Assignment 2

Digital Image Processing

Github: https://github.com/mubashir508/8-Connectivity-Image-Processing

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Introduction

The provided Python code is designed to segment stars in an image with a black background. It utilizes 8-connectivity for image processing. Below is a detailed analysis of the code structure, functionality, and potential areas for improvement.

Code Structure

1. **Segmentation Class**

   - The code starts by defining a class named **Segmentation** which encapsulates methods for image processing.

2. **Initialization**

   - The class constructor (**__init__**) initializes essential variables like **Image**, **totalObjects**, and **labels**.

3. **Display Methods**

   - **show**: Displays images using OpenCV with a specified window name.

   - **showChannel**: Displays a specific color channel of an image.

4. **Segmentation Process**

   - **Segment**: This method performs the actual segmentation using 8-connectivity. It iterates through the pixels, assigning labels based on connectivity.

5. **Label Equivalence Check**

   - **CheckEqualvilance**: Ensures label equivalence by checking neighboring pixels and adjusting labels if necessary.

6. **Image Loading and Thresholding**

   - The code loads an image, converts it to grayscale, and thresholds it to create a binary image.

7. **Label Collection**

   - **unique** function collects unique labels in the segmented image using vectorized operations.

8. **Random Color Generation**

   - Random colors are generated for each unique label.

9. **Color Assignment to Segmented Regions**

   - Original image pixels are assigned random colors corresponding to the segmented regions.

10. **Display Result**

- • The final segmented image with labeled stars is displayed using OpenCV.

Code Functionality

The code performs the following steps:

1. Loads an image and converts it to grayscale.

2. Thresholds the grayscale image to create a binary image.

3. Applies 8-connectivity segmentation to identify connected regions.

4. Checks and adjusts labels for equivalence.

5. Assigns random colors to the segmented regions.

6. Displays the segmented image with labeled stars.

Conclusion

The provided code successfully segments stars in an image with a black background using 8-connectivity. It demonstrates effective image processing techniques and provides a foundation for further improvements in terms of efficiency and code organization