

## CW3- Face Edge Detection

This work describes various edge-detection approaches for my passport image. **My aim is to delineate only the face from the image.** The work has been compared with **RGB thresholding, HSV thresholding, K-means clustering and SVM.**

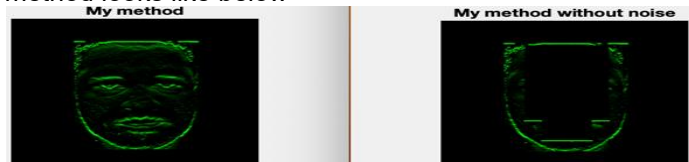
The image is an **RGB image** having a **red intensity value of up to 223**, a **green intensity value of up to 160** and a **blue intensity value of up to 130**. I first applied thresholding by considering image indexes greater than 130 to the RGB image which gives the better visibility of my face. I then segmented my face by removing the various noises. I then applied edge detection to different methods.

The **hue, saturation and value thresholds are 0.9, 0.5 and 0.07 respectively.** I first did the image processing by using these thresholds and then segmented my face to show a mask image. I removed noise below the chin with the help of **improfile**. I then applied edge detection of my segmented face to different methods.

Applied **clustering for 2, 3, 5, 7 and 10 regions in the K-Means approach.** I then used class 1 for my face to show the HSV and RGB images. I finally segmented my face from the image by removing the various noises and then applied edge detection to different methods.

Applied **the SVM approach and predicted the HSV and RGB image of my segmented face.** I segmented the face by removing the various noises and then applied SVM algorithm. The loss for predicting the HSV and RGB images is nearly 0. I then applied edge detection to the segmented predicted face to different methods.

After applying all the above approaches and different edge detection methods like **Sobel, Roberts, Canny, Log, Zero Cross, Prewitt and my own edge method**, I have found that SVM has outperformed the others. In RGB and HSV thresholding, we see a lot of noise in every edge method and even the breaking of the face edge in Sobel, Roberts, and Prewitt methods (for RGB thresholding). The K-Means algorithm has failed to distinguish between my face and the background (even for k=10 regions). The Sobel, Roberts and Prewitt methods have again shown the breaking of the face edge, and the other methods show huge noises. In the SVM approach, we see less noise in Sobel, Roberts, and Prewitt's methods but there are breaking face edges. We see many noises in the Canny, Log and Zero Cross methods. But in my own method, the noise and breaking face edges are comparatively less. Even the eyes and lips can be seen clearly. Therefore, my method in SVM has outperformed all the existing methods. I then removed the noises inside my face like eyes, nose, and lips. The result of my method looks like below –



In conclusion, the challenge I have found in detecting my facial edge is mainly to keep the continuity of facial edge lines and not let them break anywhere. Many close noises to the face like ears, hairs and shoulders have been removed with the help of **improfile**. My own method with the SVM approach has performed well in comparison with the other approaches but could have been more fine-tuned to get the perfect facial edge with the accurate convolution operator. Also, perfectly removing noises within the face was a challenging task.

### Extra Features Added:-

- Added my own signature to my image.



- Created nested functions and clear interfaces.
- Coloured the detected face edge in all the different approaches and edge methods.
- The entire work is in a single **.m** file.
- All the images have been displayed in 1 figure whose name is **Face Edge Detection**.
- Created my own edge method that stood out the best among all the existing methods in SVM approach.