Beauty Bot

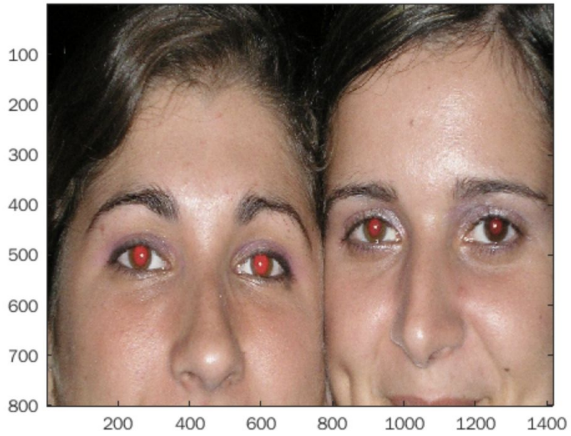
Cara Nix and Olivia Ridge

Red Eye Remover

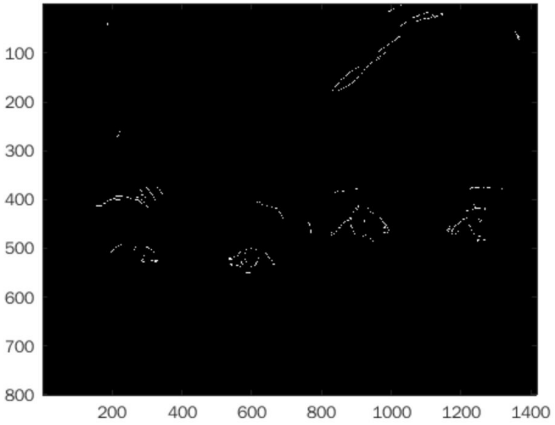
Goal: remove red eyes from image

Approach: use edge detection to isolate the eyes

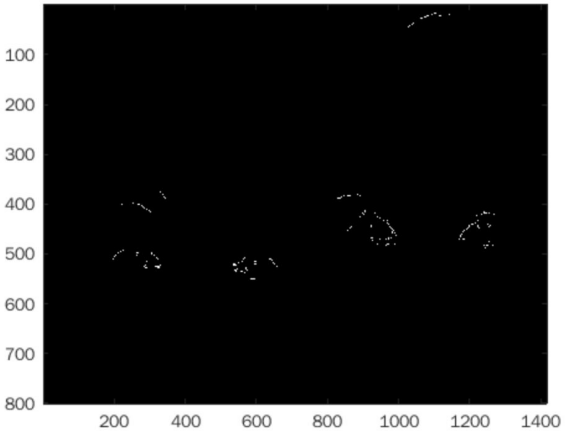
Why edge detection: We are looking for a sharp increase in intensity within “R”



