

MATLAB Special Assignment

Cheque Number Reader & Signature Verification using Image Processing

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Abstract :

Cheques are still most commonly used for transition all around the globe. Such a large amount of cheques are processed manually everyday, which is very time consuming compare with modern technology. Information written by user on cheques like amount, beneficiary name, date, account number, Signature & Cheque Number are still verified manually. But now Cheque Truncating System(CTS) is made compulsory by banks to saving efforts & time in the process of depositing Cheques in Banks. By this Matlab Code Attempt is made to reduce human effort in this system.

KEYWORDS : OCR, Cheque Truncating System, Image Processing, MATLAB, Cheque, Edge Detection.

I. INTRODUCTION :

Due to research & development in the Field of the Image Processing, Banking Industry have been benefit in many ways. In Primitive Method we have to send physical cheque to drawer branch. Due to modern technology, Sending of Physical Cheque is no longer needed. Image of the cheque & other Information is sent to drawee branch. Due to this moving of cheques from one branch to another is no longer needed, Except some Exceptional Case. So due to this there is drastic decrease in time taken in cheque payment method.

Now let's see the structure of cheque. Cheque is paper which is used for payment of money from one person or bank to another person or bank. The structure of cheque is same for all over India. At right most bottom Signature of account holder is there. It is very important filed for verification of the cheque. At Bottom there is 6 digit code which Cheque Number, then there is 9 digit Magnetic Ink Character Recognition Code(MICR), which will be unique code for every branch in India. At top left contain Banks Logo, at top right Date Of issue of Cheque. Then comes the beneficiary name, amount in words, amount in numbers, account Number, Bank's Branch Details. An example of issued cheque is given Below:-



