


# Otsu's thresholding without using MATLAB function graythresh

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 [angeljohnsy.blogspot.com/2011/06/otsus-thresholding-without-using-matlab.html](http://angeljohnsy.blogspot.com/2011/06/otsus-thresholding-without-using-matlab.html)

To perform the thresholding I followed these steps:

- a. Reshape the 2 dimensional grayscale image to 1 dimensional.
- b. Find the histogram of the image using 'hist' function.
- c. Initialize a matrix with values from 0 to 255
- d. Find the weight, mean and the variance for the foreground and background
- e. calculate  $\text{weight of foreground} \times \text{variance of foreground} + \text{weight of background} \times \text{variance of background}$ .
- f. Find the minimum value.

## **MATLAB CODE:**

```
%To threshold image without using graythresh function
```

```
function mygraythresh
```

```
global H Index;
```

```
B=imread('tire.tif');
```

Here I converted the 2d matrix to 1d matrix.

```
V=reshape(B, [], 1);
```

The histogram of the values from 0 to 255 is stored.

For instance, G(1) contains the number of occurrence of the value zero in the image.

```
G=hist(V, 0:255);
```

```
H=reshape(G, [], 1);
```

'index' is a 1 dimensional matrix ranging between 0 and 255

```
Ind=0:255;
```

```
Index=reshape(Ind, [], 1);
```

```
result=zeros(size([1 256]));
```

To avoid many for loops I used only 1 for loop and a function to calculate the weight, mean and variance.

Let me explain the foreground and the background for a value of 'i'.

if 'i' value is 5 then the foreground values will be 0,1,2,3,4,5

and the background values will be 6 to 255.

```
for i=0:255
```

```
    [wbk, varbk]=calculate(1,i);
```

```
    [wfg, varfg]=calculate(i+1,255);
```

After calculating the weights and the variance, the final computation is stored in the array 'result'.

```
result(i+1)=(wbk*varbk)+(wfg*varfg);
```

```
end
```

```
%Find the minimum value in the array.  
[threshold_value, val]=min(result);
```

```
tval=(val-1)/256;
```

Now convert the image to binary with the calculated threshold value.

```
bin_im=im2bw(B,tval);
```

```
figure,imshow(bin_im);
```

```
function [weight,var]=calculate(m,n)
```

```
%Weight Calculation
```

```
weight=sum(H(m:n))/sum(H);
```

```
%Mean Calculation
```

```
value=H(m:n).*Index(m:n);
```

```

total=sum(value);

mean=total/sum(H(m:n));

if(isnan(mean)==1)

    mean=0;

end

%Variance calculation.

value2=(Index(m:n)-mean).^2;

numer=sum(value2.*H(m:n));

var=numer/sum(H(m:n));

if(isnan(var)==1)

    var=0;

end

end

end

```

**Reference:**

Digital Image Processing (3rd Edition)Chapter:  
Image Segmentation-Basic Global thresholding