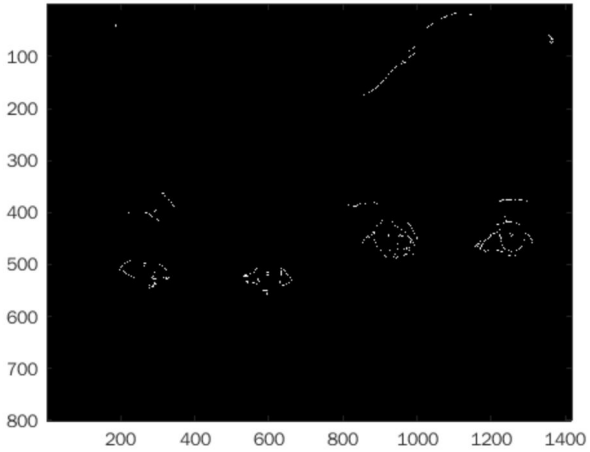
Canny Edge Detection



R

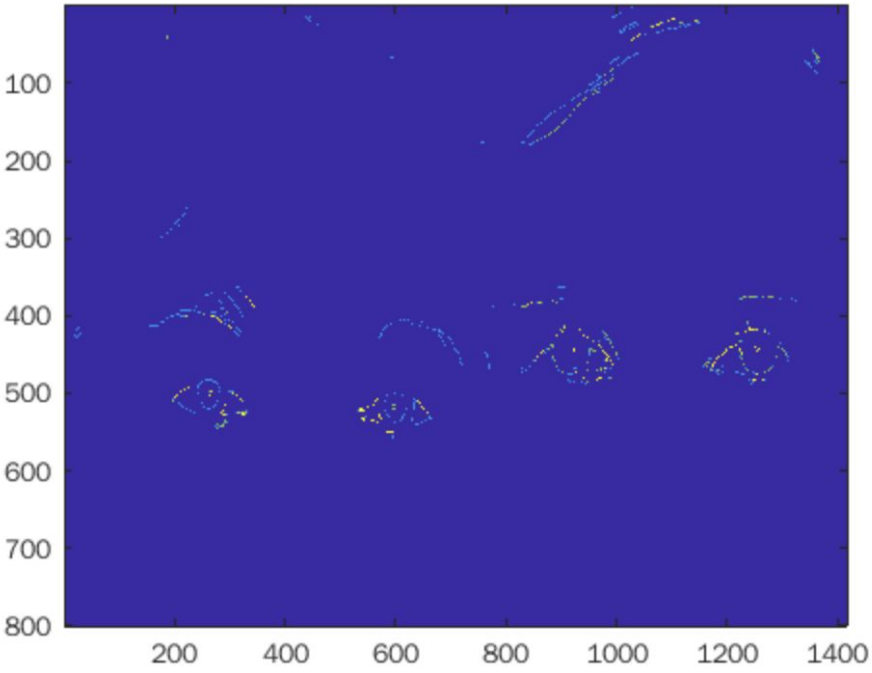


G

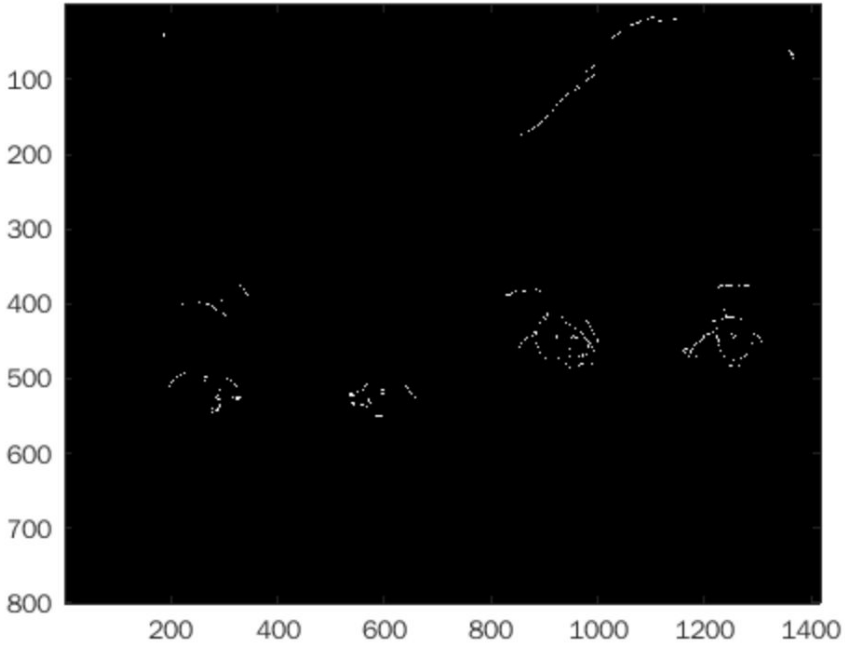


B

Combine → Threshold



R+ G + B



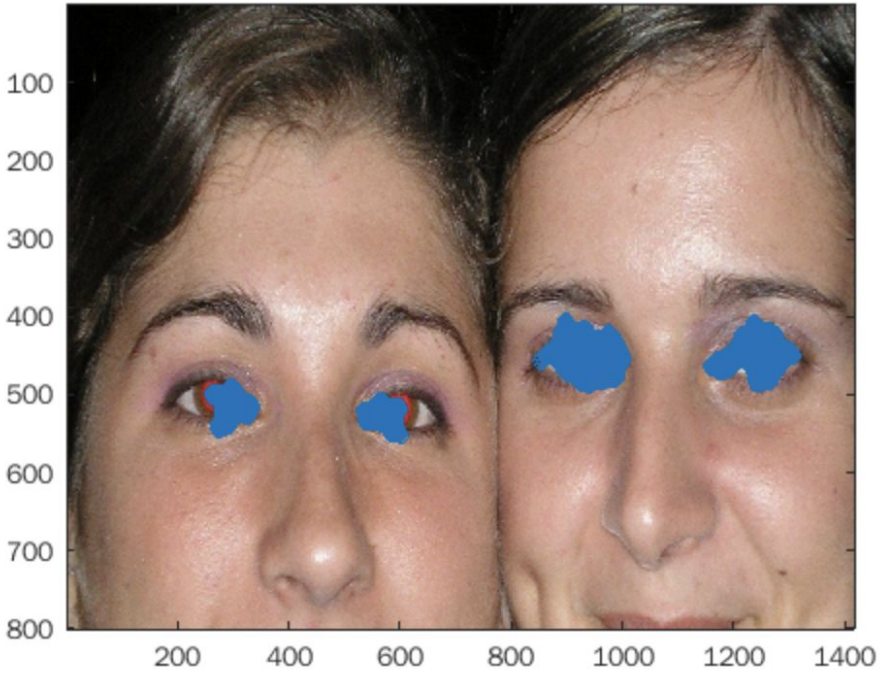
R + G + B >2

Dilation + Erosion → bwareaopen (thresholding)

