STREET SIGN DETECTION

EE146 Computer vision

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March 13, 2019

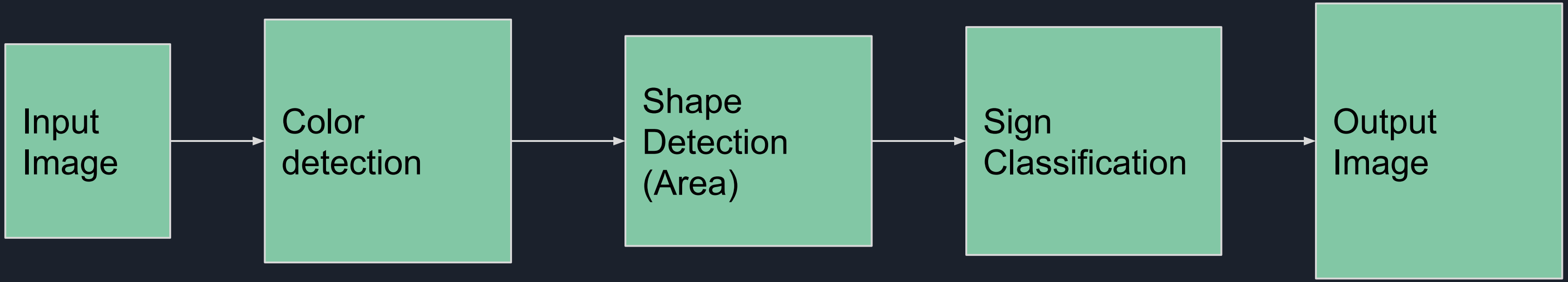
PROBLEM & SIGNIFICANCE

- **Problem** : There are many accidents on the road and with street sign detection it may help avoid accidents and help keep people safe. People get distracted on the road.
- **Significance** : It can help save lives by avoiding dangerous accidents due to distractions and missing street signs. It would help self driving cars recognize signs and respond based on what it sees.

Related Work

Traffic Warning Sign Recognition	Detection and Recognition template for Stop, Do Not Disturb and Yield. Detects Red pixels and compares to warning sign template. Waits to be detected for 4 or more frames.	Limiting to 3 signs. Able to be detected through video.
trainCascadeObjectDetect or	Using positive samples and negative images with trainCascadeObjectDetector. Use stopSignDetector.xml to help make a detector to help detect a stop sign.	Limiting to only stop signs and cars using the ‘stopSignandCars.mat’. Able to expand but need to make a .mat file for different stop signs and also a new stopSignDetector.xml for other signs.
Shape-based Road Sign Detection and Recognition for Embedded Application Using MATLAB	Read image, Threshold image, Remove noise. Then use Hough Transform which will help classify image shape.	It works for all signs because they are very distinct from each other but there are many that are the same shape and are harder to tell apart.
Traffic Sign Detection in Static Images using Matlab.	Obtain gradient image and vertical edge projection. Color and shape analysis.	Works for a variety of different street signs
Detection and Recognition of Traffic Signs Based on HSV Vision Model and Shape features	Detection and Recognition using segmentation based on color and shape. Using HSV, detection, correction based on geometry features and extraction of eigenvector using Gabor filter	accurately detect, classify and identify traffic signs from natural scenes.

Technical Approach



Input Image

Color detection

Shape Detection (Area)

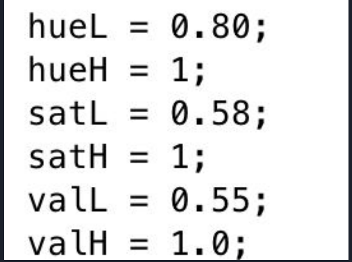
Sign Classification

Output Image

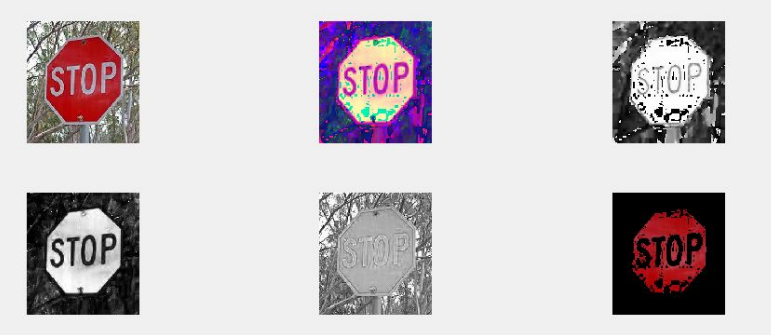
Technical Approach

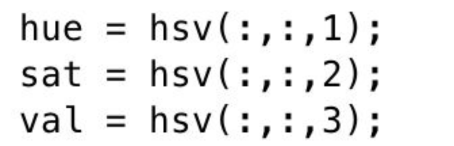
- Input Image:
    - jpeg file, RGB image.
- Color Detection:
    - User selects from 4 colors (R,G,Y,W)
    - Low and High values for Hue, Saturation and Value based on the color selected.
    - Convert RGB image to HSV to get hue, saturation and value.
    - Mask Low and High values with HSV values obtained.
    - Combine HSV values to then be multiplied with each RGB color and put together.

