631 Computer Vision
Homework 11

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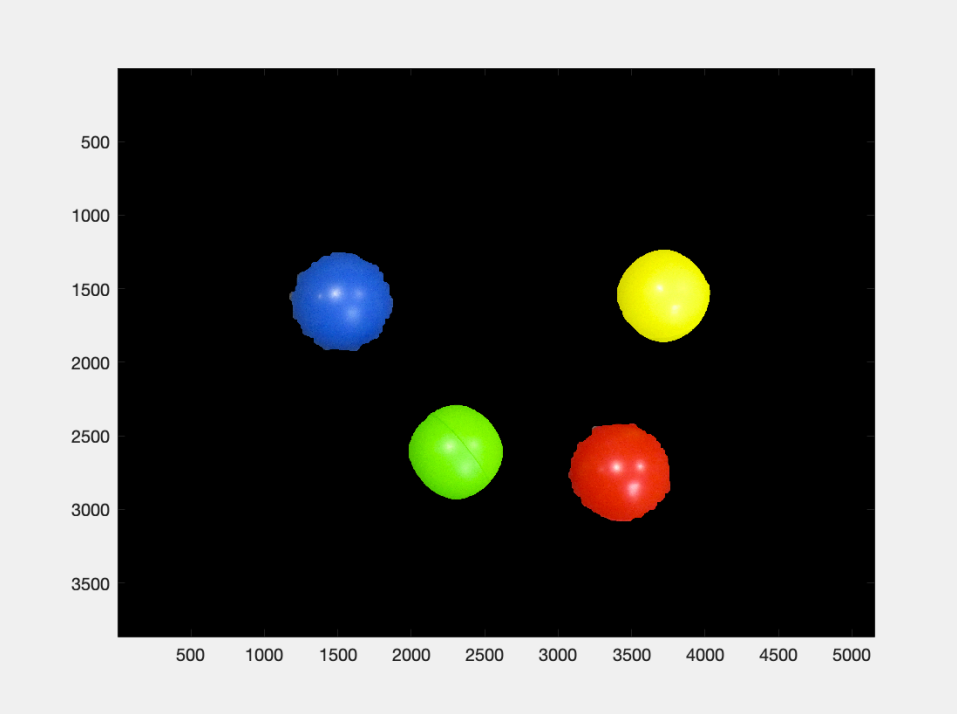
Texture Segmentation

1. Overview:

The main routine takes all the three images as input and runs the part a, b and c for the respective images. Part (a) segments the image using textures in order to detect the colorful balls; Part (b) aims to detect the number plate from the image using texture segmentation as well. Part (c) works on segmenting the darts from the grass in the image and displaying the number of darts from the image.

2. Part (a):

- L channel of LAB color space worked best for isolating the balls for this part.
- Gaussian filter is applied to smoothen the image and rove some noise from the original image.
- Range filter is used as a texture for this part. This filter calculates the local ranges of the image over a given neighborhood. For this part, the size of neighborhood is taken as 75.
- Image binarization is done and the image is inverted (complement) because I wanted the balls to be in the foreground(white) and the carpet as the background(black).
- Morphological operations of open and then dilate is applied to the image in order to get rid of noise in the image.
- To get rid of black holes in the white balls that were detected, I used the imfill function to get rid of the black holes.
- Background subtraction from the original image is performed by converting the original image to hsv, then selecting the v channel and setting all the background values to zero, by refering the binary image obtained by texture image segmentation and finally displaying the new image.
- For this part, I tried the entropy, range filter and the standard deviation filter as features and observed that the entropy look a lot of time to calculate the segmented image. All the filters had more or less same outputs. So I decided to work with rangefilt. The size of the regions that I tried was the neighborhood of 75 for all the filters.