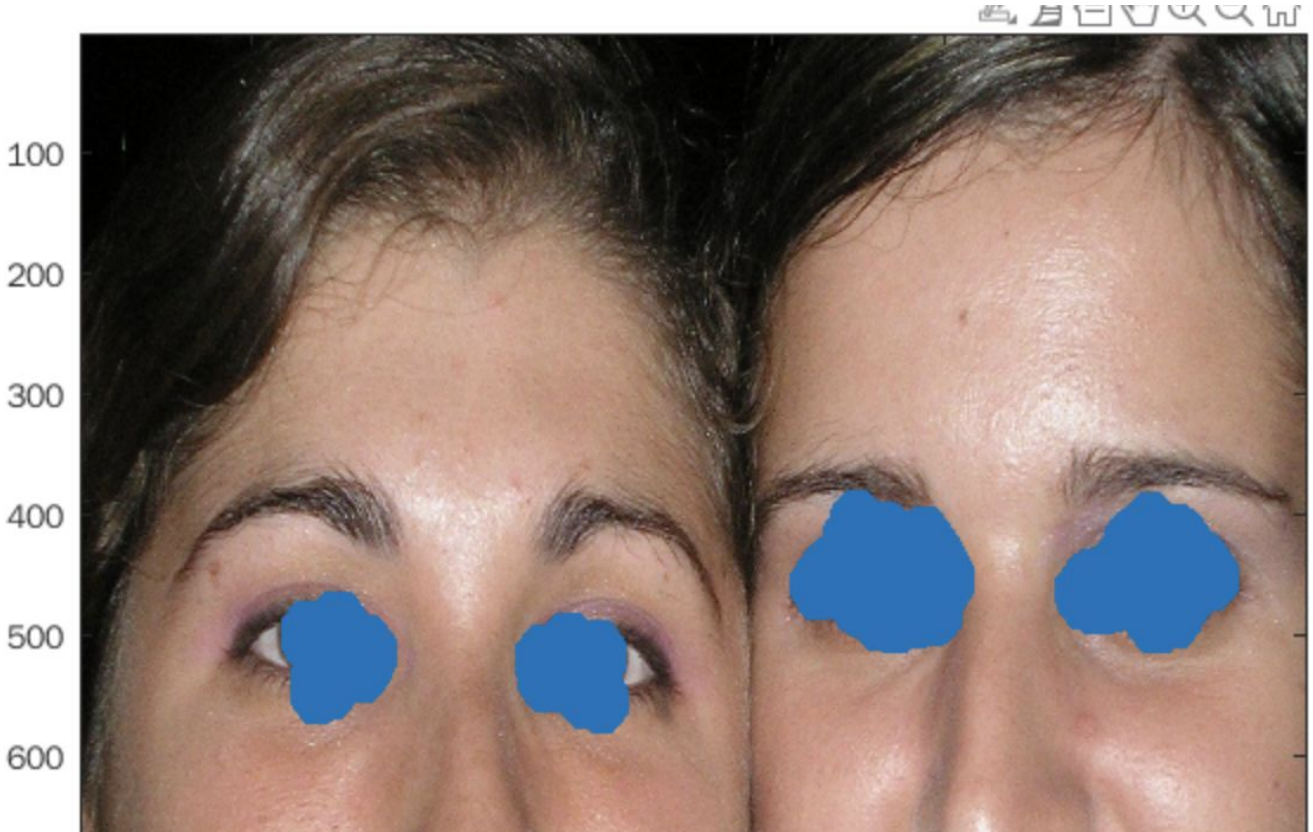
Closing (dilation + erosion)

Connected Components (Threshold 600)

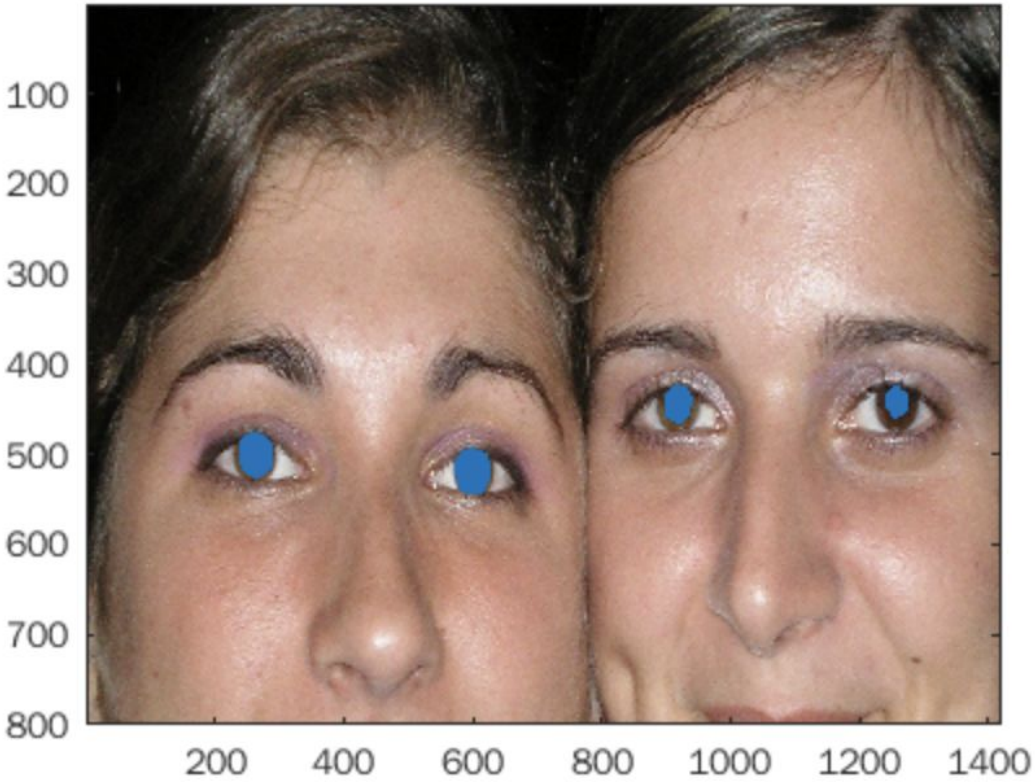
Where are these on original image?



