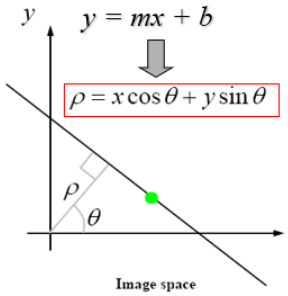
Introduction to Computer Vision S24 Assignment #2

Due May 3, '24/(Fri)

1. Math

- Polar representation of lines
  (a) Derive the 2D polar line representation: $\rho = xcos\theta + ysin\theta$.



  (b) Can you derive the polar representation of planes in 3D?

2. Generalized Hough Transform

- Read the following paper on the Retinex Theory.

D.H. Ballard, "Generalizing the Hough Transform to Detect Arbitrary Shapes", Patter Recognition, Vol.13, No.2, p.111-122, 1981

- Write your own program of the Generalized HT (GHT) algorithm.
- Test your algorithm on the given template image and the target image. You need to convert both images into edge images (you can use Open CV (Python) Canny edge detecting algorithm).
- Show your detection results and analyze them. (Display your results by overlaying the edge template at the locations you found on the target image.)
- Can you make your GHT algorithm scale and rotation invariant? How? Show the results.

Implementation & Submission instructions:

- Implementation instruction: Use Python for your implementation.
- Submission instructions: Upload the electronic file with the report, source code, and data in a single zip format with the name "**ICV_assignment#2_yourname.zip**" on the ETL class homepage.
- The report should include a brief description of the problems, code, results, and discussions
- Reference
  - Quick tutorial page on how to use Matlab
  - Quick tutorial page on how to use Image Processing Toolbox
  - OpenCV
  - OpenCV-Python Tutorials

Note: All works should be individual-based. NO copy is allowed.