Annotation of Microtubule and Membranes in Cell Tomography Images.

Name

Motivation: Manual annotation of microtubules and membranes in cell tomograms is slow. In this work, We explore using Hough transform to detect line (microtubule) lines and curves (membrane) and label these two features.

Goal and Methodology

Goal: Recognize microtubule and membrane in the image and label them in different colors.

Plan of Action

1. Preprocess image to get rid of unwanted features. These features are usually small dots. The method includes inverting image, binarizing image with thresholding, image dilation followed small region removal.

2. With preprocessed images, detect lines(microtubule) and curves(membrane) by Hough Transform and then fill gaps between line segment or curve segment.

3. Based on the curvature of lines and curves, classify and label them as microtubule or membrane.

4. Evaluate for detection accuracy.
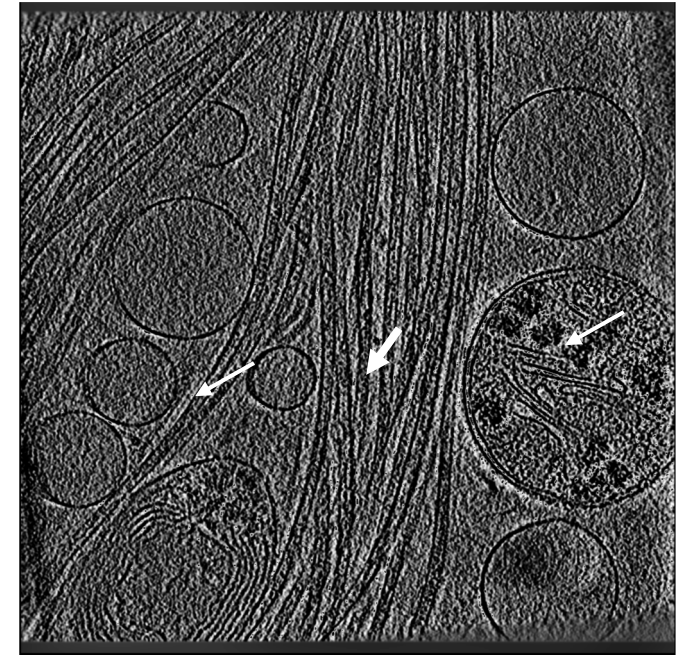
Thick arrow indicates microtubule, and thin arrow indicates membrane.

Dataset and Initial Results

- Grayscale cryoEM Neuron cell tomograms.
- PC-12 cell tomogram.

Original Tomogram Slice   Binarized Image   Lines(microtubule) Detected with Hough Transform
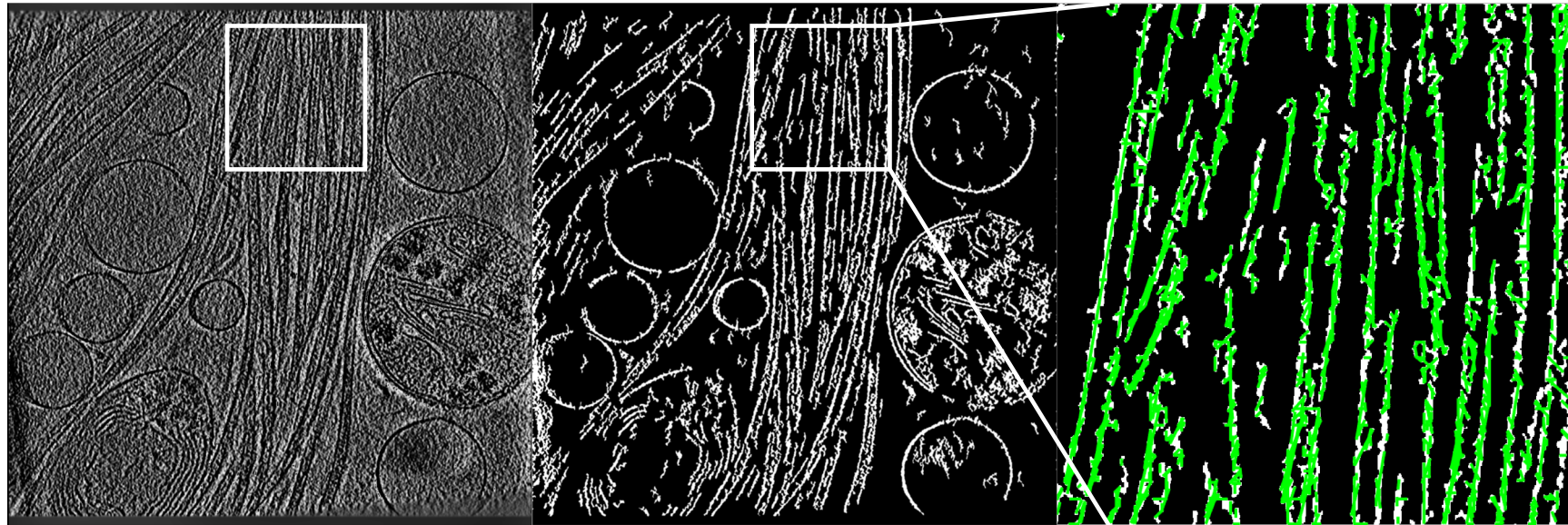
Labeled Microtubule and Membrane.