MEHDIPATNAM, HYDERABAD [AP], HYDERABAD, 500028
IFS CODE - UTIB0000426

VALID FOR THREE MONTHS FROM THE DATE OF ISSUE

DATE दिनांक 15012015
D D M M Y Y Y Y

PAY

RUPEES
रुपये

Dinesh Kumar Venkata

five Crores Ten Lacs ₹

OR BEARER / या धारक को

अदा करें

₹ ५१०,००,०००/-

A/C NO. 911010049001545

SAPPN 426160

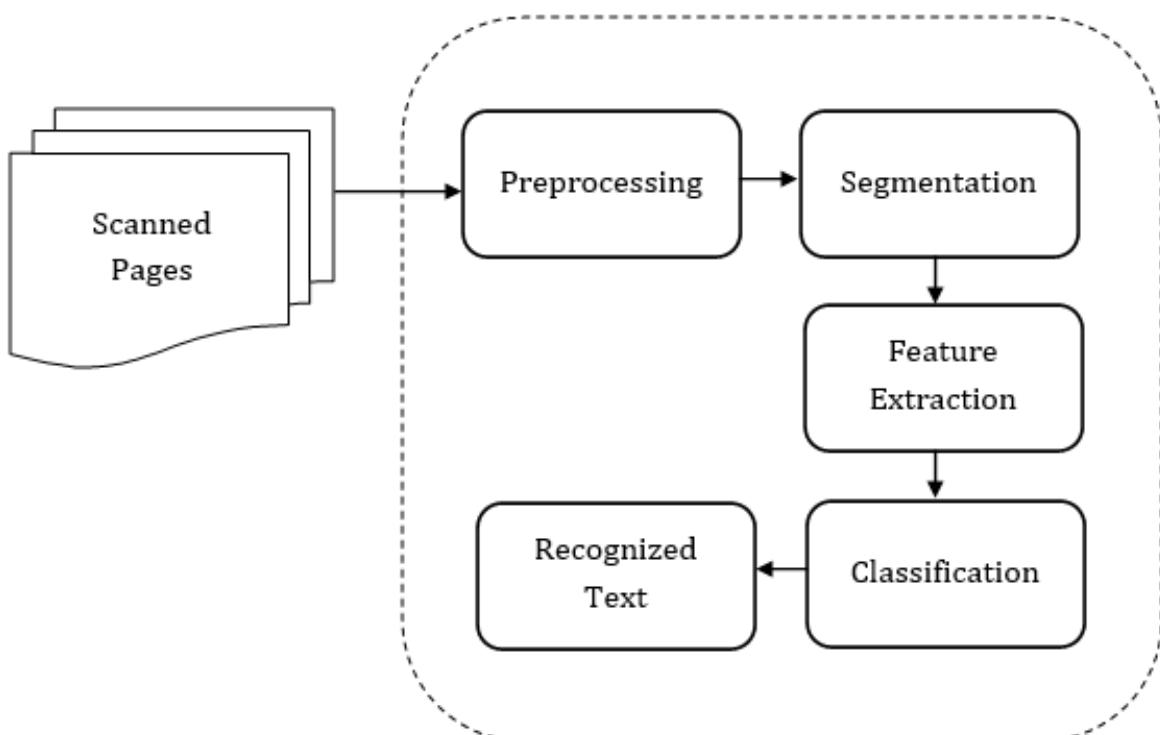
RAJARSHI PAL
Please sign above

Payable at par at all branches of Axis Bank Ltd in India.

309061 5002110121 426160 31

II. About OCR

It is Offline Method. It used to extract text from scanned image. Before using OCR we have to do some pre-processing on Image so that character recognition & extraction become easy & efficient. This technique is simple & efficient. Both handwritten text & printed text both can be recognise by OCR. The efficiency of OCR heavily depends on the Pre-Processing & Input Image Quality.



III. ALGORITHM

1. Cheque Number Reader

A. Overview :

So Basic idea is to crop cheque number from original image as cheque number are located at bottom of cheque, it will be easier to crop that part. Then in the cropped image some image processing will done and image coating first 6 digit will be cropped. Then with the help of OCR & input templates of number from 0 to 9 Cheque Number will be extracted.

B. Algorithm :

1. Input Image of Cheque.
2. Do Pre-Processing on image to Get cheque Number Information.
3. Crop image Containing Cheque Number & Crop each digit in New Image.
4. Re-size image if Required & match each digit with input template.
5. Display the Output.

C. Block Diagram

Step 1: Input of Image

Take Input of Image of cheque is with the help of camera/scanner. Take care that image is captured in perfect environmental condition. So that it doesn't affect features available.

Step 2: Pre processing

Firstly image is convert to grey image from rgb image, Then it is converted to Double so that Matrix of an image can be made. Further image is converted to binary image.

Step 3: Find Cheque Number

As we Cheque Number is located at bottom of cheque. So we will crop that potion of image and copy it to other matrix. So these new image will be saved & resizing of this image will take place. Now will crop the row containing cheque number.

Step 4: Find Digits

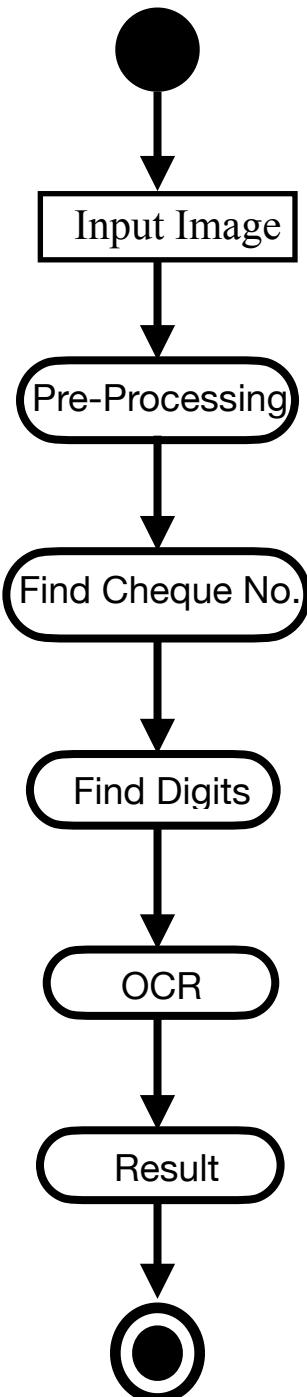
As cheque Number is Between Two Inverted Comma, we will split all the 6 digits between these two comma. Resizing of image of each digit will done. And to reduce noise some filtering operation will be performed on these Images.

Step 5: OCR

Template image of 0 to 9 will be loaded. And with help of OCR, This template image each digit value will be stored in in array

Step 6: Result

*ChequeNo =digit(1)×10⁵
+ digit(2)×10⁴ + digit(3)×10³.
+ digit(4)×10² + digit(5)×10
+ digit(6)*



2. Cheque Signature Verification

A. Overview :

So here we will compare signature of account holder in Cheque With the signature submitted by account holder to the bank. If both signature are same then output will be ‘Matched’ otherwise ‘Not Matched’. At least 4% buffer difference is allowed.

