Bauhaus-Universität Weimar

Assignment 3

Submission Deadline: 29.05.24, 11:00 pm

Straight line detection based on Hough-voting

A) **Implement a function** that detects lines in an image based on **Hough-voting**.
Do **not** use the built-in function *hough* (you may use it for comparison only). You are free to use the provided image (*input_ex3.jpg*) or your own photos containing visible straight lines.

a. Read the input image and convert it to a grayscale image with a value range $[0, 1]$. Plot the result image.

b. Apply a GoG filter (from assignment 2) to derive gradient images in *x*- and *y*-direction and compute the gradient magnitude.

c. Find and apply an appropriate threshold on the gradient magnitude to extract representative edge pixels. Plot the binary edge mask.

d. Implement a function for Hough line detection:

   i. Input: Binary edge mask (from c) and gradient images (from b)

   ii. Output: Hough voting array H, index arrays for the ranges of θ and ρ

   iii. Hints:

      1. Use the polar line representation.
      2. Incorporate information about the gradient direction to speedup processing.

e. Plot the resulting Hough voting array H.

f. Find local maxima of H. You may use the built-in function ***houghpeaks***.

g. Plot the found extrema on top of your figure in step f.

h. Use the built-in function ***houghlines*** to derive the corresponding line segments.

i. Plot the lines on the figure of step a.

Note: When working with Octave, make sure that you have loaded the **image package** before using the functions ***houghpeaks*** and ***houghlines*** (reference documentation on packages in Octave).

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