Image Processing – Edge Detection

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Outline

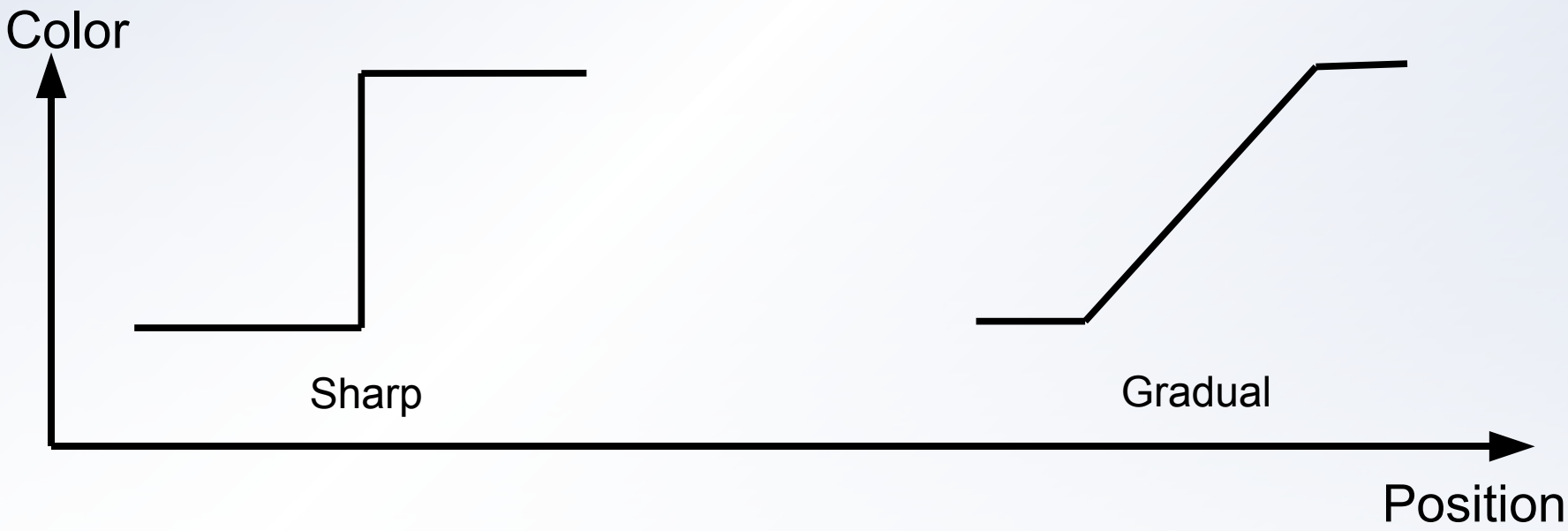
- Introduction
- Edge Detection
  - Convolution
  - Convolution – Gaussian
  - Edge Detection Methods
  - Edge Detection – Laplacian of Gaussian
- Demo
- Conclusion/Future Work

Motivation

- Depict the edge of the objects
- Create some interesting pictures
- Be able to gather the important information effectively
- Capture the more detail by outline the edge of the picture

