IVP - Tutorial

1) Canny edge detection

High threshold - 100

Low threshold - 50

* Non - Max Suppression :- Keeps only local maxima in grad direction.

* Double Thresholding

Ex.e> Pix grad > 100 → Strong edges

50 < Pix grad < 100 → weak edges if connected to strong edge

Pix grad < 50 → discarded

* After this process, the edge pix will be finalized based on connectivity from strong edges.

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2) Hough Transform : Line Detection

Active pix : (2, 2), (5, 5), (7, 7)

$$\rho = x \cdot \cos\theta + y \sin\theta$$

1) Iterate over multiple angles θ & compute ρ for each active pixel.

2) Update the Hough accumulator matrix by incrementing bin corresponding to (ρ, θ)

Ex

For $(2,2), (5,5), (7,7)$

satisfy $y = x$

$\theta = 45°$

$$\rho = x \cdot \cos 45° + y \cdot \sin 45° = \frac{x+y}{\sqrt{2}}$$

All points give the same ρ,

lie on the same line.

$$\rho = \frac{4}{\sqrt{2}} \approx 2.83 \quad , \quad \theta = 45°$$

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3) First order derivative : Edge Strength & Ramp edge detection

Given : $[10, 30, 50, 70, 100, 130, 160, 190, 210, 220]$

Gradient $[i] = I[i+1] - I[i]$

Grad values :

- 30 - 10 = 20
- 50 - 30 = 20
- 70 - 50 = 20
- 100 - 70 = 30
- 130 - 100 = 30
- 160 - 130 = 30
- 190 - 160 = 30
- 210 - 190 = 20
- 220 - 210 = 10

Ramp - edge detection

* A ramp edge starts where gradient increase (70 → 100) & ends where it decreases (190 → 210.

* The edge appears to have a moderate gradient, indicating a gradual chang