DIP - Final Project
Due on December 9 at 11:59 pm

For the final DIP project, students will work in teams of two. The assignment of students to teams can be found on ICON (see ICON → DIP → People → Groups). Each team member is expected to contribute equally to the project. The project consists of two parts as described below.

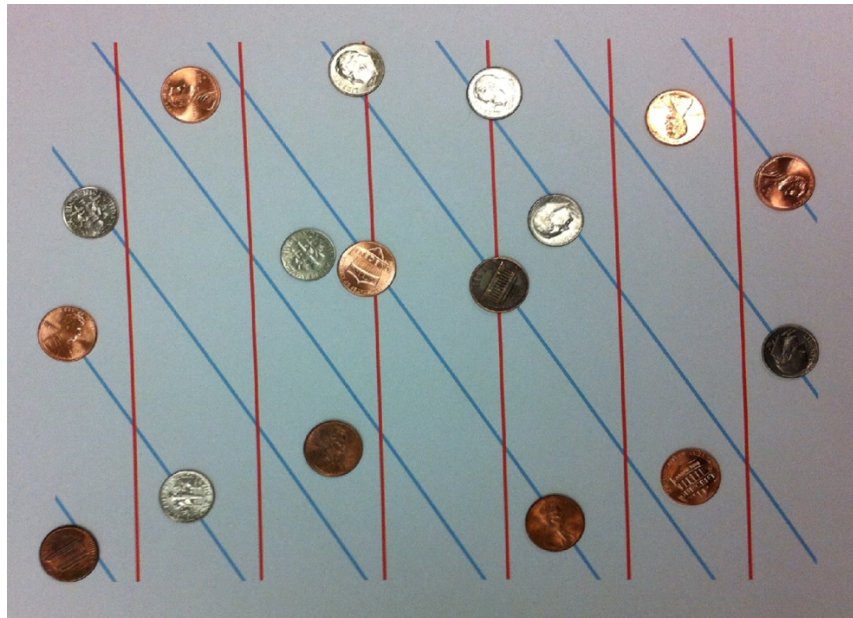## Part I
Consider the image shown in Fig. 1.

Fig. 1. "PandD.tif"

a) Utilizing the Hough transformation, design and implement an algorithm that detects (localizes) all coins in the image shown in Fig. 1. Each detected coin must have a corresponding label mask in the output image to indicate which pixels of the input image belong to it (→ one, unique label per coin).
b) Design and implement a method to automatically classify each coin into pennies and dimes. Your algorithm must produce a mapping of coin labels produced by a) to classes "penny" and "dime". Use image-derived features like color for classification. In your report, show and discuss your results. Explain the rationale behind your approach.

Note that your grade will depend on the detection performance of your algorithm.

Part II

Generalize the algorithm developed in Part I as follows. The goal is to implement an algorithm which is able to detect and classify penny, dime, and quarter coins in images that were acquired with varying distance between camera and coins. For this purpose, perform the following steps.

a) Image acquisition – Acquire 6 new images that contain several coins. Make sure that samples of all three coins are included in each image acquired. Furthermore, make sure that you have 3 images with "simple" and 3 images with more "challenging" background in your image set, each with a different scale (Fig. 2).
b) Algorithm development - Using the image dataset, expand the algorithm developed in Part I so that it can successfully handle this multi-scale and multi-coin image analysis problem (detection and classification). In your

report, **show** and discuss your results. Explain the rationale behind your approach. Your grade will depend on the detection performance of your approach.
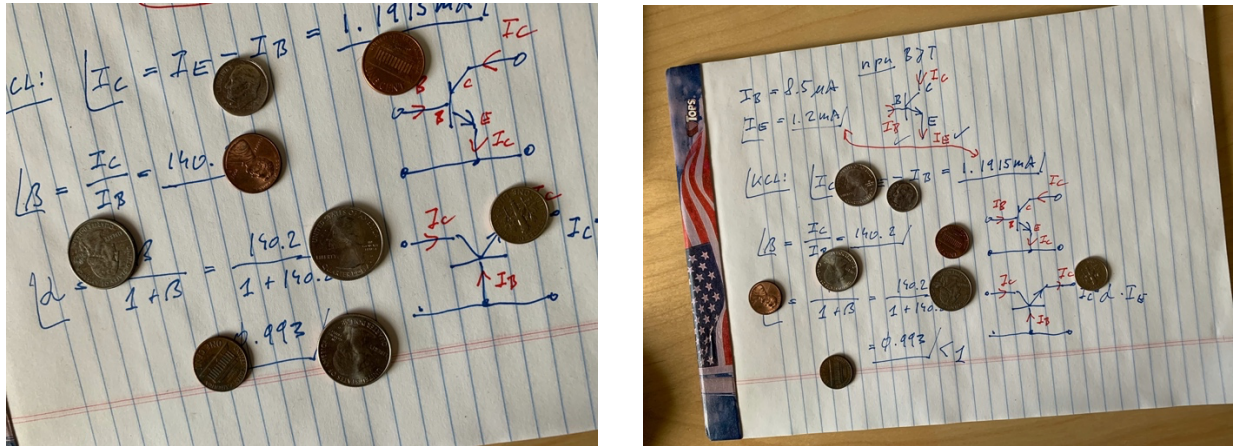

Fig. 2. Examples for images with "challenging" background and different scales.

Deliverables:
Submit your assignment by using the Dropbox on ICON. The files to be submitted include the function(s)/script(s) you have written and a report describing your work. In your report, discuss the rationale behind your approach as well as any problems you encountered. Discuss the results you obtained. Also include a "conclusions" section, in which you describe what you have learned from your experiments. For the paper, any common document file format (e.g., PDF) is acceptable. Collect all your files and compress them using zip, tar, etc. and submit the compressed file. Note that one submission/report per team is sufficient.

Furthermore, be prepared to present, demonstrate, and discuss your implementation in the last week of the DIP lecture. More details will be provided in December.