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Digital assignment 1

**ECE3043 Digital Image Processing for Medical Applications**

**ECE3042**

Submitted by

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To

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| DA1<br>014/05/2021 | Title: feature extraction |
|---|---|

## Aim: to perform feature extraction using MATLAB

# Theory:

Text Extraction and recognition in Images has become a potential application in many fields like Image indexing , Robotics, Intelligent transport systems etc.

♣ For example capturing license plate information through a video camera and extracting license number in traffic signals

♣ However, variations of text due to differences in size, style, orientation, and alignment, as well as low image contrast and complex background make the problem of automatic text extraction extremely challenging.

To extract the features ,we can use canny edge detection along with gaussian filter, convolution

**Edge detection using canny edge detection to detect the edge.**

**The code given below is to extract the text using a combination of filter, convolution, canny edge detection.**

**Canny edge detection is the most popular.**

## Algorithm:

- Convolution with Gaussian Filter Coefficient
- Convolution with Canny Filter for Horizontal and Vertical orientation
- Calculating directions using atan2
- Adjusting to nearest 0, 45, 90, and 135 degree
- Non-Maximum Suppression
- Hystheresis Thresholding

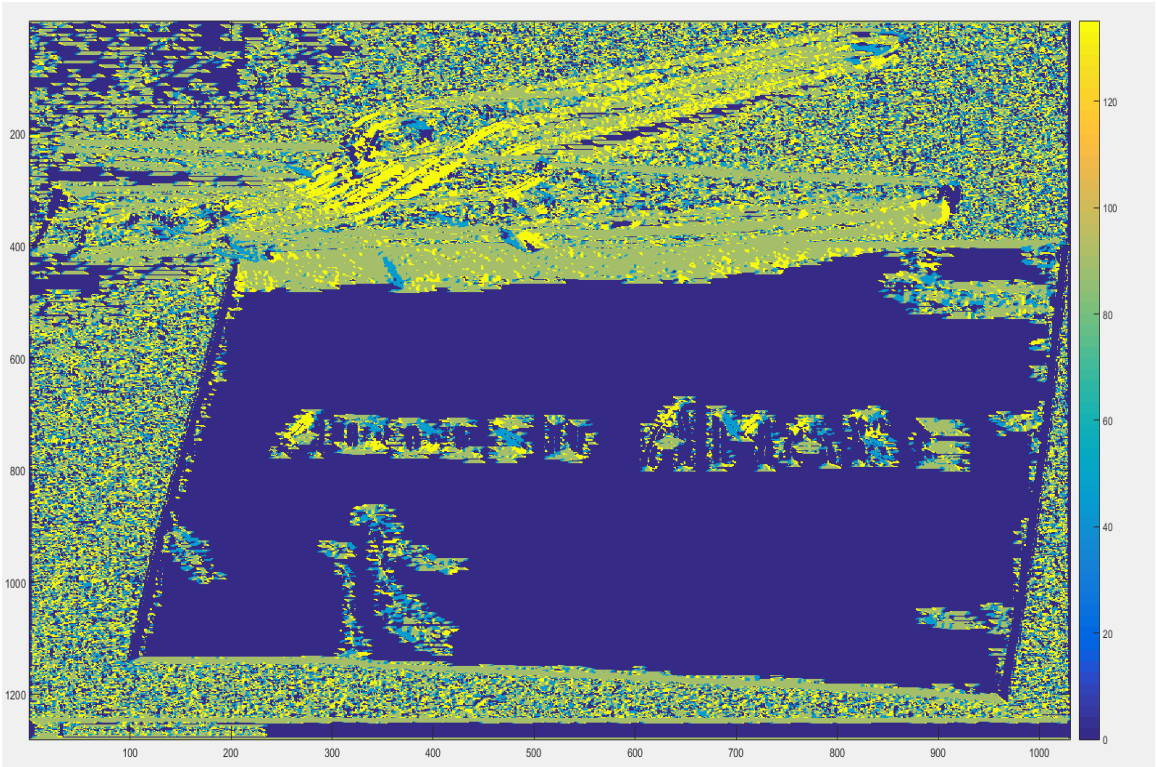
## code

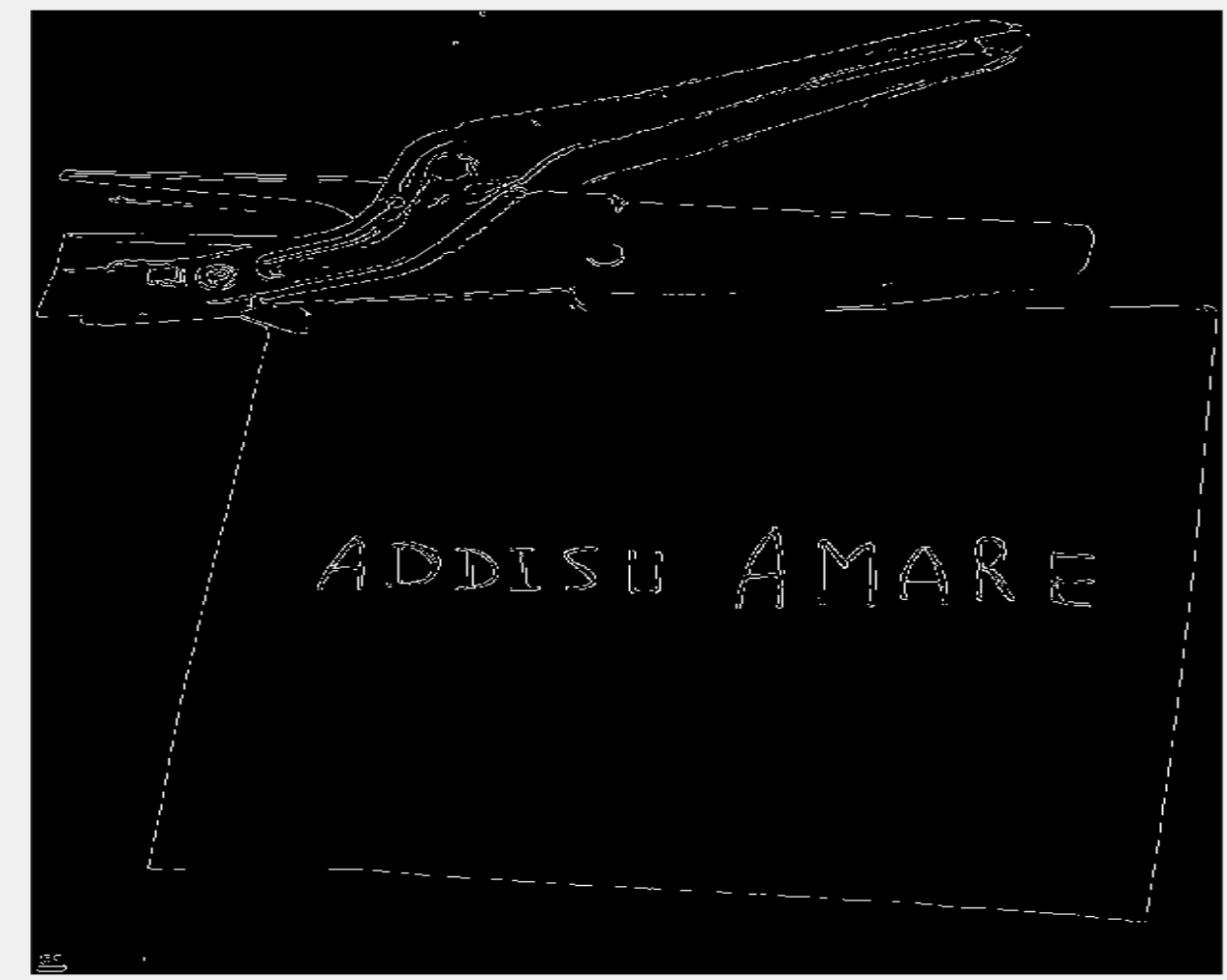
```
