CSE462/562 – Augmented Reality (Fall 2022)

Homework #2

Handed out: October 14, 2022

In this assignment, you will build a simple Unity application to align two point-cloud data. The program will load two files in the following format (all floating-point numbers):

n
x_1 y_1 z_1
…
x_n y_n z_n

Your program will show these two sets of points in their original coordinate system with two different colors. It will also align the second set to the first set (first sets coordinate system as reference) and show the alignment result.

Your program should:

- Have two different buttons for the alignment in the following two different ways (hint: use RANSAC along with three-point alignment method discussed in class).
    - Rigid transformation: Assume that there are different number of points (not ordered) in the files but at least half of the points are exact matches. The rigid transformation is given with: $Q_i = RP_i + T$.
    - Rigid transformation up to a global scale: Assume that there are different number of points (not ordered) in the files with at least half of the points are exact matches. The transformation is given with: $Q_i = \begin{bmatrix} s & 0 & 0 \\ 0 & s & 0 \\ 0 & 0 & s \end{bmatrix} RP_i + T$.
- Show the results in the following two different ways:
    - Show the aligned points (still with two different colors).
    - Show the transformed points (second sets) with its movement as a line.

Grading:

- 100 points for the correctly working Unity program (should be shown to the instructor) with all the above features.

Submission:

- Submit a short video showing your application in use with all the above features demonstrated (studentnumber_lastname_yourfirstname_hw1.avi.zip).
- Submit the link to the code (preferably GitHub) with proper access (you can add the instructor to your project using the GitHub handle yakup.genc@gtu.edu.tr).