Image Recognition Error Log 2

Multi-Endpoint Image Recognition Error Log

Why the Previous Method Didn't Work
Initially, I used a method to detect specific color ranges. The process was:
1. Define a color range (like red, blue, etc.).
2. Mask the image with this color range.
3. Find the centroid of the masked area.

This method had several drawbacks
Sensitivity to Color Variation: Slight changes in color could mean missing or wrongly identifying a point.
Overlapping Ranges: Colors close to each other in the RGB space could be confused or misidentified.
Dependence on Exact Colors: I needed to know the exact colors to look for in advance, which isn't practical if colors are randomly chosen by the user.

New Method: KMeans Clustering
The KMeans algorithm clusters data based on proximity in a given space. When applied to an image in the color space (RGB in this case), it groups pixels with similar colors. It doesn't look for specific colors, but identifies the main colors in the image.

Steps
1. Convert the image into a list of RGB values.
2. Cluster these RGB values using KMeans.
3. The centers of these clusters represent the main colors in the image.

Advantages of KMeans for this task
Flexibility: It can identify and group any color, not just predefined ones.
Robustness: Less sensitive to slight color variations.
Automatic Color Detection: It finds the main colors in the image without me having to specify what to look for.

Why KMeans Works for This Case
The image is composed of several different colors on a white background. When I apply KMeans, it easily identifies these different colors as separate clusters. After filtering out the white background and the red starting points, the remaining cluster centers provide us with the colors of the endpoints. Then, I can find these colors in the image to locate the endpoints.

Summary
While the original method was based on fixed color ranges and required precise knowledge of colors in advance, the KMeans method is more dynamic. It automatically identifies the main colors in the image, making it more versatile and powerful for various inputs.

Illustration