clear all;
clc;
%Input image
img = imread ('text.jpg');
%Show input image
figure, imshow(img);
img = rgb2gray(img);
img = double (img);
%Value for Thresholding
T_Low = 0.075;
T_High = 0.175;
%Gaussian Filter Coefficient
```

```
B = [2, 4, 5, 4, 2; 4, 9, 12, 9, 4;5, 12, 15, 12, 5;4, 9, 12, 9, 4;2, 4, 5,
4, 2 ];
B = 1/159.* B;
%Convolution of image by Gaussian Coefficient
A=conv2(img, B, 'same');
%Filter for horizontal and vertical direction
KGx = [-1, 0, 1; -2, 0, 2; -1, 0, 1];
KGy = [1, 2, 1; 0, 0, 0; -1, -2, -1];
%Convolution by image by horizontal and vertical filter
Filtered_X = conv2(A, KGx, 'same');
Filtered_Y = conv2(A, KGy, 'same');
%Calculate directions/orientations
arah = atan2 (Filtered_Y, Filtered_X);
arah = arah*180/pi;
pan=size(A,1);
leb=size(A,2);
%Adjustment for negative directions, making all directions positive
for i=1:pan
    for j=1:leb
        if (arah(i,j)<0)
            arah(i,j)=360+arah(i,j);
        end;
    end;
end;
arah2=zeros(pan, leb);
%Adjusting directions to nearest 0, 45, 90, or 135 degree
for i = 1  : pan
    for j = 1 : leb
        if ((arah(i, j) >= 0 ) && (arah(i, j) < 22.5) || (arah(i, j) >=
157.5) && (arah(i, j) < 202.5) || (arah(i, j) >= 337.5) && (arah(i, j) <=
360))
            arah2(i, j) = 0;
        elseif ((arah(i, j) >= 22.5) && (arah(i, j) < 67.5) || (arah(i, j)
>= 202.5) && (arah(i, j) < 247.5))
            arah2(i, j) = 45;
        elseif ((arah(i, j) >= 67.5 && arah(i, j) < 112.5) || (arah(i, j)
>= 247.5 && arah(i, j) < 292.5))
            arah2(i, j) = 90;
        elseif ((arah(i, j) >= 112.5 && arah(i, j) < 157.5) || (arah(i, j)