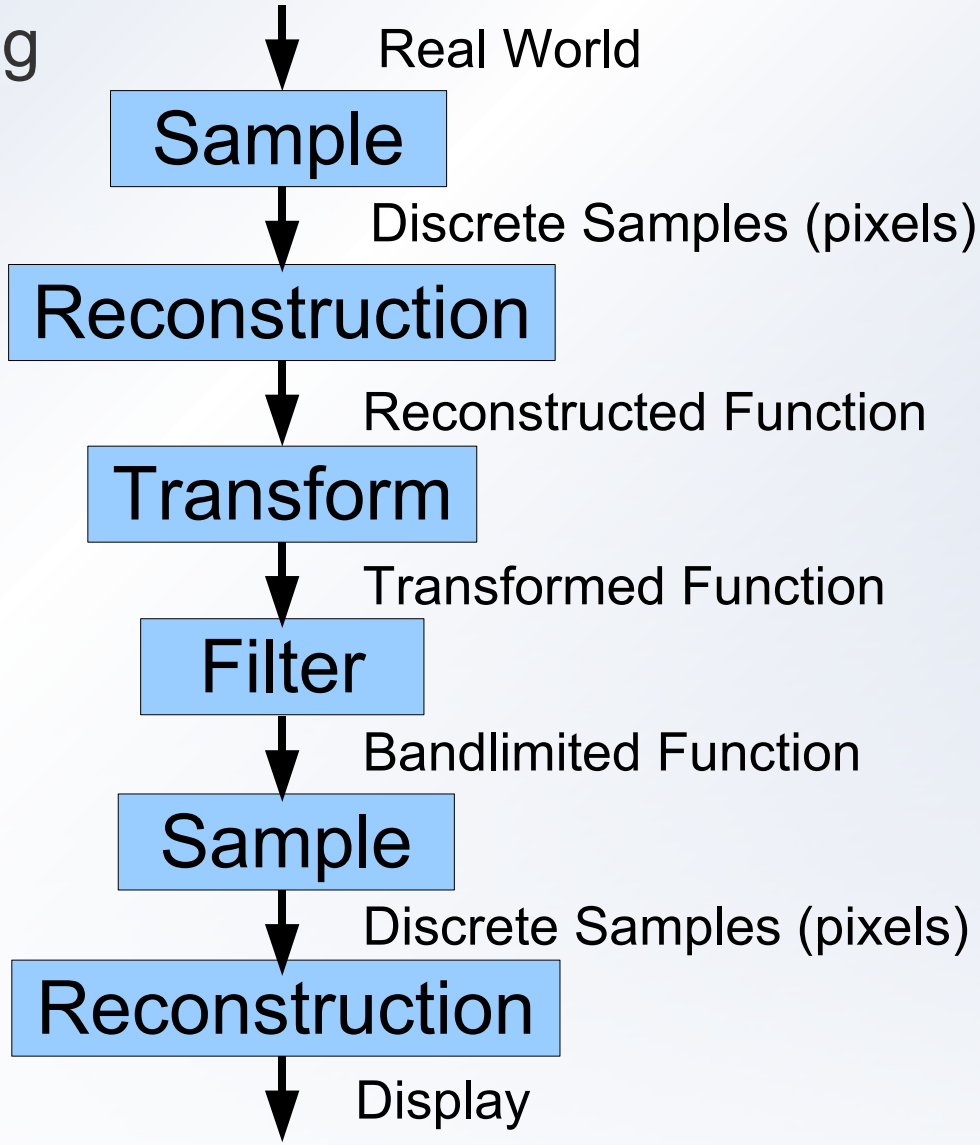
Introduction

- What is edge?
  - Clear edge (ideal)
  - Blur edge (realistic)



Introduction

- Flow of image processing



Convolution

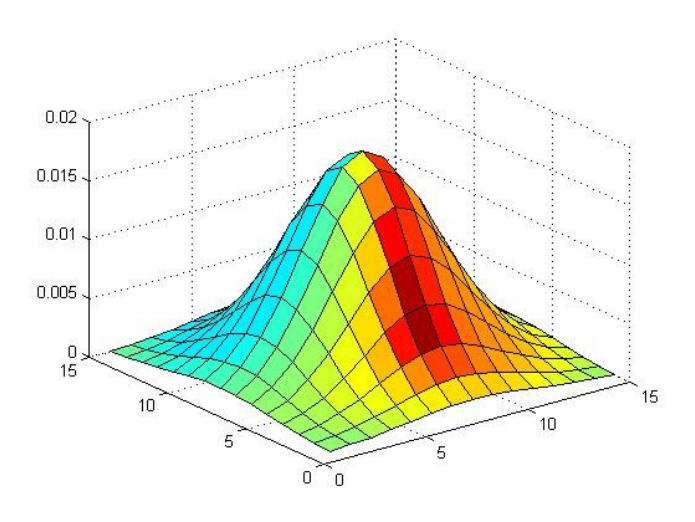
- Convolution of two functions:
  - The sum of each multiplied component

