ECE7097, Vehicle Vision System, 2022
Mid-Term Assignment : Stereo Matching
Due: Fri Nov. 4, 2022 23:55

I. Introduction

1. **Collaboration**. Students are encouraged and discussed to work in groups, but each student must submit your own work. You must include your co-workers' names in your report when you work with other students. (Note that CODE SHOULD NOT BE SHARED OR COPIED. PLEASE MAKE YOUR OWN CODE. **Plagiarism is strongly prohibited and will lead to Failure of this course**.)

2. This assignment is a substitute for the mid-term exam. For this reason, I will not answer any related questions for stereo matching until the deadline for the assignment.

3. Template skeleton codes are provided as follows. In your compressed file <ID_name.zip>, the following function will be included. You can modify input and output parameters. If you want to combine multiple functions into one (or split a function to multiple functions.) Please add what kinds of functions are combined or split, and comment with valid reasons why you combine the multiple functions.

   ```
   A. Report.docx
   B. README.txt (Describe how to Run your code.)
   C. main.m (Start point of your code.)
   D. undistort_image.m (backward warping)    (base: 5 bonus: 5)
      -use provided parameters of KITTI dataset-
   E. get_correspondence_points.m            (base:10 bonus:10)
      -use calibration image of KITTI dataset-
      -Corner detection-based method is allowed-
      -Feature-based RANSAC method is allowed-
   F. get_F_matrix.m                         (base: 5 bonus: 5)
   G. get_E_matrix.m                         (base: 5 bonus: 5)
   H. decomp_E_matrix.m                      (base: 5 bonus: 5)
   I. estimate_Rrect.m                       (base: 5 bonus: 5)
      -use KITTI provided parameter, you will get zero point on
      Problem.E,F,G,H-
   J. rectify_image.m (backward warping)     (base:10 bonus:10)
   K. get_disparity_map.m                    (base:10 bonus:10)
      -SGM implementation with 4D matrix will give extra 20 points-
   ```

4. Please upload your submission to I-Class.

5. If you implement a function with MATLAB provided built-in functions, you will get a base score (max 50 points.)

6. If you implement the core part of each function yourself, you will get bonus points for each function (max 50 points.)

II. KITTI-Dataset
(You can download data from I-Class. Use color images.)
1. Target sequence name: 2011_09_26_drive_0048
(https://www.cvlibs.net/datasets/kitti/raw_data.php?type=city)

image00 (left gray)	: /2011_09_26_drive_0048/unsync_unrect/image00
image01 (right gray)	: /2011_09_26_drive_0048/unsync_unrect/image01
image02 (left color)	: /2011_09_26_drive_0048/unsync_unrect/image02
image03 (right color)	: /2011_09_26_drive_0048/unsync_unrect/image03

Use KITTI provided calibration file:
/2011_09_26_drive_0048/calib_cam_to_cam.txt

KITTI provided rectification images:
/2011_09_26_drive_0048/sync_rect

2. Calibration sequence name: 2011_09_26_drive_0119
(https://www.cvlibs.net/datasets/kitti/raw_data.php?type=calibration)

* You can modify the inputs and outputs of the provided skeleton code.
* Due to lib. Dependency problem, **MATLAB code is highly recommended**. If you want to make your code in other languages (C/C++, Python), please provide a docker image and the running script for docker that perfectly supports your code. Note that I do not install any kinds of libraries for this project.
* In MATLAB, the official MATLAB toolbox is allowed.
* In C, C++, and Python codes, OpenCV is allowed.
  (Please do not use any other toolboxes or libraries.)
* Total max point is 100 pt (SGM implementation: 120 pt.)