Lecture Machine Vision 2019/20
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Practical Exercises: Edge Detection and Hough Transform

- Consider the image file *postit2g.png*. Calculate the grey value gradient of this image. Display the result in two images:

  Level of difficulty: easy

  - an image in which the grey value is proportional to the gradient length
  - an image in which the grey value is proportional to the gradient angle

  You might find the following MATLAB commands useful for this exercise:

$fspecial$	create a Sobel or Prewitt filter mask	$fspecial('sobel')$
$conv2$	2D-convolution	$conv2(I, F)$
$atan2$	calculate the angle (in rad) of a vector	$atan2(y, x)$

  Do not use the MATLAB built-in function *gradient* for this task.

- Generate an edge image in which all edge pixels are white and non-edge pixels are black. Use the MATLAB function *edge* and try the Canny- and the LoG-approach. Optimize the parameters of these approaches to achieve good results. Which difficulties occur?

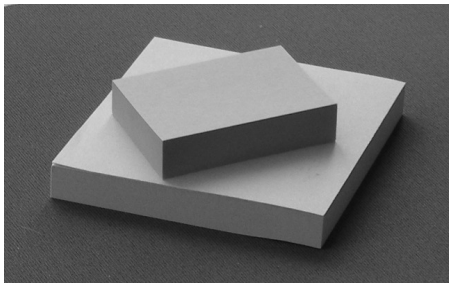
  Level of difficulty: easy

- Perform the Hough transform on the best edge image of the previous part. Determine the peaks in the Hough space and plot the respective lines into the image. Since the MATLAB built-in Hough transform is of no good quality you find an improved implementation of the Hough transform in the following files:

  Level of difficulty: medium

robust_hough.m	create the Hough transform of an edge image and extract the most dominant peaks from the accumulator array
robust_hough_lines.m	extract the most dominant line segments from the peaks in the accumulator array and the edge image
robust_hough_plot_lines.m	visualize the resulting line segments

  The function *robust_hough* creates a data struct. You can acces the elements of a struct with the dot operator. E.g. hs.accumulator yields the element named *accumulator* of the struct *hs*.



original image *postit2g.png*

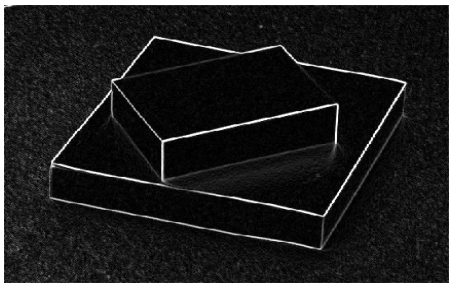
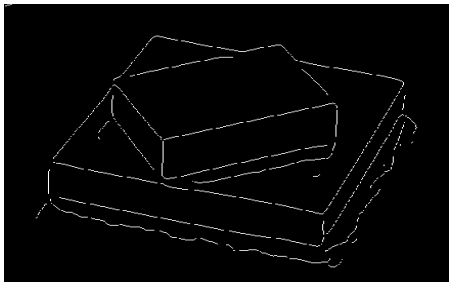


image of gradient length



edge image

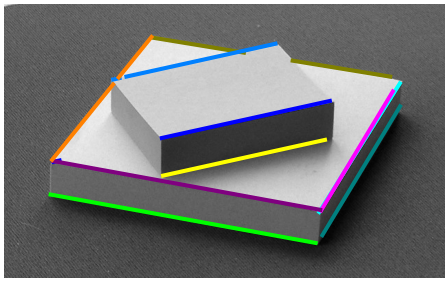


image with line segments found
using the Hough transform