Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Department of Artificial Intelligence & Machine Learning
Academic Year 2023-2024

Name: Abhay Mathur **SAPID:** 60017210016
Batch: A1

Experiment No. 5B

Aim: Feature Detection in Images

Objective: Develop a program to detect features in an Image (Edge)

Theory:

Difference of Gaussians (DoG) is calculated as the difference between two smoothed versions of an image obtained by applying two Gaussian kernels of different standard deviations (sigma) on that image

As an image enhancement algorithm, the difference of Gaussians can be utilized to increase the visibility of edges and other detail present in a digital image.

A wide variety of alternative edge sharpening filters operate by enhancing high frequency detail, but because random noise also has a high spatial frequency, many of these sharpening filters tend to enhance noise, an undesirable artifact.

The difference of Gaussians algorithm removes high frequency detail that often includes random noise, rendering this approach one of the most suitable for processing images with a high degree of noise.

A major drawback to application of the difference of Gaussians algorithm is an inherent reduction in overall image contrast produced by the operation.

Problem Definition

- Edge Detection using Difference of Gaussian

Observations

SAP ID: 60017210016
Name: Abhay Mathur Class & Div.: Roll No.:
Subject: Topic: Page No.: Date:

CV Experiment 5-B.

Aim: Feature Detection in Images

Objective: Develop a program to detect features in an image (Edge)

Observations: We wanted to detect edges in an image using the difference of Gaussian (DoG) method. This method applies GaussianBlur on an image using the cv2.GaussianBlur function, first with a different standard deviation and then with another different standard deviation.
First we tried with the first GaussianBlur function's standard deviation equal to 5 and the second GaussianBlur function's standard deviation equal to 3. Both having a kernel size of 3x3. We got an image with very less noise but the edges were also thin and a little grainy. When we increased the kernel size ~~of~~ was increased to 5x5, the edge thickness increases but the edges become more defined and there is very less noise. When kernel size is increased to 7x7, the edge becomes too thick & noise becomes much lesser. Thus, the ideal kernel size should be 5x5.
When the kernel size is kept constant as 5x5 and the standard deviations are varied, the following results are observed.

Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Department of Artificial Intelligence & Machine Learning
Academic Year 2023-2024

Name : ____ Class & Div. : ____ Roll No. : ____
Subject : ____ Topic : ____ Page No. : ____ Date : ____

When ~~the~~ σ_1 is made 10 & σ_2 is kept 3 edges become less defined.
When σ_1 is made 5 & σ_2 is made 4 the edges become almost vanish.
When σ_1 is made 20 & σ_2 is are 10, the image completely disappears.

<u>Conclusion</u>: We concluded that the 5x5 kernel produce the best thickness of edges of images along with standard deviation of $\sigma_1 = 5$, $\sigma_2 = 3$ in the Difference of Gaussian filter