# Computer Vision
# Assignment №5

Theoretical Questions

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## 1 Roberts Edge Detector

This operator consists of two $2 * 2$ convolutions masks. It performs a quick to compute gradient.

Gx:

| | |
|---|---|
| +1 | 0 |
| 0 | -1 |

Gy:

| | |
|---|---|
| 0 | +1 |
| -1 | 0 |

This operator is designed to respond maximally to edges running at 45° (Sobel responds maximally to vertical and horizontal edges).

This operator is faster to compute than Sobel operator. beacause of $2 * 2$ kernel size.

Sobel operator provides noise smoothing and differentiating concurrently, but roberts operator does not provide noise smoothing and can be more noise sensitive.

## 2 Laplacian Edge Detector

- Because the kernel is actually approximating a second derivative measurement on the image, it is very sensitive to noise. To resolve this usually noise smoothing is applied before the laplacian.
- The zero crossing generally falls in between two pixels, so this approach doesn't have a high accuracy. It is either more right or more left to the actual edge.[1]

[1] Paper on robotics vision, Israel Institute of Technology

- Because of the zero crossing detection method, even very small local peaks in the first derivative will result in zero crossing in the second derivative, so the accuracy is not high.

# 3 Isotropic Edge Detector

**Isotropic:** Having the same properties in all directions or with respect to all axes.[2]

In terms of image processing, an isotropic edge detector is an edge detector that has a uniform edge magnitude for all directions and angles, unlike anisotropic edge detectors that have a non-uniform magnitude and the intensity of the edge detected is related to the direction e.g. for 45° directions, magnitudes are amplified and for 90° directions magnitude is suppressed.[3]

A famous example of isotropic edge detectors is the Laplacian Edge Detector.[4]

[2] Oxford Dictionary Reference
[3] ME5286, Lecture 6, University of Minnesota
[4] Lecture on Edge Detection, University of Nevada, Reno