B. Algorithm :

1. Take Input Image of Cheque & reference Signature..
2. Crop the Signature from the Cheque Image.
3. Do Pre-processing on both Image.
4. Now using Function compare Both Image.
5. If difference is less than 0.4 then Signature is matched.
6. Otherwise Both Signature are not same.

C. Block Diagram

Step 1: Input of Image

Take first Input as Image of cheque is with the help of camera/scanner. Second Input as Signature of account Holder which was submitted by them to bank.

Step 2: Pre processing

In this image is converted to grey image from rgb image, as it is easier and effective to do operation on grey image compared to colourful image. Then as Signature of account holder is located at right bottom, Crop that part of image and copy it to new Matrix. Now Resize the new image.

Matrix of an image can be made. Further image is converted to binary image.

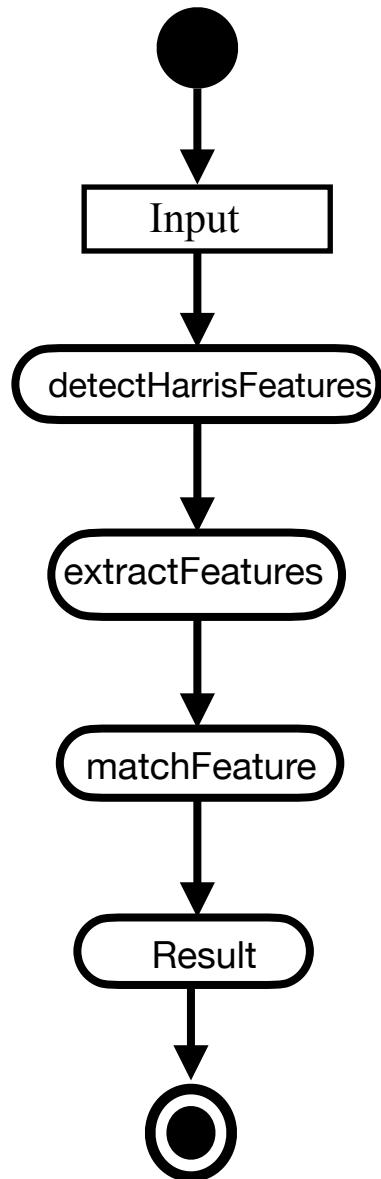
Step 3: Comparison

Now with help of detectHarrisFeatures() we will detect Corners in both images. Now we will apply extractFeatures() function on both images, which will store all information of each pixel.

matchFeatures() will match all the same features in both the Images. Then we will find % of matching features of both Image.

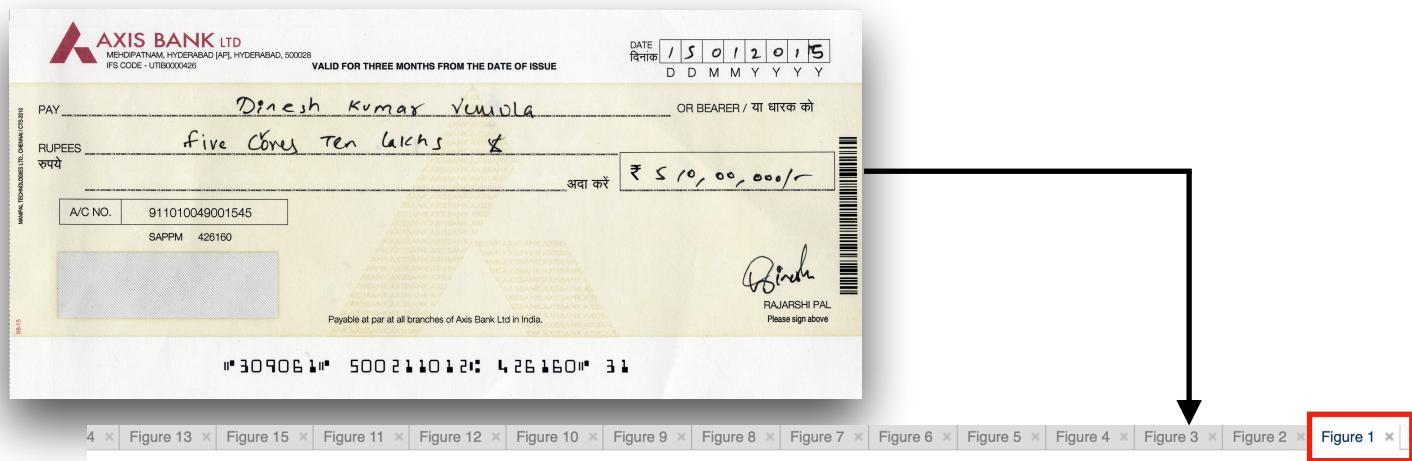
Step 4: Result

Now If Difference between matching Features both Image is Less than 4% then output will ‘Signature Matched’ otherwise ‘Signature Not Matched’.

