IN5520 – Autumn 2021

Exercises on Hough transform

Exercise 1

Walk through the MATLAB script "hough_transform_examples.m" in order to familiarise yourself with the Hough transform and the associated MATLAB functions for line detection and/or the Jupyter Notebook "hough_transform_examples.ipynb" in order to familiarise yourself with the Hough transform and the associated OpenCV functions for line detection. The scripts can be found at: https://www.uio.no/studier/emner/matnat/ifi/IN5520/h21/undervisningsmateriale/exercises/

In order to run the last part of the scripts, you will also need to download "corridor.png" from: http://www.uio.no/studier/emner/matnat/ifi/in5520/h21/undervisningsmateriale/images/

Exercise 2

Detect a circle for each coin in the image "coins2.jpg" using library functions for detecting circles using the Hough transform. The image can be found at: http://www.uio.no/studier/emner/matnat/ifi/in5520/h21/undervisningsmateriale/images/

In MATLAB, you can use the function IMFINDCIRCLES to detect the circles and the function VISCIRCLES to display the circles on top of the original image. In Python, you can use the OpenCV function HoughCircles() to detect the circles and the OpenCV function circle() to display the circles on top of the original image.

Exercise 3

Implement the randomized Hough transform for detecting circles. The randomized Hough transform can be orders of magnitude faster than the ordinary Hough transform. For the case of line detection, the randomized Hough transform can be described as follows:

- From the edge image (g(x,y)>T), pick two random points.
- Find the ρ and θ corresponding to this set of points.
- Increment the indicated (ρ,θ) cell.
- Once a cell reaches a certain (low) count, assume that an edge is present in the image.
- Verify this.
- If truly present:
    - Store line parameters.
    - Erase this line from the edge image.
- Continue until no more points or until the number of iterations between two detections is too high.

In order to find circle parameters from three points, you can use the MATLAB function "threepoint.m" or the Python function in "threepoint.py", both located at: https://www.uio.no/studier/emner/matnat/ifi/IN5520/h21/undervisningsmateriale/exercises/