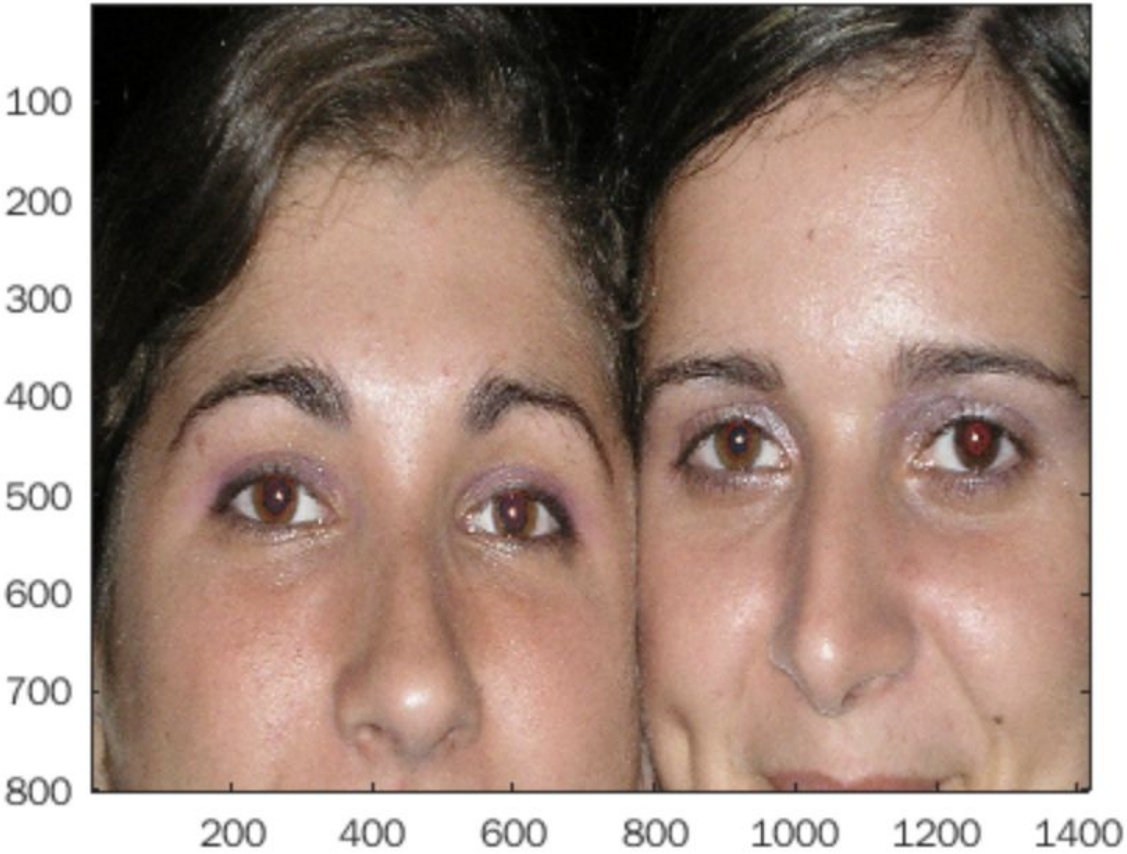
Made it bigger- Dilation



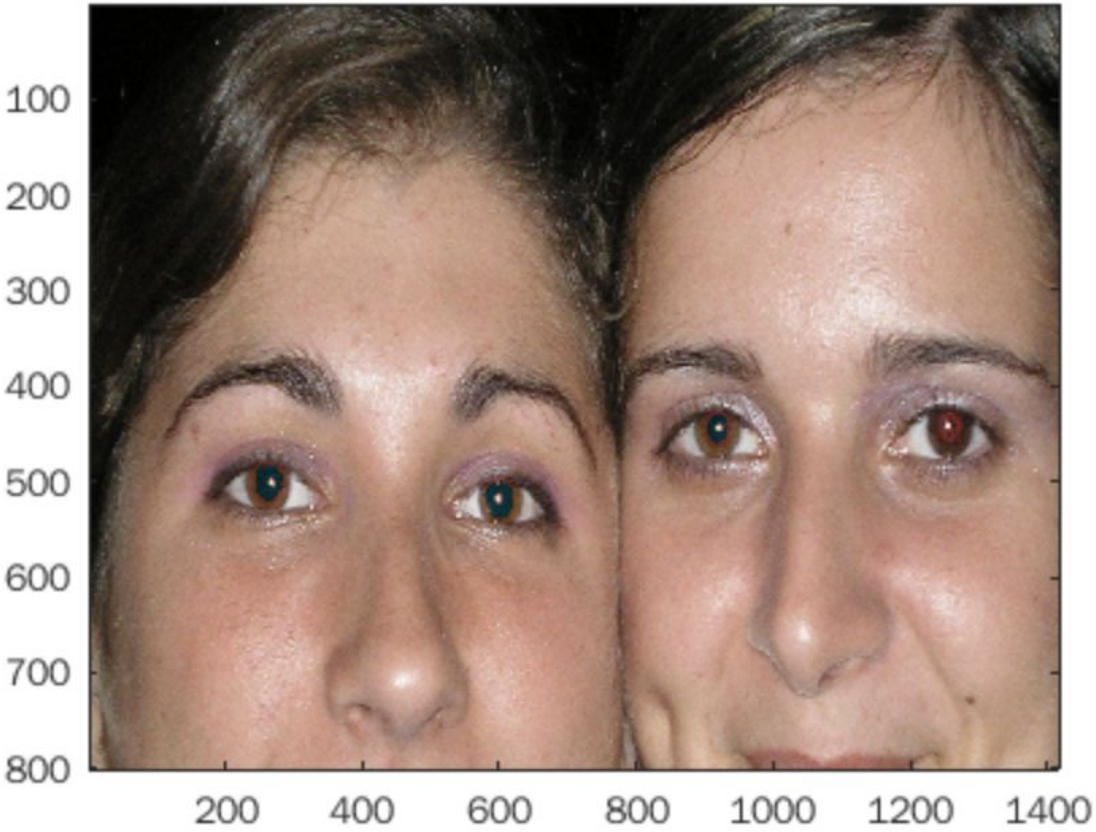
Thresholding (R >140, G >70, B >70)



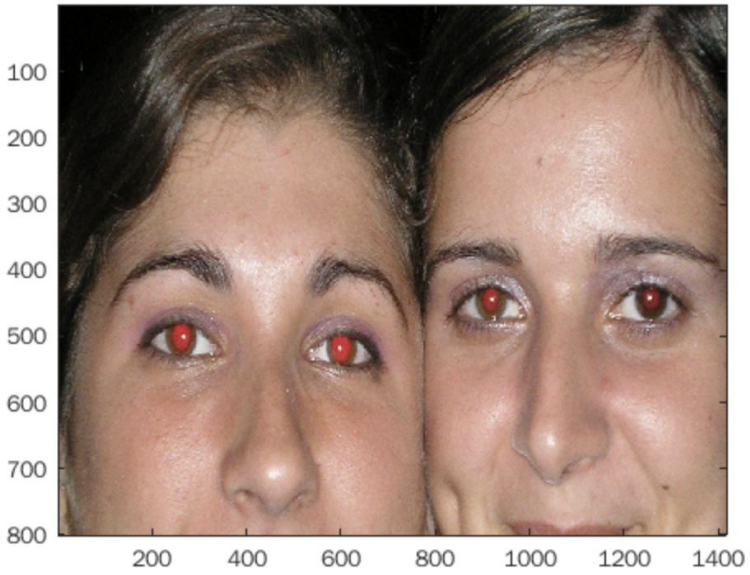
Change color (R-120)



Gaussian Blur (localized)!



Compare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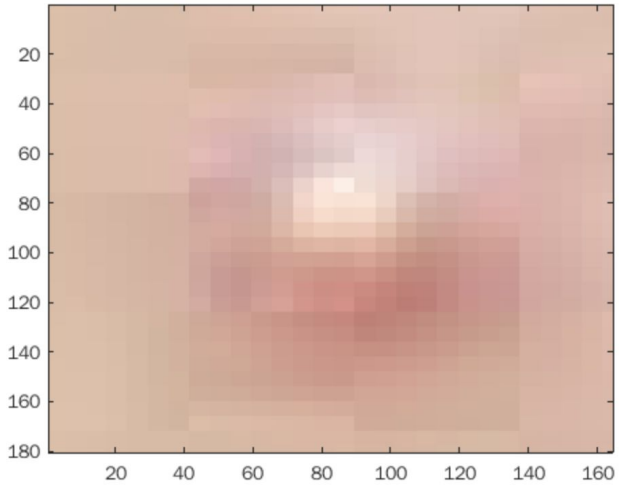
Acne Removal- Template Search

