Course: Industrielle & Medizinische Bildverarbeitung

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3.1

```
clc, clear variables, close all;
addpath('.\Petri');
petri = {};

for i = 1:7

    n = sprintf('petri%d',i);
    [img, map] = dicomread(n);

    petri{i}.inf = dicominfo(n);
    petri{i}.img = img;
    petri{i}.map = map;

    date = petri{i}.inf.AcquisitionDate;
    YY = str2num(date(1:4));
    DD = str2num(date(5:6));
    MM = str2num(date(7:8));

    time = petri{i}.inf.AcquisitionTime;
    hh = str2num(time(1:2));
    mm = str2num(time(3:4));
    ss = str2num(time(5:6));

    timestamp = [YY DD MM hh mm ss];

    N(i) = sum(sum(petri{i}.img));

    petri{i}.timestamp = timestamp;

end

for i=1:6
    delta_t = etime(petri{i+1}.timestamp,petri{i}.timestamp);
    lambda(i) =  -log(N(i+1)/N(i))/delta_t;
end

t_half = (log(2)/mean(lambda)/3600);

fprintf('According to the calculation, the half-life is %.3g hours.', t_half);
```

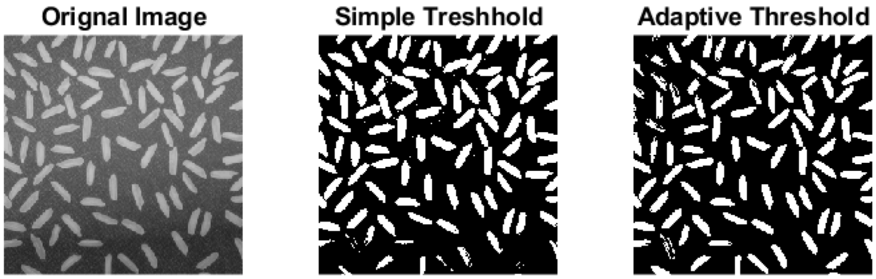
```
According to the calculation, the half-life is 6.06 hours.
```

3.2

```
img1 = imread('DSA1.jpg');
img2 = imread('DSA2.jpg');
img3 = img1-img2;

figure
subplot(131);
imshow(img1,[]);
title('IMG1');

subplot(132);
imshow(img2,[]);
title('IMG2');

subplot(133);
imshow(img3,[]);
title('IMG1-IMG2');
colormap(hot);
```

3.3.a

```
img = imread('rice.png');
s = 80;
t = [-2:0.1:1.4];

subplot(131);
imshow(img);
title('Orignal Image');

BW = imbinarize(img);

subplot(132);
imshow(BW,[]);
title('Simple Treshhold');

subplot(133)
for i=1:1:numel(t)
    seg_img = MyAdaptiveThresholding(img, s, t(i));
    imshow(seg_img, []);
    title('Adaptive Threshold');
    pause(0.01);
end
```



3.3.b & 3.3.c

The threshold value calculation according to Otsu is used to reduce a grayscale image to a binary image. With this method, the algorithm assumes that the image contains two classes (foreground and background pixels). From this, the optimal threshold value can then be calculated which divides the two classes. The combined spread is therefore minimal or equivalent with a maximum variance (Source: Wikpedia).

```
clc, clear variables, close all;

img_names = {'journal.png','jb007.jpg','sonnet.png', 'barcode.png'};
s = [30, 80, 6, 25];
t = [0.7, 1.2, 0.925, 1.0];
img ={};

for i=1:4
    img{i}.read = imread(img_names{i});
end

for i=1:numel(img)

    figure;
    subplot(141);
    imshow(img{i}.read,[]);
    title('Image');
    subplot(142);
    try
        BW = imbinarize(img{i}.read);
        imshow(BW,[]);
    catch
        BW = rgb2gray(img{i}.read);
        BW = imbinarize(BW);
        imshow(BW,[]);
    end
    title('Simple');

    subplot(143);
    try
        img{i}.segimg = MyAdaptiveThresholding(img{i}.read, s(i), t(i));
        imshow(img{i}.segimg);
    catch
        img{i}.segimg = MyAdaptiveThresholding(rgb2gray(img{i}.read), s(i), t(i));
        imshow(img{i}.segimg,[]);
    end
    title('Adaptive');

    subplot(144);
    level = graythresh(img{i}.read);
    try
        img{i}.segimg = MyAdaptiveThresholding(img{i}.read, s(i), level);
        imshow(img{i}.segimg);
    catch
        img{i}.segimg = MyAdaptiveThresholding(rgb2gray(img{i}.read), s(i), level);
        imshow(img{i}.segimg,[]);
    end
    title('According To Otsu');

end
```

