

# Institute of Robotics, University of Innopolis

## Sensation and Perception

### Home Work 02

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## 1 Attention

This is valid for the each and every lab class, you can do your lab tasks with the most preferred language but these standards need to be fulfilled.

- JAVA 8
- C++ 11
- C 99
- Python 2.7.x or 3.6.x
- Matlab 17a onwards

You need to submit your source code along with a clear description of how to run your implementation.

## 2 Task One

### 2.1 Case 1

Name
Abdurohman Abdurohman
Sabirova Adelya
Ahmed Nawaz
Andrey Stepanov
Arslan Siddique

UAV flies through the strong wind and begins to oscillate. The pitch angle change was measured with the gyro during a few seconds. Estimate proper trajectory for the pitch angle while considering the gyro reading are normally distributed by using Kalman filter.

## 2.2 Case 2

Name
Artem Yarchuk
Awet Hailelassie Gebrehiwot
Aydar Ahmetzyanov
Danil Ilyasov
Dmitriy Sorokin

UAV flies through the strong wind and begins to oscillate. The roll angle change was measured with the gyro during a few seconds. Estimate proper trajectory for the roll angle while considering the gyro reading are normally distributed by using Kalman filter.

## 2.3 Case 3

Name
Dmitriy Desyatkin
Lyailya Aminova
Maksim Rassabin
Marina Mikhaylova

UAV performs loop-the-loop. The pitch angle change was measured with the gyro during a few seconds. Estimate proper trajectory for the pitch angle while considering the gyro reading are normally distributed by using Kalman filter.

## 2.4 Case 4

Name
Matias Correa Hudson
Oleg Balakhnov
Sami Sellami
Timur Arysyanov

The human CoM (center of mass) during the walking has been measured with Kinect sensors. Estimate proper trajectory for the human CoM movement while considering reading are normally distributed by using Kalman filter.

## 2.5 Case 5

Name
Valeriya Skvortsova
Victor Massague Respall
Víctor Fernando Pérez García
Yuriy Kashaev

Inside the right hand of the AR-601 robot there is an accelerometer. Engineers fixed the robot on the crane and went for a lunch. Robot was swinging by inertia for a few minutes. Engineers came back after lunch and read the data from accelerometer. Help them to understand what they measured. Estimate proper trajectory for the accelerometer reading while considering reading are normally distributed by using Kalman filter.

**Note: Kalman filter is needed to be implemented by yourself. You may have to make some assumptions while implementing your filter. Please comment on it**

### 3 Task Two

Calibrate a camera (your phone or computer camera should be utilized) using the chessboard pattern. It's logically to switch off the auto focus mode of the camera, if it is enabled. The number of images should be at least 30 (with different chessboard positions). Obtain the intrinsic and extrinsic parameters. Once you have calibrated your camera, store intrinsic and extrinsic parameters. Then take a photo of some object (for example, a cup) using the calibrated camera, estimate the height and width of the selected object using both a ruler and an image from the calibrated camera. Calculate the distance between the camera image plane and the selected object.

### 4 Task Three

Id	Name
01	Abdurohman
02	Sabirova Adelya
03	Ahmed Nawaz
04	Andrey Stepanov
05	Arslan Siddique
06	Artem Yarchuk
07	Awet Hailelassie Gebrehiwot
08	Aydar Ahmetzyanov
09	Danil Ilyasov
10	Dmitriy Sorokin
11	Dmitriy Desyatkin
12	Lyailya Aminova
13	Maksim Rassabin
14	Marina Mikhaylova
15	Matias Correa Hudson
16	Oleg Balakhnov
17	Sami Sellami
18	Timur Arysyanov
19	Valeriya Skvortsova
20	Victor Massague Respall
21	Víctor Fernando Pérez García
22	Yuriy Kashaev

The provided dataset contains left and right images in two different folders with the same name. For this task please select image pair corresponds to your id (0000[Id].png). You need to use 8 point

algorithm in order to find the fundamental matrix. For the initial key points detection (minimum 8 corresponding points) you can either do it manually or use any key points detection technique. Next step is to estimate the disparity map for the selected image pair. You may assume the baseline of the stereo camera as the 10cm and focal length of both the left and right side cameras as 2.8mm. If you need any additional assumptions, please elaborate them in the report.

## **5 Submit**

Please upload the single zip file which includes your source code and the report. The report should include what you did and why you did it.

## **6 Deadline**

The deadline: September 30, 23:59:59 GMT+3.