$$g(x) = f(x) \otimes h(x) = \int f(\lambda) h(x-\lambda)\, d\lambda$$

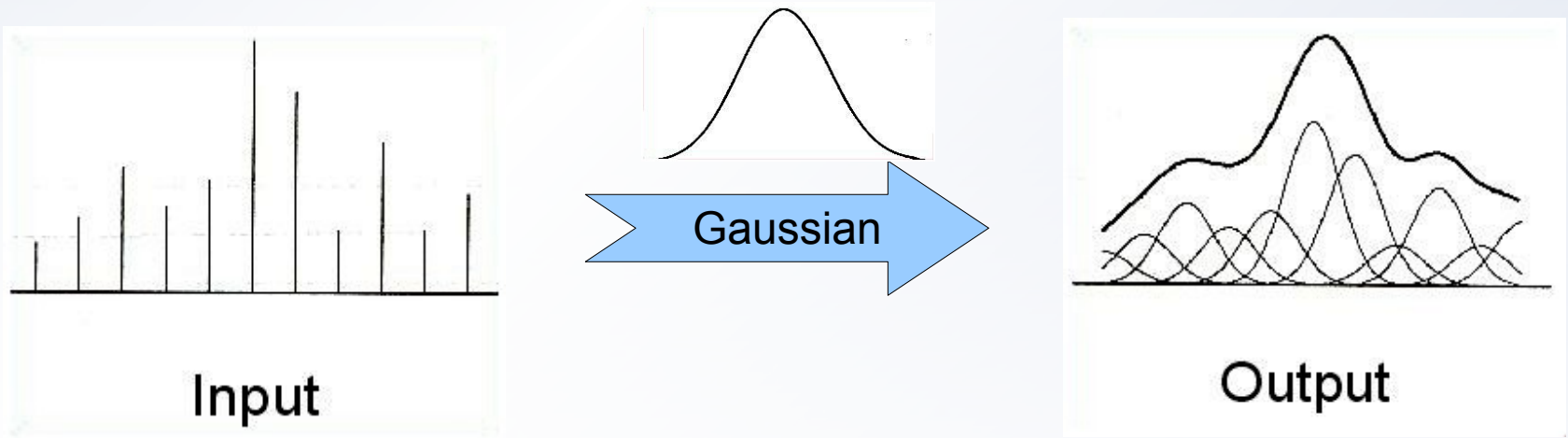
- Convolution Theory
  - Convolution in spatial domain is same as multiplication in frequency domain, and vice-versa

