

## Image processing course – homework #5

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In this assignment you will detect edges and find patterns.  
You will be using Canny edge detector, Hough transform.

Create a single script which performs the following tasks:

- 1) Sobel Edge detection – Calculate and display the edge magnitude image and the edge direction image of image **balls1.tif**, using Sobel Edge detection.  
Do not use a **built in edge** function. You may use **convolve2d from scipy**.  
Display a binary edge image (1 edge pixel, 0 no edge) of strong edge pixels (above a threshold - Determine a threshold that eliminates the ball shadows).
- 2) Canny Edge detection – Find the edge boundary of the coins in image **coins1.tif**.  
You must create an edge image that contains the complete coin boundaries with as minimum internal edge clutter as possible.  
Use opencv Canny Edge Detection function (cv2.Canny)  
You must determine the best Canny parameters to obtain the desired results.
- 3) Canny Edge detection – challenge.  
A more challenging image; **balls1.tif** or **balls2.tif**.  
Display a binary edge image (1 edge pixel, 0 no edge) of strong edge pixels (above a threshold). Determine parameters that eliminates the ball shadows.  
Use opencv Canny Edge Detection function (cv2.Canny)  
You must determine the best Canny parameters to obtain the desired results.
- 4) Hough Transform – Circles  
Find all circles of coins in **coins3.tif** using Hough Transform.  
Use opencv function **HoughCircles**  
Display the original image with the found circles marked.
- 5) Hough Transform – Lines  
Find all lines of dividers and boundary of box in images:  
**boxOfChocolates1.tif, boxOfChocolates2.tif and boxOfChocolates2rot.tif**.  
Your segments should have as few lines as possible (not have duplicate lines to represent each segment).  
Do not miss boundaries.  
Use opencv **houghlines**.

The script should be independent. i.e., should not request any input from the user.  
You may create additional .py-files if needed (do not forget to submit them with your HW).

Google the documentation of the built in opencv functions to know how to use them.

Good luck!