Experiment-8

Image Segmentation using Active Contour Model

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Aim: To perform image segmentation using active contour and snake model.

Resources Used: Anaconda Python Environment

Google Colab Jupyter Notebook

Theory :

OpenCV stands as an open-source library designed for computer vision and machine learning applications. Its primary goal is to offer a unified foundation for computer vision projects and to facilitate the integration of machine perception into various commercial products.

On the other hand, NumPy serves as a Python library, enabling support for large, multi-dimensional arrays and matrices, accompanied by an extensive array of high-level mathematical functions for manipulating these arrays.

Additionally, Matplotlib functions as a Python plotting library, directly connected to the numerical mathematics capabilities of NumPy. It delivers an object-oriented API for seamlessly embedding plots within applications.

Tasks:

1) Perform segmentation of an input image (take astronaut image in scikit-image) using Active Contour Model. Initialize a suitable spline to perform the segmentation.
2) Use 'COIN" image and extract maximum possible number of coin objects using Snake Model.

Procedure :

- Open Google Colab and create a new Jupyter Notebook.
- Import important libraries namely Skimage, Numpy and Matplotlib.

Exp_8_21BAI1500_N_U_Praneeth_Reddy_MV.ipynb

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Exp-8 : To perform image segmentation using active contour and snake model.

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```
[1] import numpy as np
    import matplotlib.pyplot as plt
    from skimage import data, color
    from skimage.segmentation import active_contour
    from skimage.draw import circle_perimeter
    from skimage.segmentation import (morphological_geodesic_active_contour,inverse_gaussian_gradient)
```

- Read the image and display it in grayscale.

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```
[2] img = data.astronaut()
    gray_img = color.rgb2gray(img)
    plt.imshow(gray_img,"gray")
```

```
<matplotlib.image.AxesImage at 0x7e976c87f790>
```

Task-1 : Perform active contour on the image for segmentation with suitable spline.

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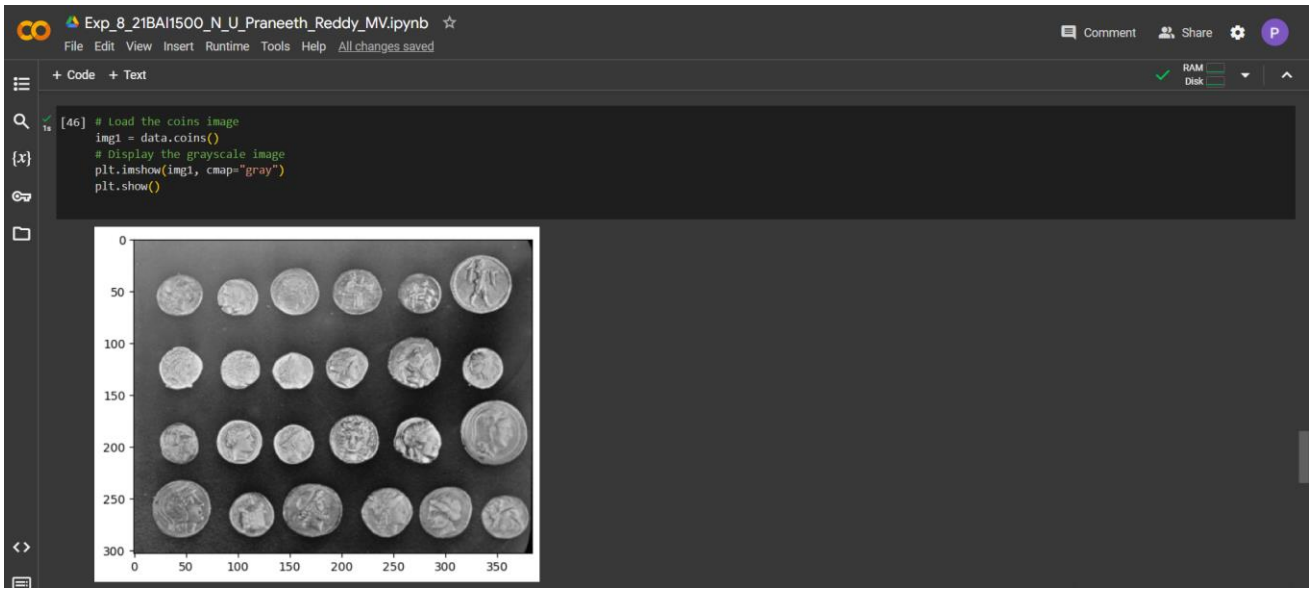
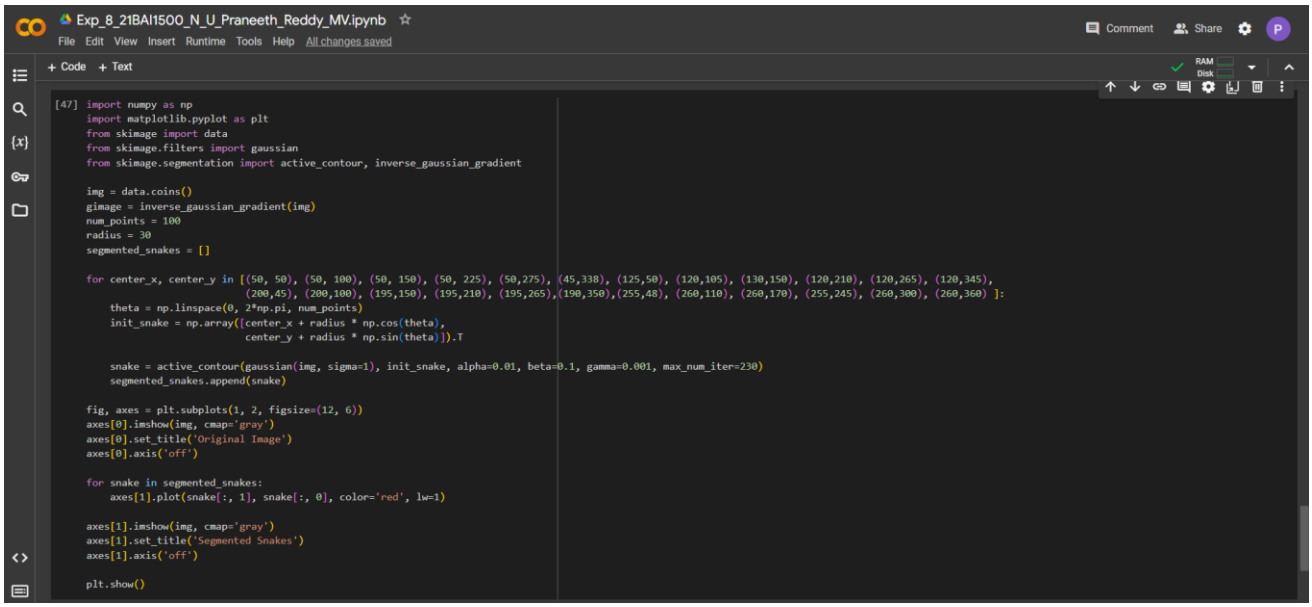
```
[3] r = 100  # Radius of the circle
    rows, cols = gray_img.shape
    theta = np.linspace(0, 2*np.pi, 100)
    x = 220 + r * np.cos(theta)
    y = 100 + r * np.sin(theta)
    init = np.array([x, y]).T

    alpha = 0.01
    beta = 1.0
    gamma = 0.001
    coordinates = active_contour(gray_img, init, alpha=alpha, beta=beta, gamma=gamma)

    fig, ax = plt.subplots(figsize=(7, 7))
    ax.imshow(gray_img, cmap='gray')
    ax.plot(init[:, 0], init[:, 1], '--r', lw=3)
    ax.plot(coordinates[:, 0], coordinates[:, 1], '-b', lw=3)
    ax.set_xticks([]), ax.set_yticks([])
    ax.axis([0, gray_img.shape[1], gray_img.shape[0], 0])

    plt.show()
```

