

COMMENTARY

1 Results of thresholding for RGB channels

Using sliders to apply thresholding independently to the red, green, and blue channels produced different results due to the RGB color model's representation of color. The red channel thresholding brought out the highlights of objects with strong red components, while the green and blue channels emphasized areas dominated by their respective colors. Depending on the dominant color, objects appear differently in each channel due to the varying intensity values.

2 Comparison of Thresholds

Different RGB thresholding results were obtained using color space conversion between YCbCr, HSV, and HSL. By separating luminance from chrominance, YCbCr reduced sensitivity to lighting changes and enhanced contrast. Color segmentation and object distinction were enhanced by HSV, which prioritized hue over intensity. Edge detection and color separation were enhanced by HSL. These methods, which separated brightness from chromatic components, reduced noise and enhanced segmentation compared to RGB, leading to more consistent thresholding in various lighting scenarios.

3 Problems faced and Solutions

The inconsistencies in color thresholding were addressed with adjustable sliders. Background segmentation occasionally produced objects, which were reduced by slightly blurring the segmentation mask. Another challenge was maintaining a visually structured and orderly display, which required careful calculations to ensure that the grid was positioned correctly.

4 Project Completion and Areas for Improvement

The project was completed successfully. Overall, this project increased my understanding of image processing techniques, color space conversion, and thresholding. The experience has enhanced my skills in image processing and application development.

5 Extensions

1. HSL colour space conversion and thresholding

The addition of thresholding and HSL color space conversion improved color-based image processing. With HSL, color and brightness can be separated for more precise adjustments. By focusing on hue instead of total brightness, this

enhancement improved color filtering and object segmentation, ensuring more accurate results.

2. Background segmentation with colour-changing feature

Using the color wheel button, users can alter the background color of the background segmentation extension, which is based on the background subtraction technique. Users can dynamically select a color to customize the image background.

3. Load external images

At first, image processing could only be done using live webcam input, but with this extension, users can upload their own photos and use the same filters and adjustments.

4. Capture button

A capture button was included to facilitate users' ability to store their processed images. This feature captures the entire filtered grid as a JPEG file, allowing users to save the applied transformations for later use.

5. Zoom-in/zoom-out filter

Users can use zoom-in and zoom-out features to examine individual filters. When multiple photos and transformations were displayed in a grid, some details were hard to see. The zoom-in feature will allow users to click on a specific processed image to enlarge it, making it easier to see the effects of thresholding and color space conversion.