RED Low/High Values



```
hueL = 0.80;
hueH = 1;
satL = 0.58;
satH = 1;
valL = 0.55;
valH = 1.0;
```

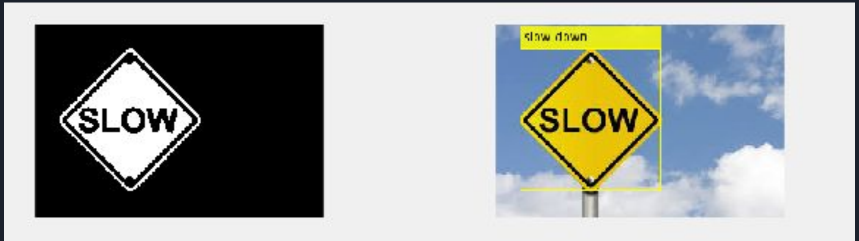


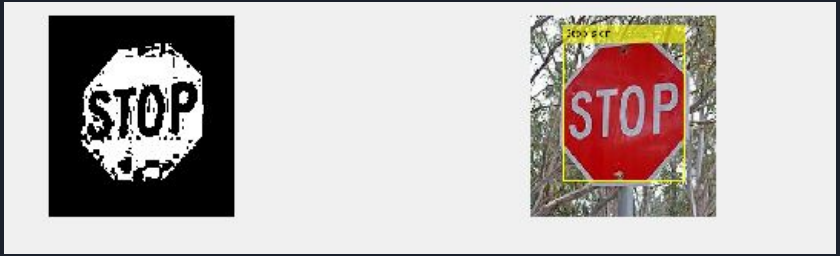


```
hue = hsv(:,:,1);
sat = hsv(:,:,2);
val = hsv(:,:,3);
```

Technical Approach

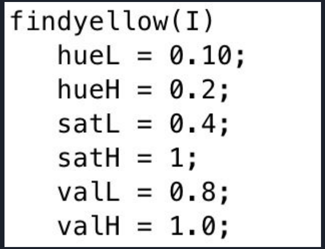
- Shape Detection:
    - Convert RGB image to binary image.
    - Label connect components to connect separated values.
    - Determine blobs of an image using RegionProps
    - Remove Areas smaller than a certain value because they are unneeded.
- Sign Classification:
    - Based on the Area it would help determine which shape it is and helps classify the street sign.



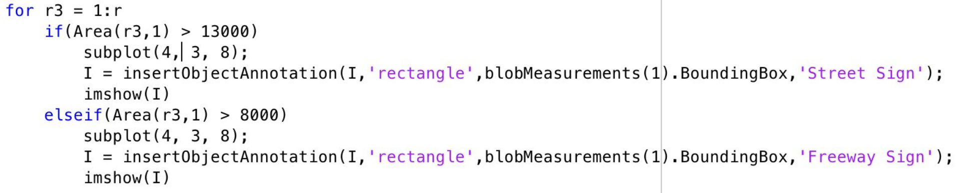


Results

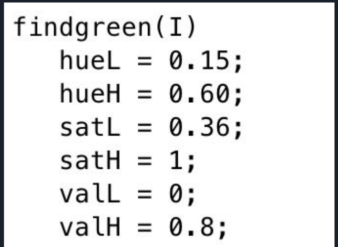
- Data:
  - Made High and Low values for HSV values obtained to get desired colors.
  - Determine Areas of the desired colors.
  - Based on the Areas and colors it will help us determine what street sign it is.
- Parameter:
  - Input Image
  - 4 Input colors (R,G,Y,W)
  - Low/High HSV Values



```
findyellow(I)
    hueL = 0.10;
    hueH = 0.2;
    satL = 0.4;
    satH = 1;
    valL = 0.8;
    valH = 1.0;
```



```
for r3 = 1:r
    if(Area(r3,1) > 13000)
        subplot(4, 3, 8);
        I = insertObjectAnnotation(I,'rectangle',blobMeasurements(1).BoundingBox,'Street Sign');
        imshow(I)
    elseif(Area(r3,1) > 8000)
        subplot(4, 3, 8);
        I = insertObjectAnnotation(I,'rectangle',blobMeasurements(1).BoundingBox,'Freeway Sign');
        imshow(I)
```



```
findgreen(I)
    hueL = 0.15;
    hueH = 0.60;
    satL = 0.36;
    satH = 1;
    valL = 0;
    valH = 0.8;
```

Conclusion

Using this technique I was able to detect 7 different types of street signs. It has a 70% success rate because at time the Area can differ from the ones acquired and it will not give the right output. That is because Areas, Perimeters and Circularities are always changing so it is hard to identify certain shapes.

Street Signs found

- Stop Sign
- Yield Sign
- Slow Down Sign
- Freeway Sign
- Slip Sign
- Turn right Sign
- Street Sign

References

Traffic Warning Sign Recognition

trainCascadeObjectDetector