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 INFORMATION TECHNOLOGY

COURSE CODE: DJS22ITL603

COURSE NAME: Image Processing and Computer Vision Laboratory CLASS: T Y B. TECH

NAME: Anish Sharma ROLL: I011 DIV: IT1-1

EXPERIMENT NO. 7 CO/LO:

Apply Image Enhancement Techniques.

AIM / OBJECTIVE: To apply Morphological techniques

EXERCISE

Perform Morphological operations such as dilation, erosion, opening, closing.

CODE:

```
import cv2 import
numpy as np
from matplotlib import pyplot as plt

# Load the image
image = cv2.imread('cameraman.bmp')

# Convert to grayscale
gray_image = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)

# Define kernel for morphological operations kernel
= np.ones((5, 5), np.uint8)

# Dilation
dilated_image = cv2.dilate(gray_image, kernel, iterations=1)
```

```
# Erosion
eroded_image = cv2.erode(gray_image, kernel, iterations=1)

# Opening (erosion followed by dilation)
opened_image = cv2.morphologyEx(gray_image, cv2.MORPH_OPEN, kernel)

# Closing (dilation followed by erosion)
closed_image = cv2.morphologyEx(gray_image, cv2.MORPH_CLOSE, kernel)

# Plot results plt.figure(figsize=(8,
8))

plt.subplot(2, 3, 1)
plt.imshow(cv2.cvtColor(image, cv2.COLOR_BGR2RGB))
plt.title('Original Coloured Image') plt.axis('off')

plt.subplot(2, 3, 2)
plt.imshow(gray_image, cmap='gray')
plt.title('Original Grayscale Image')
plt.axis('off')

plt.subplot(2, 3, 3)
plt.imshow(dilated_image, cmap='gray')
plt.title('Dilation') plt.axis('off')

plt.subplot(2, 3, 4)
plt.imshow(eroded_image, cmap='gray')
plt.title('Erosion') plt.axis('off')
```

```
plt.subplot(2, 3, 5)
plt.imshow(opened_image, cmap='gray')
plt.title('Opening') plt.axis('off')

plt.subplot(2, 3, 6)
plt.imshow(closed_image, cmap='gray')
plt.title('Closing') plt.axis('off')

plt.tight_layout() plt.show()
```

OUTPUT:

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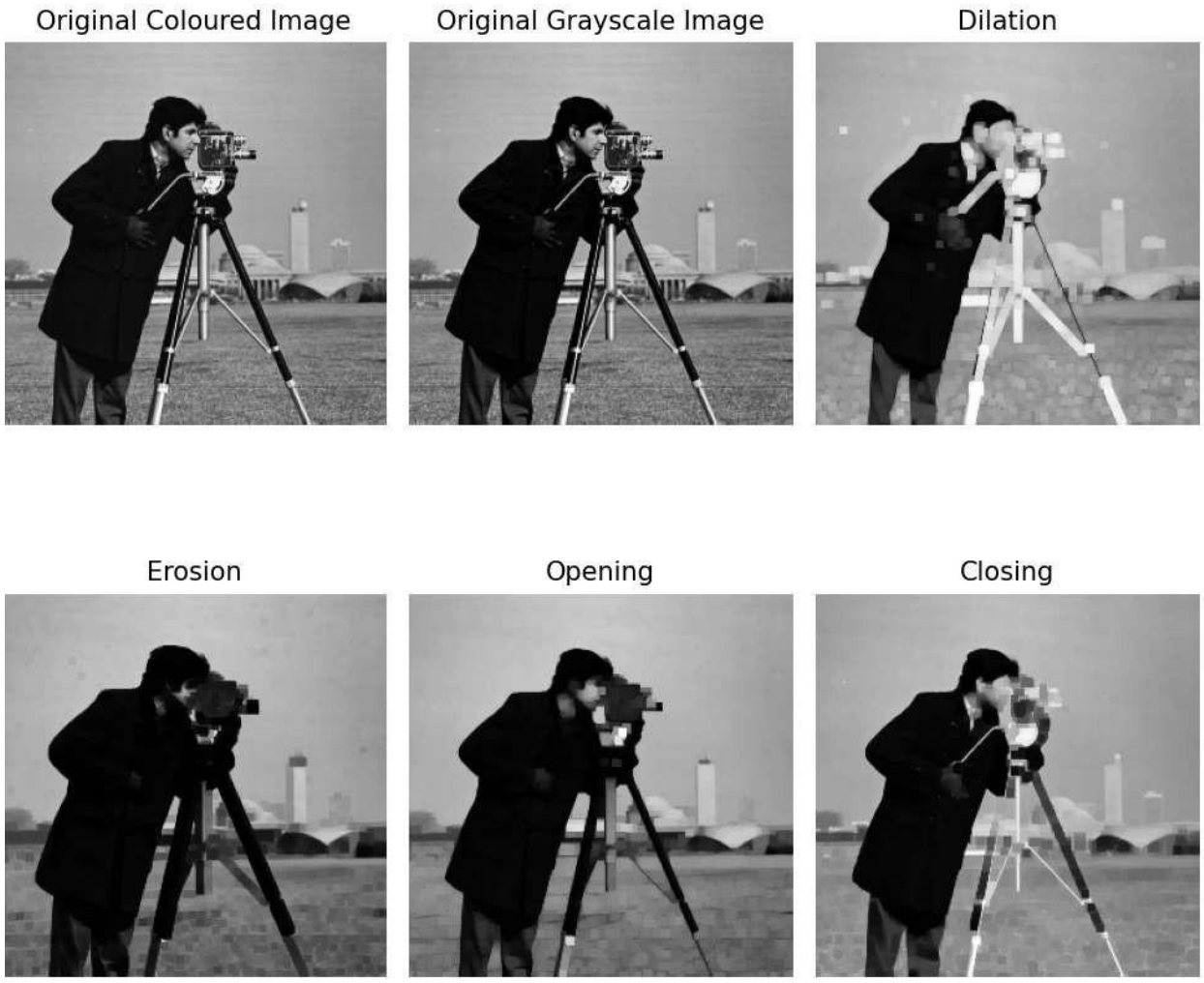

CONCLUSION:

This experiment demonstrates the effectiveness of morphological operations (dilation, erosion, opening, and closing) in image processing. Dilation expands object boundaries, erosion shrinks them, opening removes small noise, and closing fills small holes in objects. These techniques are widely used in noise reduction, edge enhancement, and shape analysis in computer vision applications.

REFERENCES:

Website References:

1. Kaggle, “Spatial Filtering OpenCV,” Available: https://www.kaggle.com/code/bhavinmoriya/spatial-filtering-opencv.
2. OpenCV “Image Filtering,” *OpenCV Documentation*. Available: https://docs.opencv.org/4.x/dd/d6a/tutorial_js_filtering.html#:~:text=As%20in%20one%2Ddimensional%20signals,finding%20edges%20in%20the%20images..