Department of Robotics, University of Innopolis

Sensation and Perception
Home Work 01
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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
SabirovaAdelya Sabirova
Ahmed NawazAhmed Nawaz
Andrey StepanovAndrey Stepanov
Arslan SiddiqueArslan Siddique

UAV flies through the strong wind and begins to oscillate. The pitch angle change was measured with the gyro during a few seconds. Exclude from the consideration rare random deviation (outliers) and estimate the true value of the roll angle. Calculate the confidence interval of error for 99.9% confidence level. Consider that the gyro errors are normally distributed, except for the rare random deviations. The rare random deviations are unreliable and a priori should be excluded using regression algorithms.

2.2 Case 2

Name
Artem YarchukArtem Yarchuk
Awet Haileslassie GebrehiwotAwet Haileslassie Gebrehiwot
Aydar AhmetzyanovAydar Ahmetzyanov
Danil IlyasovDanil Ilyasov
Dmitriy SorokinDmitriy Sorokin

UAV flies through the strong wind and begins to oscillate. The roll angle change was measured with the gyro during a few seconds. Exclude from the consideration rare random deviation (outliers) and estimate the true value of the roll angle. Calculate the confidence interval of error for 95% confidence level. Consider that the gyro errors are normally distributed, except for the rare random deviations. The rare random deviations are unreliable and a priori should be excluded using regression algorithms.

2.3 Case 3

Name
Dmitriy DesyatkinDmitriy Desyatkin
Lyailya AminovaLyailya Aminova
Maksim RassabinMaksim Rassabin
Marina MikhaylovaMarina Mikhaylova

UAV performs loop-the-loop. The pitch angle change was measured with the gyro during 1 seconds. Exclude from the consideration rare random deviation (outliers) and estimate the true value of the roll angle. Calculate the confidence interval of error for 95% confidence level. Consider that the gyro errors are normally distributed, except for the rare random deviations. The rare random deviations are unreliable and a priori should be excluded using regression algorithms.

2.4 Case 4

Name
Matias Correa HudsonMatias Correa Hudson
Oleg BalakhnovOleg Balakhnov
Sami SellamiSami Sellami
Timur AryslanovTimur Aryslanov

The human CoM (center of mass) during the walking has been measured with Kinect sensors. Estimate the true value of the x-component of acceleration. For example, you can use a moving average filter. Calculate the confidence interval of error for 95% confidence level. Consider that the errors are normally distributed, except for the rare random deviations. The rare random deviations are unreliable and a priori should be excluded using regression algorithms.

2.5 Case 5

Name
Valeriya SkvortsovaValeriya Skvortsova
Victor Massague RespallVictor Massague Respall
Víctor Fernando Pérez GarcíaVíctor Fernando Pérez García
Yuriy KashaevYuriy 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. Exclude from the consideration rare random deviation (outliers) and estimate the true value of the y-component of acceleration. Calculate the confidence interval of error for 99.9% confidence level. Consider that the accelerometer errors are normally distributed, except the rare random deviations. The rare random deviations are unreliable and a priori should be excluded using regression algorithms.

3 Task Two

Id	Name
1	AbdurohmanAbdurohman Abdurohman
2	SabirovaAdelya Sabirova
3	Ahmed NawazAhmed Nawaz
4	Andrey StepanovAndrey Stepanov
5	Arslan SiddiqueArslan Siddique
6	Artem YarchukArtem Yarchuk
7	Awet Haileslassie GebrehiwotAwet Haileslassie Gebrehiwot
8	Aydar AhmetzyanovAydar Ahmetzyanov
9	Danil IlyasovDanil Ilyasov
10	Dmitriy SorokinDmitriy Sorokin
11	Dmitriy DesyatkinDmitriy Desyatkin
12	Lyailya AminovaLyailya Aminova
13	Maksim RassabinMaksim Rassabin
14	Marina MikhaylovaMarina Mikhaylova
15	Matias Correa HudsonMatias Correa Hudson
16	Oleg BalakhnovOleg Balakhnov
17	Sami SellamiSami Sellami
18	Timur AryslanovTimur Aryslanov
19	Valeriya SkvortsovaValeriya Skvortsova
20	Victor Massague RespallVictor Massague Respall
21	Víctor Fernando Pérez GarcíaVíctor Fernando Pérez García
22	Yuriy KashaevYuriy Kashaev

You are given a dataset (select the dataset with corresponds to your ID), includes some data points in $\mathbb{R}^3$. Your task is to estimate whether it represents a plane, line or something else. You must use the RANSAC for this task. Explain the way you selected your minimal sample set, number of

iteration and threshold level? It would be better to provide an analytical solution derivation as well as graphical interpretation.

4 Submit

Please upload the single zip file which includes your source code and the report.

5 Deadline

The deadline: September 12, 23:59:59 GMT+3.