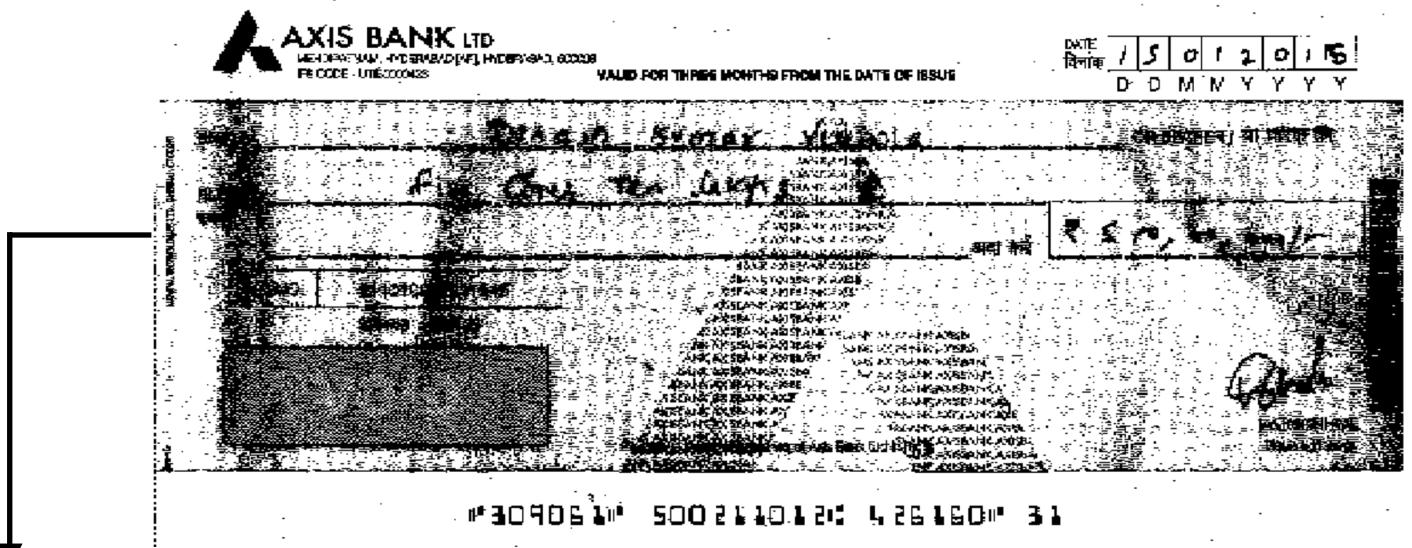


IV. RESULTS

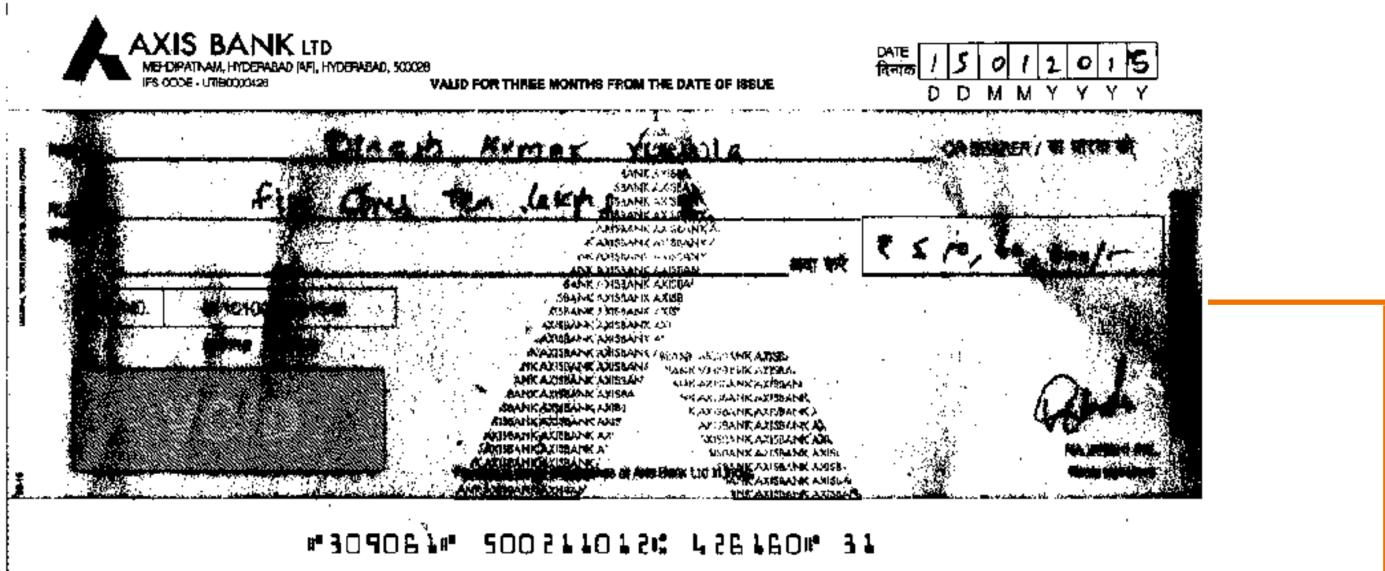
1. Cheque Number Reader



4 × Figure 13 × Figure 15 × Figure 11 × Figure 12 × Figure 10 × Figure 9 × Figure 8 × Figure 7 × Figure 6 × Figure 5 × Figure 4 × Figure 3 × Figure 2 × Figure 1 ×