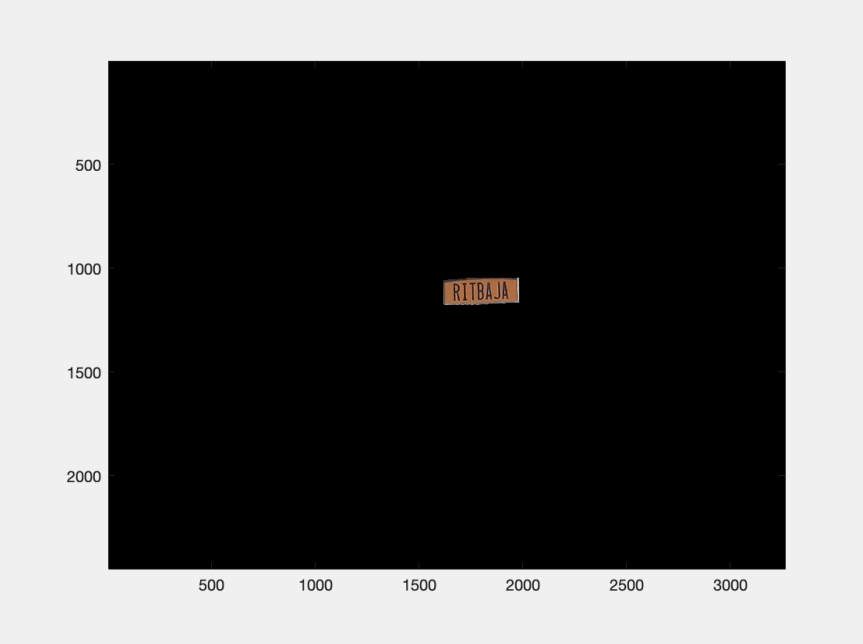


3. Part (b):

- Fot this part, I tried to create the best color channel for detecting the number plate from the image. After playing around with color channels I found that the best channel was the green channel minus the blue channel in the rgb color space. This channel gave the best results in order to isolate the number plate.
- Range filter is used as a texture for this part. This filter calculates the local ranges of the image over a given neighborhood. For this part, the size of neighborhood is taken as 75.
- Image binarization is done because I wanted the number plate to be in the foreground (white) and the rest of the image as the background (black).
- Morphological operations of erode and then dilate is applied to the image in order to get rid of noise in the image. The dilation is done using a 'rectangle' structural element because the number plate is rectangle in shape.
- Background subtraction from the original image is performed by converting the original image to hsv, then selecting the v channel and setting all the background values to zero, by referring the binary image obtained by texture image segmentation and finally displaying the new image.

- For this part as well, I tried the standard deviation filter and the range filter as features. Both the filters had more or less same outputs. So I decided to work with rangefilt. The size of the regions that I tried was the neighborhood of 75 for all the filters. I tried implementing the dct coefficients but I was not able to detect the number plate perfectly. The headlights and some other regions of the image were

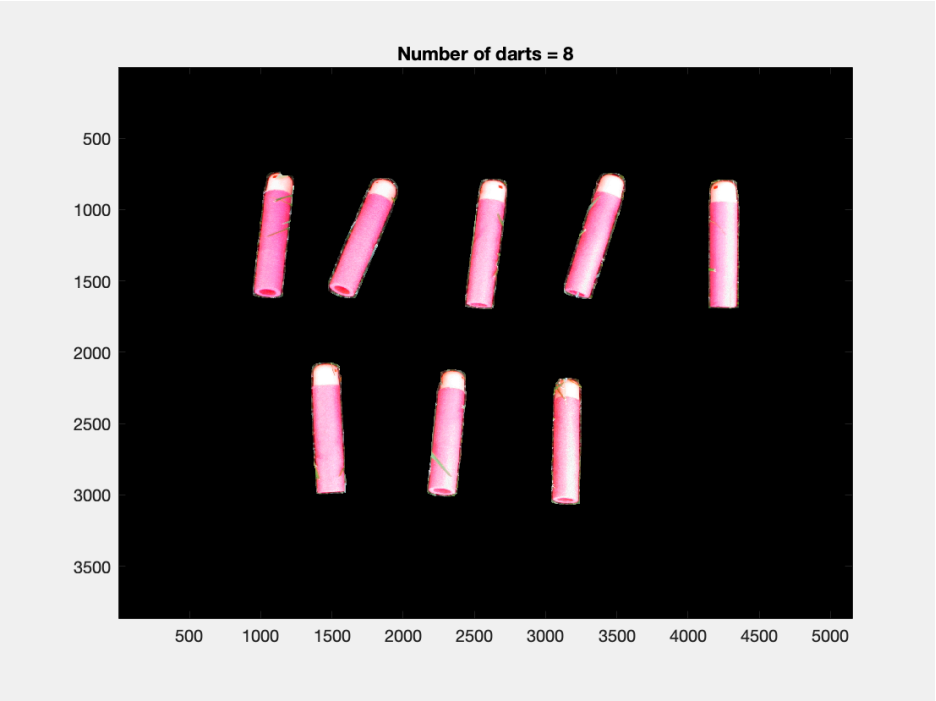
also getting detected. Never the less, I guess tweaking the parameters again and performing pre-processing and noise removal could have improved the results.



4. Part (c):

- The red minus green channel of RGB color space worked best for isolating the darts from the grass for this part.
- Range filter is used as a texture for this part. This filter calculates the local ranges of the image over a given neighborhood. For this part, the size of neighborhood is taken as 75.
- Image binarization is done and the darts come out to be in the foreground(white) and the carpet as the background(black).
- To get rid of black holes in the darts that were detected, I used the imfill function to get rid of the black holes.
- Morphological operations of erode is applied to the image in order to get rid of noise in the image that is some extra grass area that was getting detected.
- Background subtraction from the original image is performed by converting the original image to hsv, then selecting the v channel and setting all the background values to zero, by refering the binary image obtained by texture image segmentation and finally displaying the new image.
- For this part, I tried the entropy, range filter and the standard deviation filter as features and observed that the entropy look a lot of time to calculate the segmented image. All the filters had more or less same outputs. So I decided to work with rangefilt. The size of the regions that I tried was the neighborhood of 75 for all the filters. . I also tried the gabor filter but the results obtained by it were not that great, although the results could have been improved by tweaking the parameters again

and performing pre-processing and noise removal.



5. Conclusion and Learning:

This assignment helped in getting a good overall understanding of how image segmentation can be done by using textures.

- I understood the importance of noise removal using blurring and morphology, as all images are not perfect and we need to handle the minute problems in an image effectively.
- I got to learn about the different types of textures that can be used for image segmentation like entropy, range filter, standard deviation filter, gabor filter and dct coefficients.
- I performed background subtraction by setting the value channel of hsv color space to 0, wherever the background was present in the binary images.
- Due to the scale space problem, it was important to select the correct size of the texture that I was applying on the image.