School of Computing
National University of Singapore
CS4243 Computer Vision and Pattern Recognition
Semester 1, AY 2018/19

Lab 5 Corner Detector
Due date: 7th Oct 2017, 2359hrs

Objective:

To understand and implement the corner detector that we learned in class.

Preparation:

- Download the file Lab5_pictures.zip from IVLE into your working directory. Uncompress the file and you should find the following pictures: letterBox.jpg, checker.jpg, pipe.jpg, carmanBox.jpg

Steps

The following shows the detailed steps of the corner detector that you will implement in this lab:

- Get the horizontal edge strength of every point in the image and store in *Ix*.
  - You can use the approximation *Ix = pic(x+1,y) – pic(x,y)*
  - *Note: you can ignore the pixels at the borders of the image i.e. set their Ix to zero*

- Get the vertical edge strength of every point in image and store in *Iy*.
  - You can use the approximation *Iy = pic(x, y+1) – pic(x,y)*
  - *Note: you can ignore the pixels at the borders of the image i.e. set their Iy to zero*

- Perform corner detection at all the sampled point locations *(x, y)* given by

$$(x, y) = (n * 7, m * 7) \quad where\ n = 1, 2, 3, \ldots\ and\ m = 1,2,3, \ldots$$

Hint:

- *At each sample point, form the following 2 by 2 matrix by summing over a neighborhood of 13 by 13 pixels around that sample point*

$$\sum\sum \begin{bmatrix} I_x^2 & I_x I_y \\ I_x I_y & I_y^2 \end{bmatrix}$$

- *Compute the eigenvalues of the above matrix. using the Matlab function eig.*

- *Store the smaller of the eigenvalues at all the sampled point locations and store them in a matrix called eig_min.*

- *Find the top 200 values in the matrix eig_min, and mark these locations on the picture. You may use the following Matlab commands:*

    - *reshape*
        - *for arranging a 2D matrix into a 1D vector*
    - *sort*
        - *for sorting the eigenvalues*
    - *find*
        - *for finding the locations in a matrix where the values are above the cut-off eigenvalues.*
    - *cat*
        - *for constructing a 3 channel RGB image from a single gray scale image, eg. cat(3, grayPic, grayPic, grayPic). This allows you to use color to mark the feature locations later (see rectangle below).*
    - *rectangle*
        - *for marking the location of good features (i.e. corners)*
        - *please mark the corners using red rectangles*

Instructions

- Please perform corner detection on all the 4 pictures

- You must implement the corner detector by writing the Matlab codes all by yourself (i.e. you cannot get the codes from elsewhere).

<u>Submission Instruction</u>

At the end of your lab session, submit the softcopy of your Matlab codes and the pictures marked with good features (i.e. corners) to IVLE.

Please put your files in a folder and submit the folder. Use the following convention to name your folder:

StudentNumber_yourName_Lab#. For example, if your student number is A1234567B, and your name is Chow Yuen Fatt, for this lab, your file name should be A1234567B_ChowYuenFatt_Lab5.