CMPT412

Assignment 2

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Whites Detection

My algorithm takes advantage of the fact that butts are white and they tend to be the brightest spot in the image. By locating the white spots of the image, they will most likely where the butts are in the image; thus avoid dealing with scale or rotation of the cigarette butt model.

Preprocessing

For every image, we preprocess by converting the image to grayscale and boost the contrast using histogram equalization.

```
img = imread('Cig01.JPG');
I = rgb2gray(img);
J = imadjust(I);
```

Detecting White Spot and Noise Removal

Now we pull the brightest spots from an image, map the results onto a binary image, then remove noise using a median filter.

```
BW = imregionalmax(J);
BWM = medfilt2(BW, [9,9]);
```

Further Noise Reduction

We can further reduce noise to improve the accuracy. Once we get the white blobs, we now extract the centroids of the white blobs to be the location of the butts.

```
rmnoise = bwareaopen(BW,400);
stats = regionprops('table',rmnoise,'Centroid');
```

	1 Centroid	
1	345.2806	165.8194
2	465.4893	302.1760
3	569.4567	123.3482

Results

After testing, we detected 9/15 cigarette butts. It performs poorly if the cigarette butts are either too small or not of white color. This is to be expected, butts in small scale tend to mistaken for noise and tan butts tend not to have high brightness that white butts do. Bright spots in the image also interfere with the results. Metal cross patterns are often mistaken for cigarette butts.

Figure . Detection Results are created in the binary image

Journal:

Edge Detection:

We tries using Canny edge detector and by setting a custom threshold, I can get well defined edges without too much noise in the image.

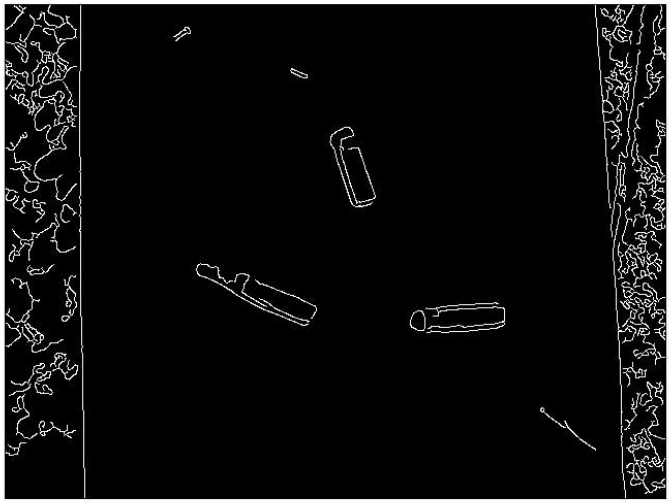

Figure. Canny Edge Detection on Cig_on_Orange1.jpg Orange background

Radon Transform:

Next we tried to find all the straight lines in the image. The idea is if we can find two straight parallel lines that are close to each other, then a cigarette butt could be there. Unfortunately after we get the output from radon transform, we cannot understand the output.

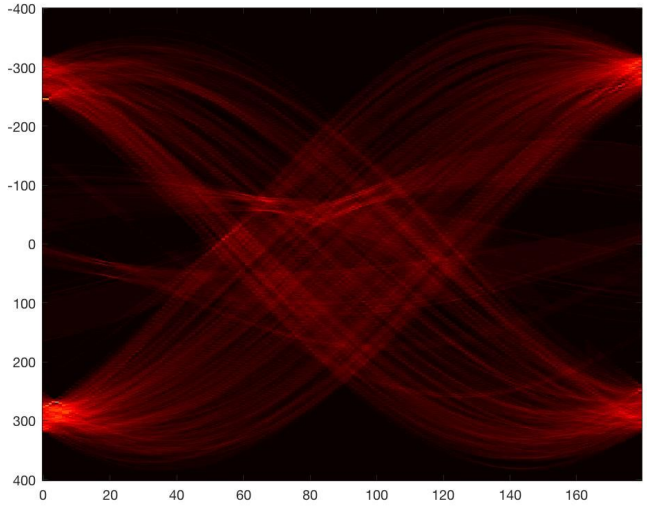

Figure. Radon transform output

Find the whites in the image:

Because cigarette butts are white, they tend to be the brightest pixels of an image. Using this information, I extracted the brightest pixels of image and mapped it on a binary image. Even after removing noise, one cigarette butt was missed while noise was still visible.

Figure. Brightness detection with custom noise level setting for every image

Although this produces somewhat good results, I am custom setting the noise filtering for every single image. I would like to produce good result without custom settings. I experimented with using SIFT, but the butt models do not provide enough keypoints for adequate results. In the end, medium filtering appears to a good approach.