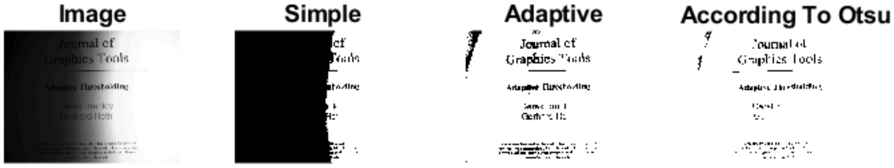


Image
Simple
Adaptive
According To Otsu
Journal of
Graphics Tools
Adaptive Thresholding

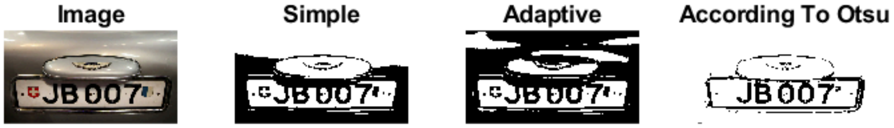
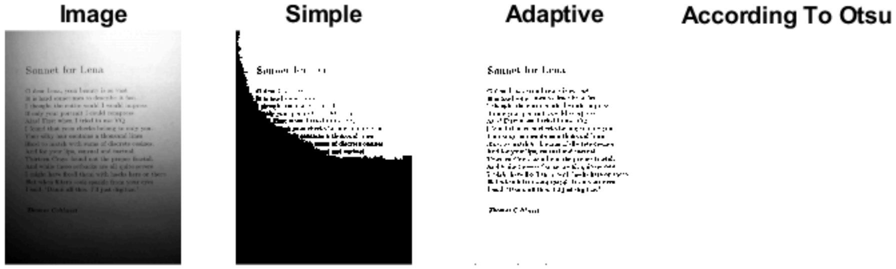


Image
Simple
Adaptive
According To Otsu
JB 007

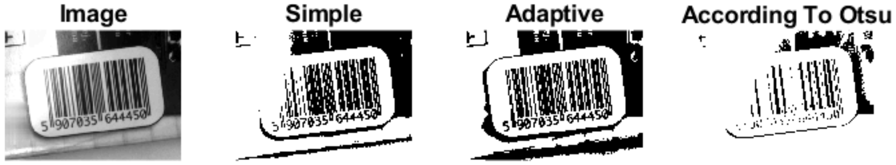


Image

Simple

Adaptive

According To Otsu



Image

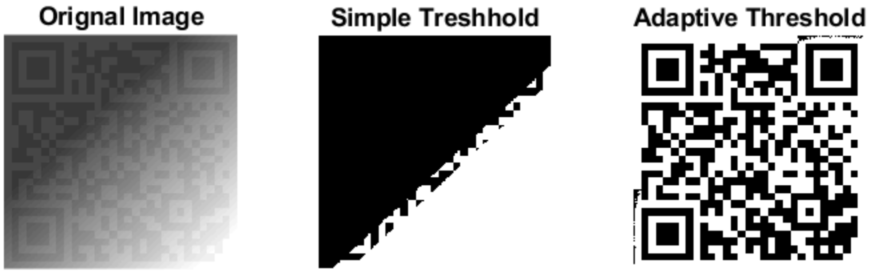
Simple

Adaptive

According To Otsu

3.3.d

```
clc, clear variables, close all;

img = imread('suprise.png');
img = rgb2gray(img);
s = 25;
t = [-2:0.1:1.0];

subplot(131);
imshow(img);
title('Orignal Image');

BW = imbinarize(img);

subplot(132);
imshow(BW,[]);
title('Simple Treshhold');

subplot(133)
for i=1:1:numel(t)
    seg_img = MyAdaptiveThresholding(img, s, t(i));
    imshow(seg_img, []);
    title('Adaptive Threshold');
    pause(0.01);
end
```



Orignal Image

Simple Treshhold

Adaptive Threshold

```
fprintf("Content of the surprise:\nhttps://www.youtube.com/watch?v=Oos4ojutOMM\n");
```

```
Content of the surprise:
https://www.youtube.com/watch?v=Oos4ojutOMM
```