

Part A: Image segmentation to identify license plate in the image.

Solution:

Most license plates are yellow or white colored so we had to work around them to find the best segmentation. The luminance and saturation channels were the first ones that I tried on the image, even though it worked for some images, but it could not find the license for others. So I tried the channels and found that the red channel gave the best resulting image.

The license in image poor parking was quite difficult to find as the car color and the license plate itself came into consideration. The plate was too small and with the given surrounding which had lots of colors, a lot of white color too and shadow effect on the image, made it difficult to give that part of the image a separate color then the car. So after performing a couple of different quantization's I got an image where even though it has the same color as the car but it has an edge to differentiate it from the surrounding.

The license in the yellow car also was difficult to find as it had a yellow plate. With the effect of the sun's (yellow) light on the image and the plate color being yellow the car was given the same color as the license plate. Though after trying a few different quantization levels there was a level 6 which did give it a slightly different color.



Yellow Car

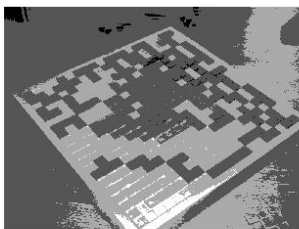


Poor parking

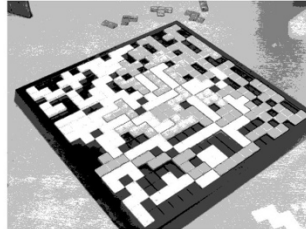
Part B: Image segmentation to emphasize balls and the tiles in game of blokus in the image

Solution:

The images used in this subpart contain all the primary colors which means using a specific color channel or color space which works with colors will not work as by using one color we may eliminate the opposite color in it. So we need a channel which doesn't effect the color so the L channel of Lab color space and S channel of the HSV color space are a good choice. So after trying both of them with different quantization levels I found the S channel of HSV with quantization level of 5 as the best method to emphasize the balls and tiles in the image.



L channel of Lab



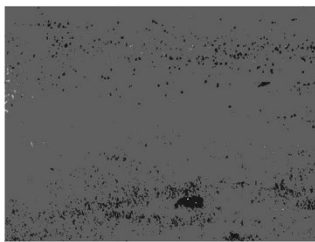
S channel of HSV

Part C: Image segmentation to emphasize the animals (clover and ducks) in the image

Solution:

The images that are used in this subpart contains animals that mix with the surroundings so trying any color channel with them would not be fruitful, the animals would just merge in with the surrounding when the quantization was applied. No single color space and quantization would be able to distinguish between the background and the animals/plants in consideration. The hue channel of HSV was easily able to distinguish between the ducks and the surrounding at different quantization levels but it could not find the small white clovers in the image they were black dots which was also found at different areas. The saturation channel was somewhat able to find the small clovers but then it could not identify the ducks. The A channel could get the clovers but also detected the rabbit like the H channel.

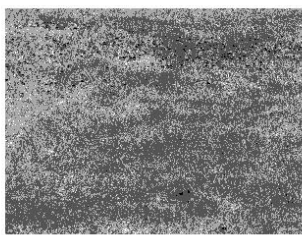
H channel:



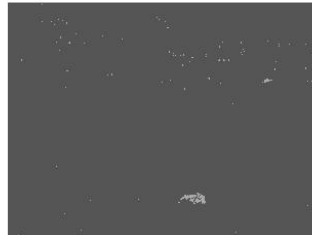
H Channel for duckling



S channel of HSV:



A channel of LAB

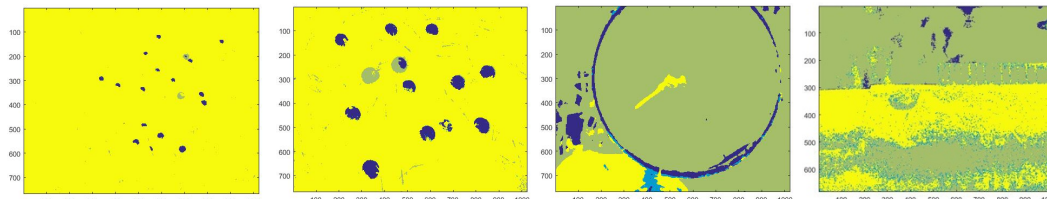


Part D: Image segmentation to emphasize the animals in the image

Solution:

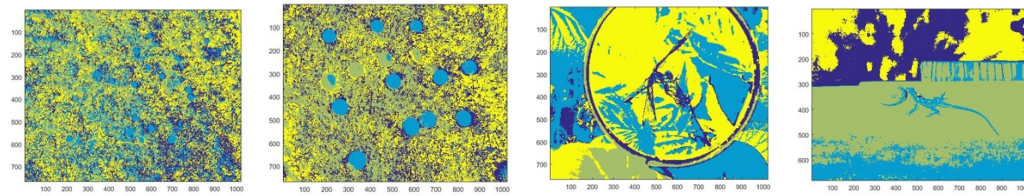
This subpart has images that mostly have a lot of green background. We were asked to use the `rgb2ind` function to perform color quantization. I tested using all 4 color spaces (`rgb`, `hsv`, `lab`, `ycbcr`) to check which of them perform better.

When I used the LAB space, with different quantization levels, all the balls in both the images, and the body of the dragon fly were visible easily but the gecko was lost completely in the background.