>= 292.5 && arah(i, j) < 337.5))
            arah2(i, j) = 135;
        end;
    end;
end;
figure, imagesc(arah2); colorbar;
%Calculate magnitude
magnitude = (Filtered_X.^2) + (Filtered_Y.^2);
magnitude2 = sqrt(magnitude);
BW = zeros (pan, leb);
%Non-Maximum Supression
for i=2:pan-1
    for j=2:leb-1
        if (arah2(i,j)==0)
            BW(i,j) = (magnitude2(i,j) == max([magnitude2(i,j),
magnitude2(i,j+1), magnitude2(i,j-1)]));
        elseif (arah2(i,j)==45)
            BW(i,j) = (magnitude2(i,j) == max([magnitude2(i,j),
magnitude2(i+1,j-1), magnitude2(i-1,j+1)]));
        elseif (arah2(i,j)==90)
            BW(i,j) = (magnitude2(i,j) == max([magnitude2(i,j),
magnitude2(i+1,j), magnitude2(i-1,j)]));
```

```
        elseif (arah2(i,j)==135)
            BW(i,j) = (magnitude2(i,j) == max([magnitude2(i,j),
magnitude2(i+1,j+1), magnitude2(i-1,j-1)]));
        end;
    end;
end;
BW = BW.*magnitude2;
figure, imshow(BW);
%Hysteresis Thresholding
T_Low = T_Low * max(max(BW));
T_High = T_High * max(max(BW));
T_res = zeros (pan, leb);
for i = 1  : pan
    for j = 1 : leb
        if (BW(i, j) < T_Low)
            T_res(i, j) = 0;
        elseif (BW(i, j) > T_High)
            T_res(i, j) = 1;
        %Using 8-connected components
        elseif ( BW(i+1,j)>T_High || BW(i-1,j)>T_High || BW(i,j+1)>T_High
|| BW(i,j-1)>T_High || BW(i-1, j-1)>T_High || BW(i-1, j+1)>T_High ||
BW(i+1, j+1)>T_High || BW(i+1, j-1)>T_High)
            T_res(i,j) = 1;
        end;
    end;
end;
edge_final = uint8(T_res.*255);
%Show final edge detection result
figure, imshow(edge_final);
```

