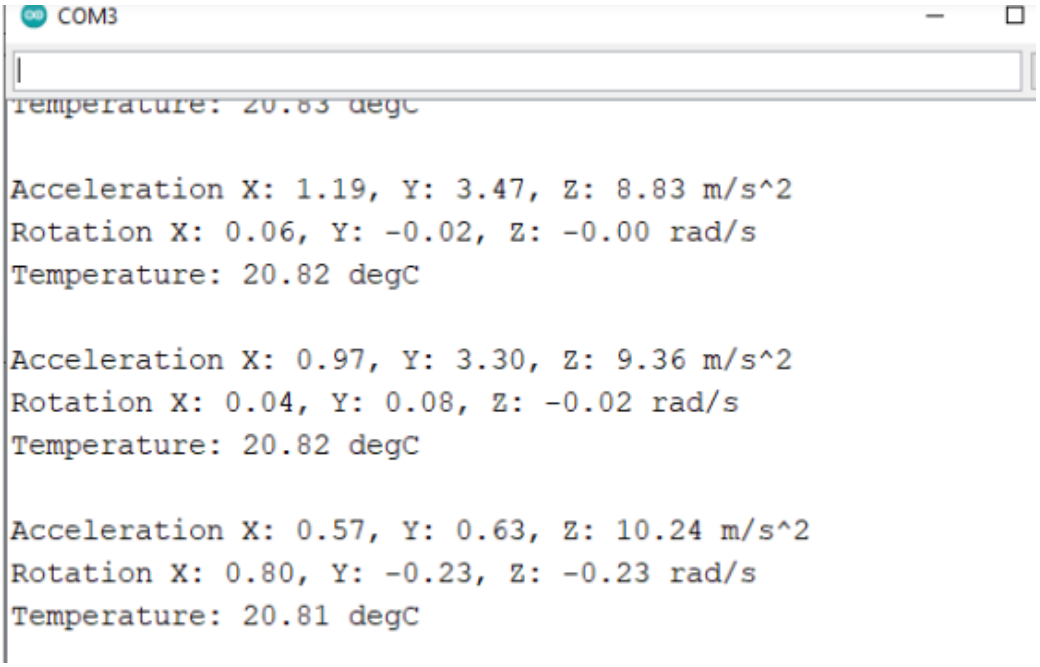

Figure 2 Sample Screenshot of a Serial Monitor

Deliverables and assessment rubric:

Submit onto Kodiak.

Final PDF report (file name: Project3_YourGroupNumber.PDF") that contains • Screenshot of your serial monitor • Arduino Program • Video of the task. Move the robot manually and rotate it around while it is tethered to a PC that displays the data on the serial monitor.	**90**
Quality and professionalism of the report.	**10**

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