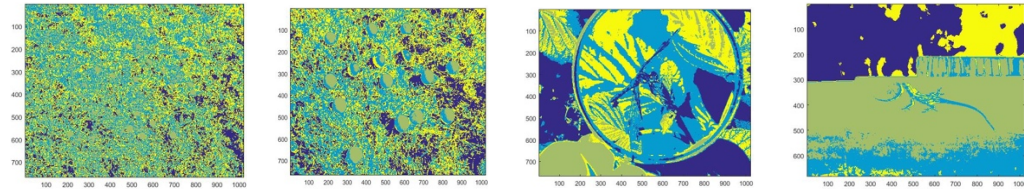


When I used the HSV color space, the balls of image 837 though visible had a lot of noise in them, which means a lot of the surrounding also had the same color as the balls making it difficult to

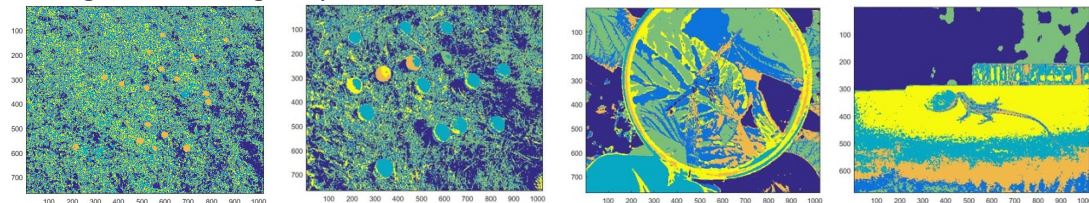
recognize them. The white balls in image 846 were visible but the colored ones were mixed with the surrounding. The gecko and dragon fly image worked really well in this color space.



When I used the YCBCR color space, the balls were fairly visible, the dragonfly and gecko are also quite visible with a few noise values in them.



RGB color space faired well with the balls and gecko (with a little noise) but was unable to distinguish the dragonfly.

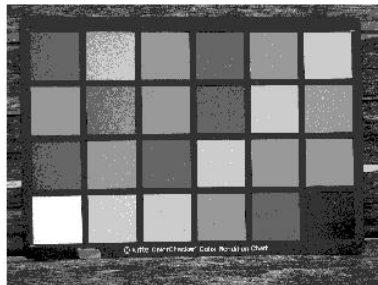


I tried using a Gaussian filter to remove the noise (grassy/leafy effect) from the image, this helped in sharpening some of the color blobs and distributing the color in the balls and dragon images which helped get a good image for them in the HSV space. Also I used the “nodither” option for the function to get a smooth image.

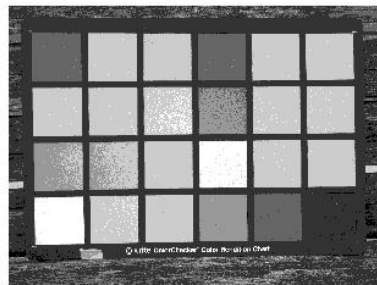
Part E: Image segmentation to emphasize the Macbeth color boxes and nerf dart in the image

Solution:

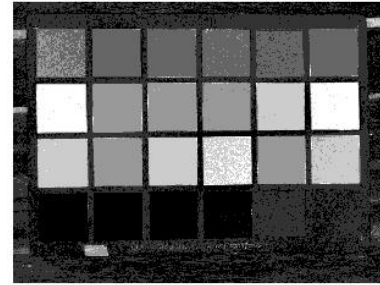
Nerf darts can be segmented easily using most color spaces but the Macbeth color checker which has all the colors in it like 12 main colors, and a few more like brown, skin color and also it has 6 shades of grey so using any color channels wont work with it as it would eliminate some colors from it. Here the best results would be if we used saturation, value or luminance channel of HSV or LAB respectively as it does not deal with the color. The problem with saturation is that the grey levels were being merged and we lost a few more boxes in the colored boxes even if we changed the quantization levels. The luminance channel also gave a good output but the best result came with value channel where the only box lost to the background was the black box and most boxes had similar color.



L channel of LAB



V channel of HSV

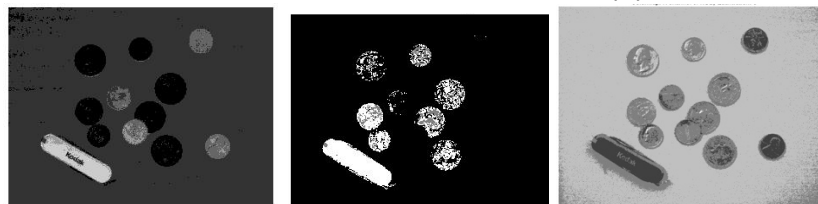


S channel of HSV

Part F: Image segmentation to emphasize the coins in the image.

Solution:

The value, luminance and red channel gave some of the best results. Some other channels also did give a good result but it had problems like the overlapping coin was lost(2) or at other times the silver colored coins became too dark(1).



The best Quantization was with the value channel of HSV with level 5 quantization (last image)

Part G: Image segmentation to emphasize the terns in the image.

Solution:

The terns image has white birds in a greenish grey background. Unlike other images there are many colors and variations in the image so while doing quantization a lot of colors and details will be lost, which means the birds would also be lost. So it was important to select a good color space with a good quantization level to get the birds. And the color channel would not work. So after working with the value, saturation and luminance channels I found that the birds were completely mixed in the S channel. And by trying different quantization levels I found that level 10 gave a good image with the terns in the V channel. And the V channel also talks about the depth of color which makes the birds pop in the quantization.



V channel of HSV

L channel of LAB

S channel of HSV