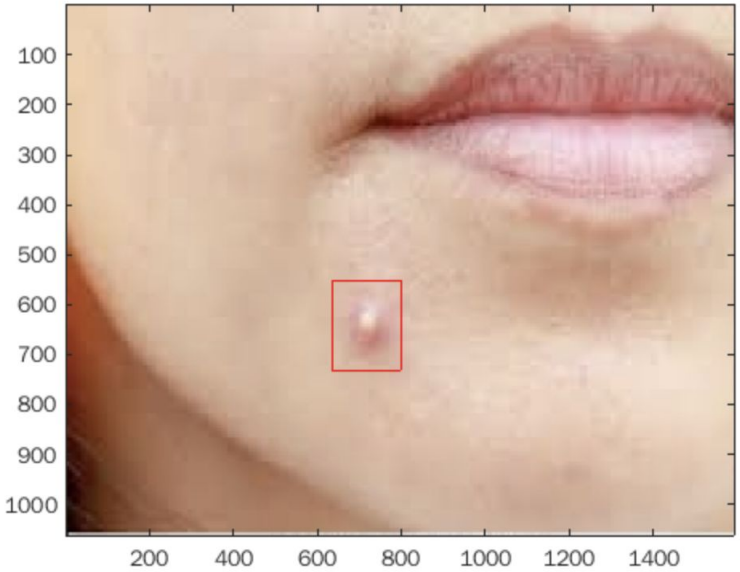
Original Image/ Search Image



template

Method: Use NCC

- Search image for template (max NCC value)- took ~16 minutes to run



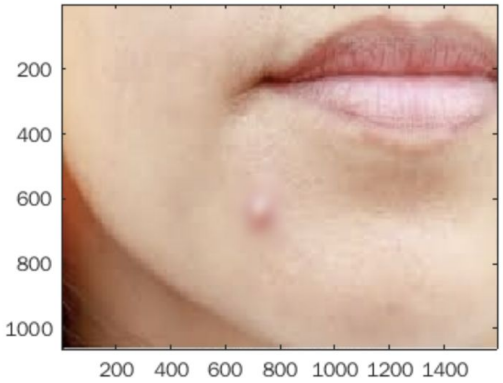
Smooth- Gaussian

Sigma = 15

Sigma = 35

Sigma = 50

Smooth- Gaussian (expanded smoothing area x 50)



Sigma = 15

Sigma = 35

Sigma = 50

Before & After Acne Removal

Retroactive Portrait Mode

Goal: apply portrait mode stylization after the photo is taken

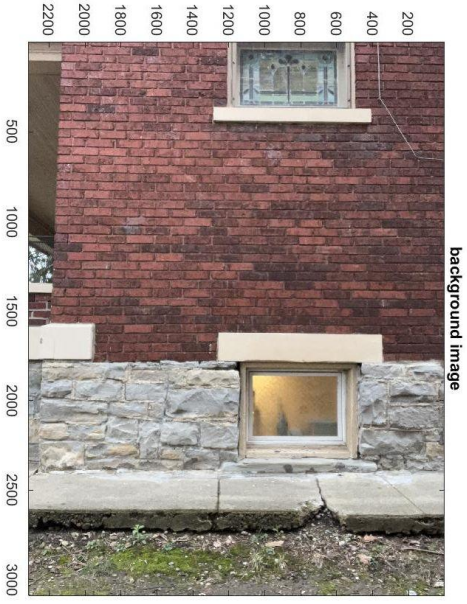
Approach: use background subtraction, erosion, dilation, etc. to accurately target subject, use Gaussian smoothing to blur background, combine

Why background subtraction: A way to isolate the subject using photos that are more feasible to take than those needed for a depth map, less costly to compute

