Image analysis – Hough Transform

BE 2h - MATLAB

Practice & Report

Exercises with report (to be evaluated)

References

- Computer Vision: Algorithms and Applications, Richard Szeliski

  Page 251 HoughTransform

- Lane Departure Warning System.pdf

In this lab work we focus on Hough Transform and its applications. The first stage is the study and understanding of the Hough transform.

I.   Review the chapter and references before making your synthesis and summary of the Hough Transform (3 pages max) for:

1. Line Detection and fitting,

2. Circle detection and fitting,

3. Generalized forms.

II.   Application of the HT

II.1. Line detection and fitting following the steps

a. Read an image into the MATLAB workspace using imread function

b. Find the edges in the image using canny filter using edge function

c. Compute the Hough transform of the image using the hough function

d. Display the transform using imshow or imagesc function

e. Find the peaks in the Hough transform matrix, H, using the houghpeaks function

f. Plot the peaks using "hold on" on the previous figure and using plot for peaks

g. Detect maximum line segments in the image by optimizing parameters used and using houghlines function

h. Create a plot that superimposes the lines on the original image

Make your deductions about the conditions for the efficiency of the Hough transformation in detecting rows.

II.2. Circle detection and fitting following the steps

a. Load Image

b. Determine Radius Range for Searching Circles

c. Initial Attempt to Find Circles

d. Increase Detection Sensitivity

e. Draw the Circles on the Image

f. Use the Second Method (Two-stage) for Finding Circles

g. Why are Some Circles Still Getting Missed?

h. Find "Bright" Circles in the Image

i. Draw "Bright" Circles with Different Color

j. Lower the Value of "EdgeThreshold"

k. Draw "Dark" and "Bright" Circles Together

Are all the circles detected?

Make your deductions about the conditions for the efficiency of the Hough transformation in detecting rows.

Changing the parameters to be more aggressive in detection may find more lines or circles, but it also increases the likelihood of detecting false objects. There is a trade-off between the number of true circles that can be found (detection rate) and the number of false circles that are found with them (false alarm rate).

Compress your report as well as your matlab code. Drop the compressed file on the dedicated moodle link.