Convolution - Gaussian

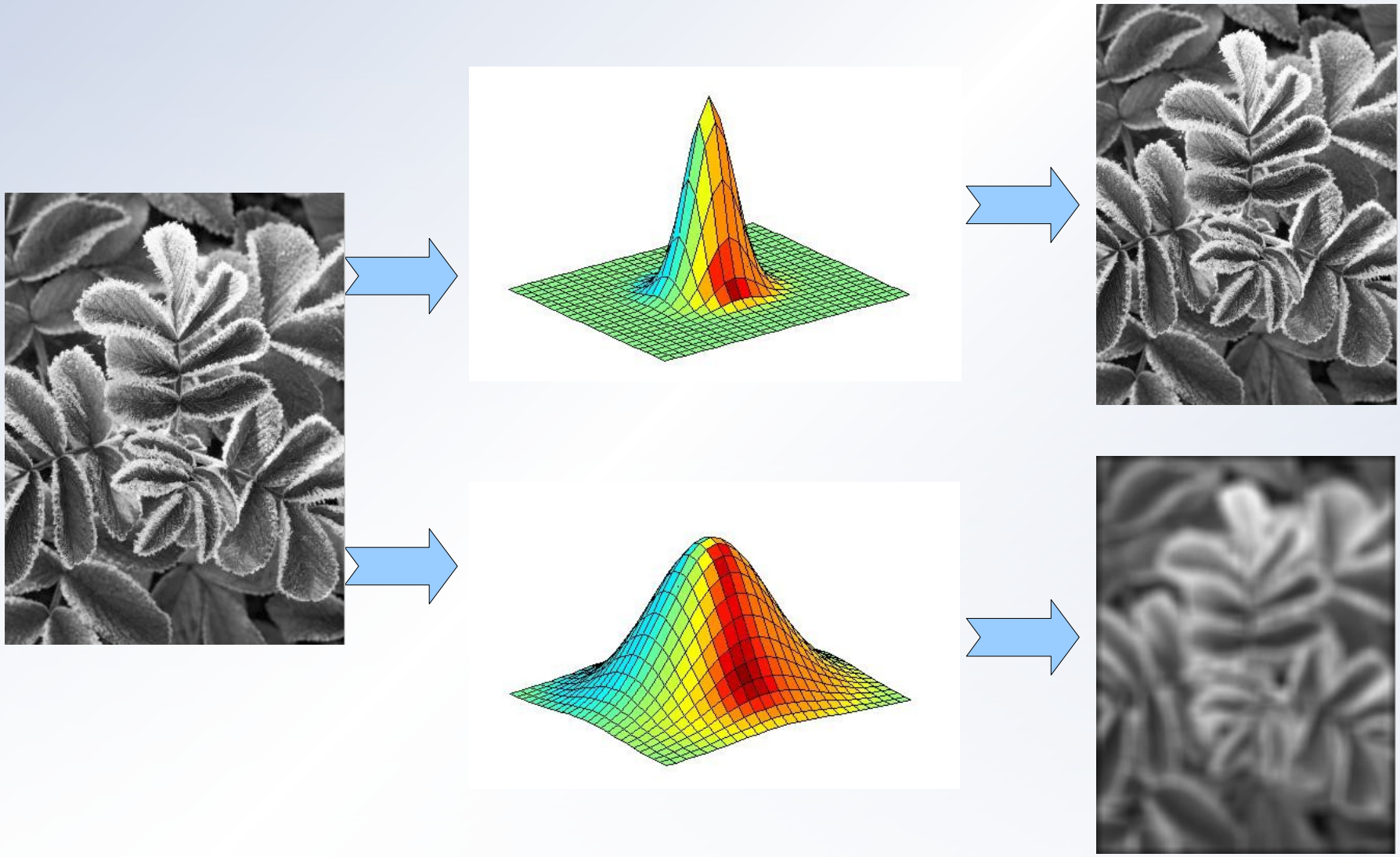
- Gaussian Function



- Convolution



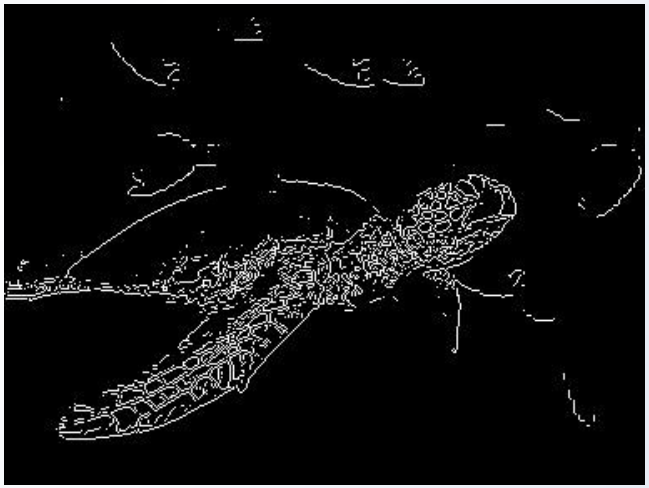
Convolution - Gaussian



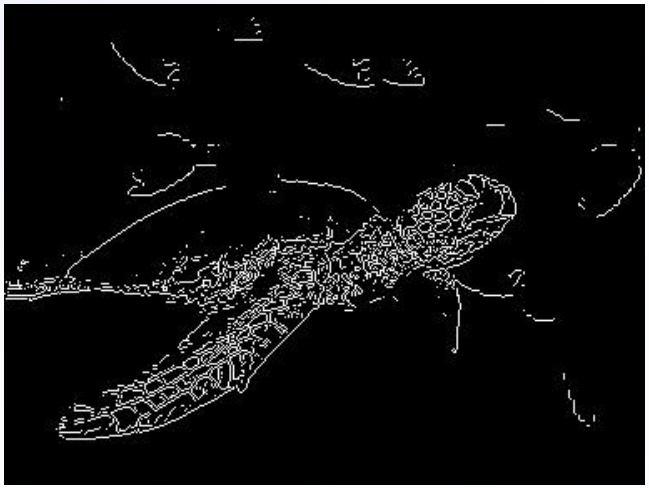
Edge Detection Methods

Original

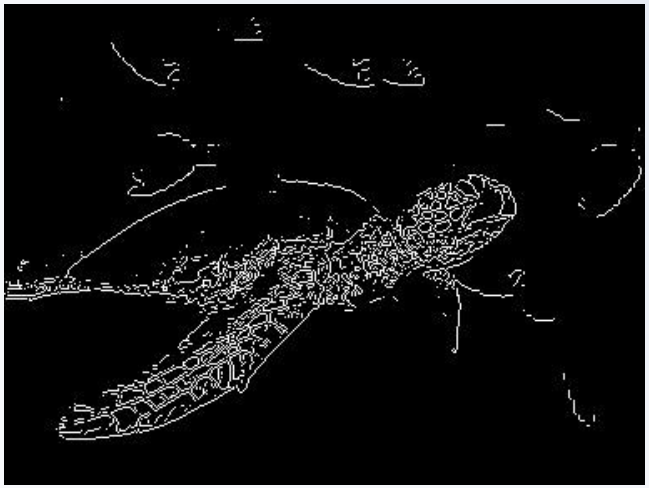
Roberts



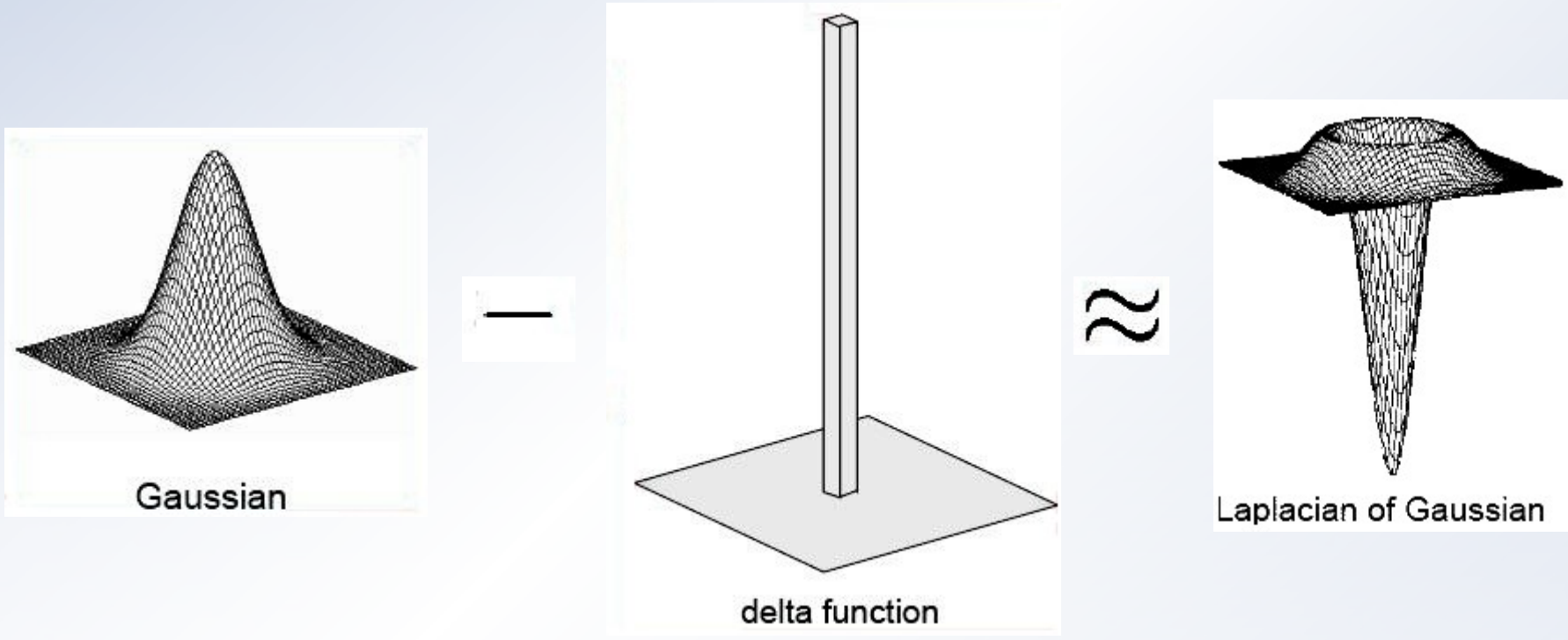
Prewitt



Sobel



Edge Detection – Laplacian of Gaussian



Original Image

Demo

Conclusion/Future Work

- Edge Detection
  - Medical Application
  - Sharp the edge (variance)
- Edge Linking
  - Discontinuing segment

Reference

[1] Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing 2nd” Addison-Wesley (2001)

[2] Duane Hanselman, Bruce Littlefield, “Mastering MATLAB 7” Pearson Prentice Hall (2005)