Course:Digital Image Processing
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In this assignment, I worked with digital images using Python in a Jupyter Notebook. I used libraries such as OpenCV for image processing, NumPy for numerical operations, and Matplotlib for displaying images.

First, I loaded a color image and checked its basic properties, including its shape and data type. The image size was 1500 × 1500 pixels with three color channels (RGB), and the data type was uint8. I also examined specific pixel values to better understand how image data is stored.

Next, I saved the image to a new file and reloaded it to confirm that the saving process worked correctly. After that, I converted the image to grayscale and observed the difference between the original RGB image and the grayscale version.

I then applied two types of thresholding: a manual threshold with a fixed value (128) and Otsu's automatic thresholding method. Otsu's method selected a threshold value of 115, which adapts automatically based on the image histogram.

I also extracted a Region of Interest (ROI) from the center of the image to demonstrate cropping techniques. In addition, I converted the image from RGB to HSV color space and displayed the Hue, Saturation, and Value channels separately to better understand color representation.

Finally, I performed several arithmetic operations on the image, such as adding and subtracting intensity values, increasing only the red channel, multiplying pixel values, and dividing them. These operations showed how image brightness and contrast can be adjusted. To avoid errors, pixel values were clipped to remain within the valid range of 0–255.

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