



## Human and Robot Interaction Laboratory Advanced Robotics Mathematics Background

### Introduction

One of the most important concepts of chapter 2 is Rotation Matrix, which you have to comprehend and the best way is to use it practically. To perform this project you have to communicate with "Gyro Sensor" (Figure 1.1).

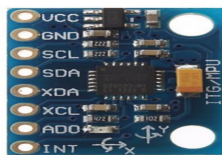


Figure 1.1: MPU-6050 (Gyro-Accel Sensor)

## Brief Information About Sensor

The MPU-6000<sup>TM</sup> (figure 1.1) family provides the world's first integrated 6-axis MotionProcessing<sup>TM</sup> solution that eliminates the package-level gyro/accel cross-axis misalignment associated with discrete solutions. The devices combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon die together with an on-board Digital Motion Processor<sup>TM</sup> (DMP<sup>TM</sup>) capable of processing complex 9-axis MotionFusion algorithms. The parts' integrated 9-axis MotionFusion algorithms access external magnetometers or other sensors through an auxiliary master I2C bus, allowing the devices to gather a full set of sensor data without intervention from the system processor.

## Problem Definition

First you have to go through the text about Rotation Matrix , then you have to get the "Gyro Sensor" from AliReza & Omid. You have to communicate with the sensor and get data on your computer. Then using either "MATLAB" or "Qt" you have to provide a GUI to provide the following information:

1. The Rotation Matrix
2. The parameters of your specific method (Specified in table 1.1)
3. Valuation of the Rotation Matrix
4. The 12 different combination of Euler Angles
5. A graph which shows each angles through time
6. A graph which shows the derivation of each angles through time

## Groups - Methods

Due to Sortition performed in TaarLab, the Members & Methods are determined as Table 1.1.

| Group number | Members       | Method                         |
|--------------|---------------|--------------------------------|
| 1            | Mojtaba & Ali | The Euler-Rodrigues Parameters |
| 2            | Behzad & Nima | Natural Invariant              |
| 3            | Amir & Zeinab | Linear Invariants              |

Table 1.1: Team Selection Table

## Introduction Class

A class will be held by Alireza and Omid to provide you the basic information for your project on next Tuesday at 13 o'clock.

## Deadline

2 hours to new year ...!!!