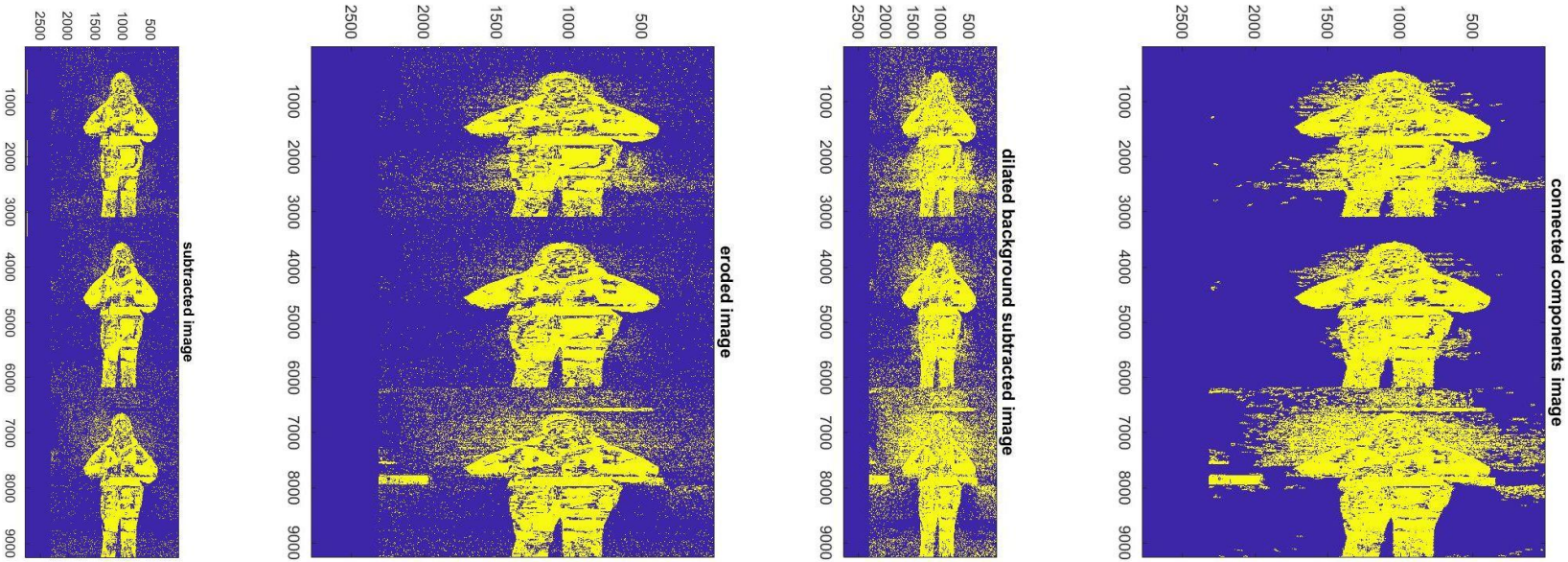
Background Subtraction - Photos Needed

Problem: iPhone front facing camera can’t take portrait mode photos.

Solution: User can use the front camera to take two photos, one of background and one of subject in front of background.



Subtraction, Erosion, Dilation, Connected Components



To Note: T=10 used during background subtraction because it gave the best results for not cutting out too much of subject, dilated after erosion to increase this as well

Blurred Background (sigma=15), Final Portrait

Sigma=15 chosen because caused blur to be most similar to effect seen in portrait mode on phones

Lip Color Changer

Goal: change the color of the lips of the person in the photo

Approach: use template matching with SSD to find lip region, isolate lips with canny edge detection, manipulate color channels within lip area

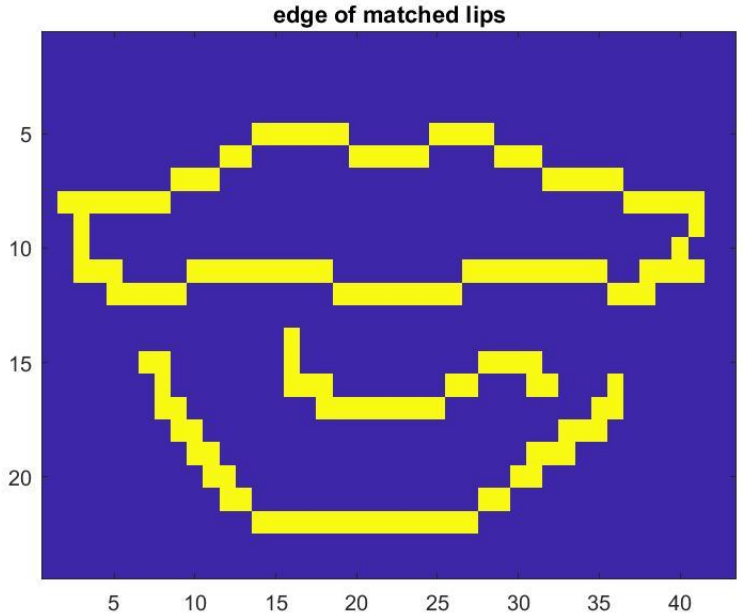
Why SSD: SSD is better suited for situations where the search image and template have the same brightness. In this case, they are from the same image. SSD is also a more efficient option than NCC.

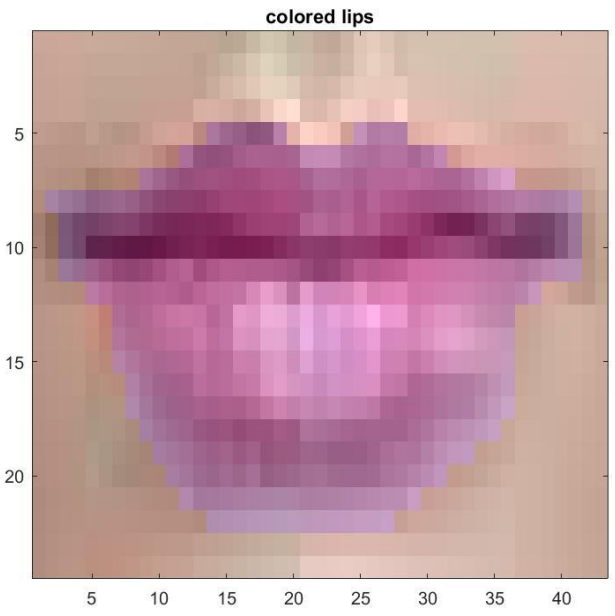
Template Matching - Photos Needed

Idea: person takes a photo of their face and, if they choose to change their lip color, they'd be prompted to draw a box around their lips.