## output:


200
400
600
800
1000
1200
100
200
300
400
500
600
700
800
900
1000
120
100
80
60
40
20
0




## To extract the each character we can use the following algorithm and code.

Algorithm

- Read Image
- Show image
- Convert to gray scale
- Convert to binary image
- Show image binary image
- Label connected components
- Plot Bounding Box
- Text extraction using for loop.

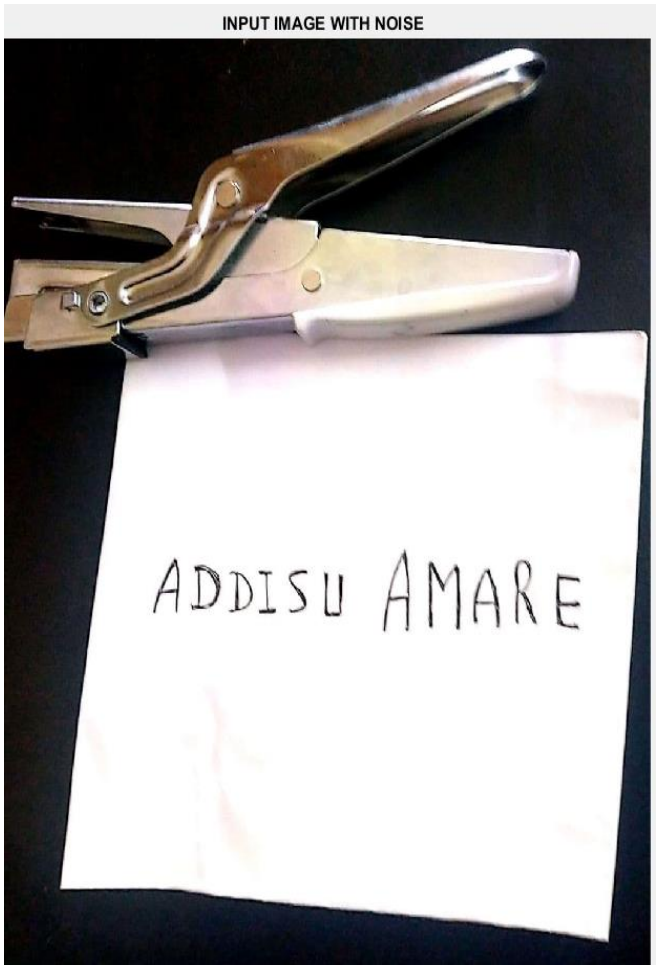
## Code

output:

```
%feature  extraction
imagen=imread('text.jpg');
%% Show image
figure(1)
```

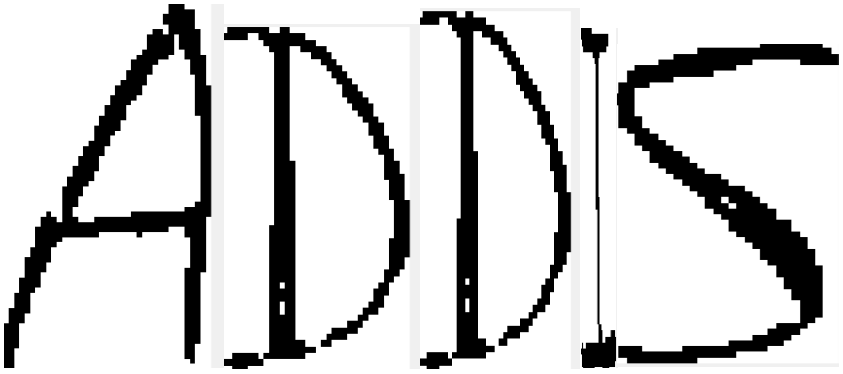
```
imshow(imagen);
title('INPUT IMAGE WITH NOISE')
%% Convert to gray scale
if size(imagen,3)==2% RGB image
    imagen=rgb2gray(imagen);
end
%% Convert to binary image
threshold = graythresh(imagen);
imagen =~im2bw(imagen,threshold);
%% Remove all object containing fewer than 30 pixels
imagen = bwareaopen(imagen,30);
pause(1)
%% Show image binary image
figure(2)
imshow(~imagen);
title('INPUT IMAGE WITHOUT NOISE')
%% Label connected components
[L Ne]=bwlabel(imagen);
%% Measure properties of image regions
propied=regionprops(L,'BoundingBox');
hold on
%% Plot Bounding Box
for n=1:size(propied,1)

rectangle('Position',propied(n).BoundingBox,'EdgeColor','b','LineWidth',2)
end
hold off
pause (1)
%% Objects extraction
figure
for n=1:Ne
    [r,c] = find(L==n);
    n1=imagen(min(r):max(r),min(c):max(c));
    imshow(~n1);
    pause(0.5)
end
```

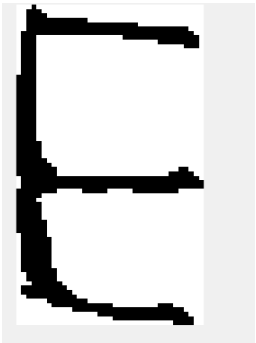
output:





Character extracted:





**Text extracted**