Task-2: Using snake model extract coins from the coin image of skimage.

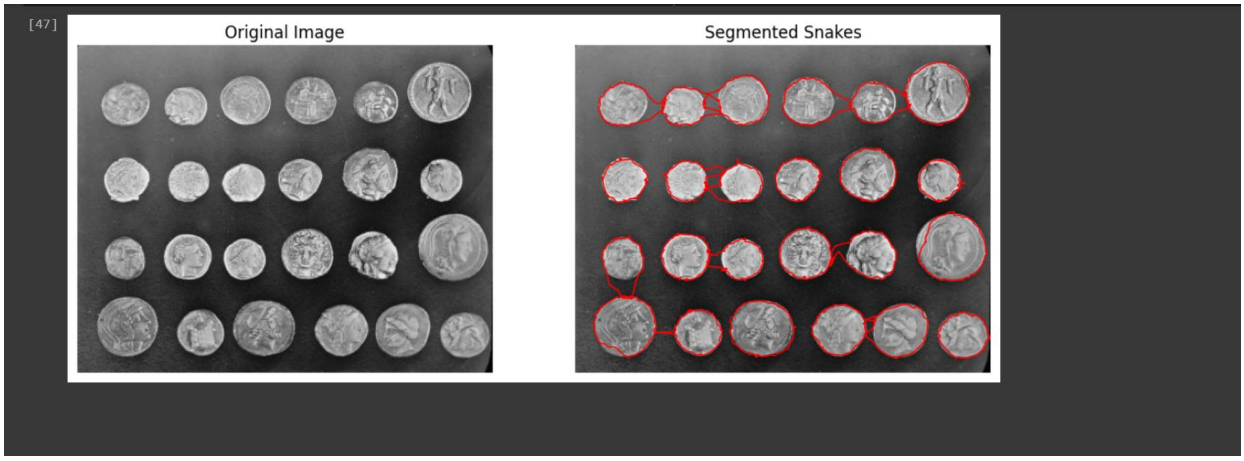
- Read the coins image and display it in grayscale.



- segmenting multiple coins in an image using active contours (snakes) initialized as circles around each coin.



- Plotting the original image and the segmented snakes



Results: The given tasks have been done using programs in Python using Skimage, Matplotlib and Numpy libraries.

Conclusion: Python program have been created to perform Snake model and Active Contouring on the coins image and the astronaut image.

Google Collab Link :
https://colab.research.google.com/drive/1KtSezNAe4OFPbqqWILzDdD0TiehGx_Kw?usp=sharing