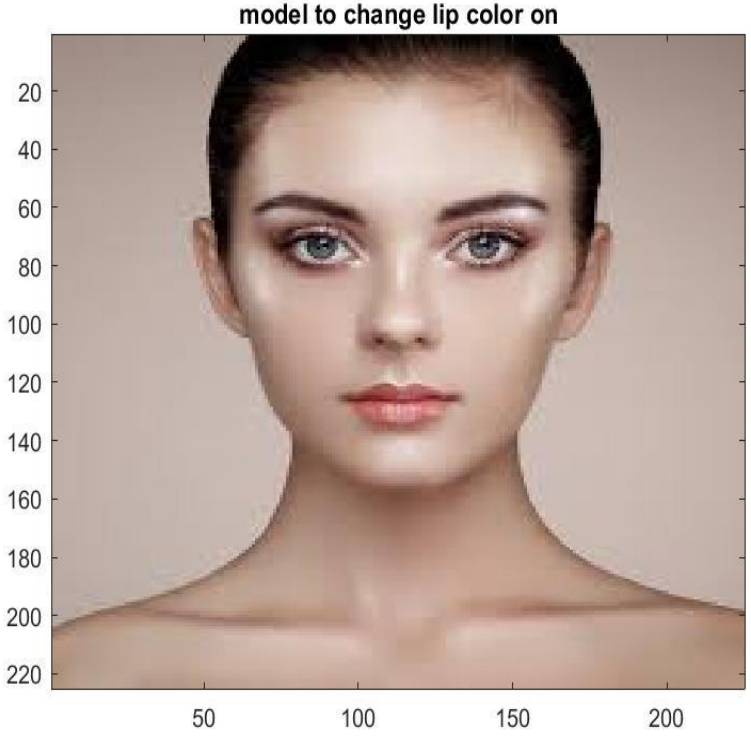
Canny Edge Detection, Color Manipulation

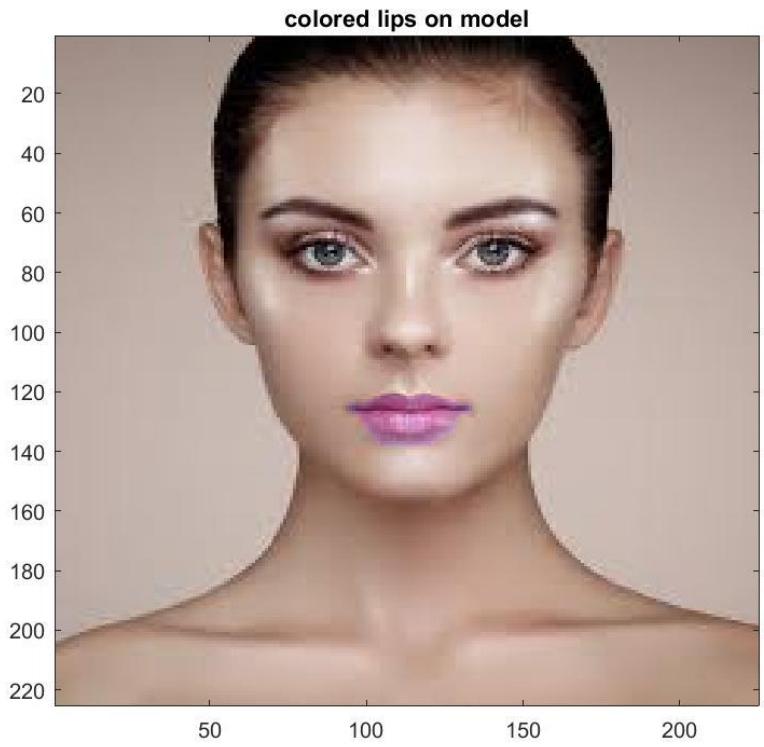
Color Channel Manipulation: By adding or subtracting the colors from their original values, maintains the depth of the lip color instead of setting all of the pixels to one flat color.





Final Product - Before and After





Summary - Future Work

Q: How would we continue this work?

A: Add more features!

- could make image sharp by adding noise
- change hair color, eye color
- scale invariant template matching, automatically find lips
- make interactive graphical user interface (though takes away some of the “vision”)

Summary - Task Assignments

- Cara
    - Red Eye Removal
    - Acne Removal
- Olivia
    - Portrait Mode
    - Lip Color Changer