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Edge Detection Summarize

## Introduction

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for object recognition, image matching,document analysis, horizon detection, image segmentation, data extraction…

There are many indications that lead to detecting edges, such as: changes in depth, in surface, in color and in illumination.

## Methodology

There are 2 common detection methods: Canny edge detector and Sobel edge detector.

\*Canny edge detector:

* Overview:

The Canny edge detector is based on the gradient magnitude of a smoothed image: local maxima of the gradient magnitude that are high are identified as edges. The motivation for Canny’s edge operator was to derive an ‘optimal’ operator in the sense that it’s to minimizes: the probability of multiply detecting an edge, the probability of failing to detect an edge and the distance of the reported edge from the true edge.

* Steps:

1. Smoothing: By applying Gaussian filter, smoothing of an image is done to reduce noise.

2. Finding gradients: The edges have been marked where the gradients of the image are having large magnitudes.

3. Non-maximum suppression: Only local maxima have been marked as edges.

4. Thresholding: Potential and actual edges are determined by thresholding.

5. Edge tracking by hysteresis: Edges that are not connected with strong edges have been suppressed.

\*Sobel edge detection:

The Sobel operator consists of a pair of 3×3 convolution kernels (1 kernel is the other rotated by 90\*):

|  |  |  |
| --- | --- | --- |
|  |  |  |
| -2 | 0 | 2 |
| -1 | 0 | 1 |
| -1 | 0 | 1 |

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 1 |
| 0 | 0 | 0 |
| -1 | -2 | -1 |

These kernels are designed to respond maximally to edges which are vertical and horizontal relative to the pixel grid, one kernel for each of the two perpendicular orientations. The kernels can be applied separately to the input image. This produces separate measurements of the gradient component in each direction. After this, these can be combined together to find the absolute magnitude of the gradient at each point and the orientation of that gradient.

1. Result

|  |  |  |
| --- | --- | --- |
| Original image | Canny edge detector | Sobel edge detector |
|  |  |  |