3 × Figure 15 × Figure 11 × Figure 12 × Figure 10 × Figure 9 × Figure 8 × Figure 7 × Figure 6 × Figure 5 × Figure 4 × Figure 3 × Figure 2 × Figure 1 ×

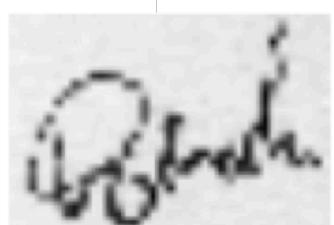
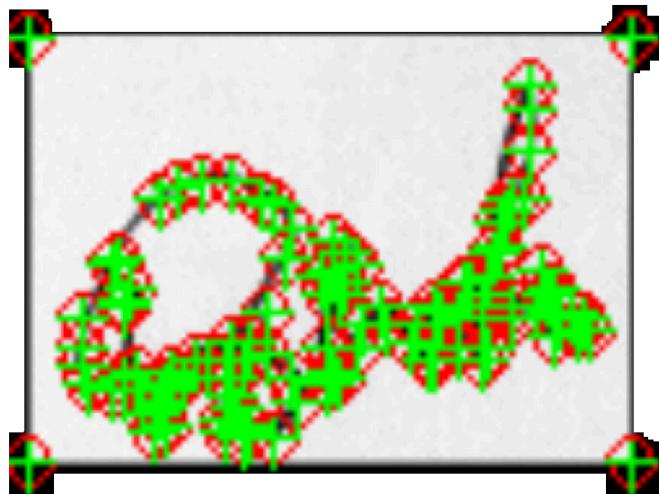
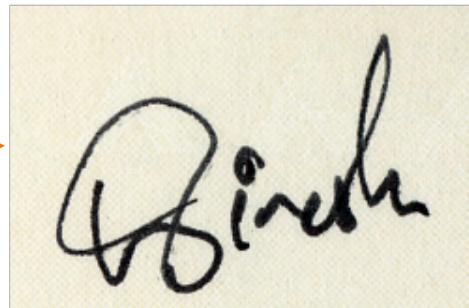
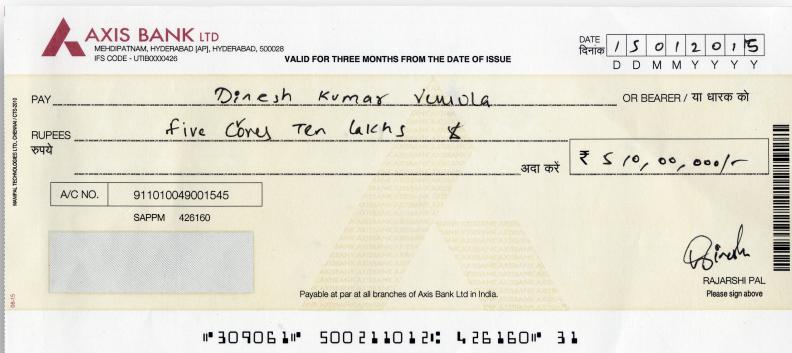


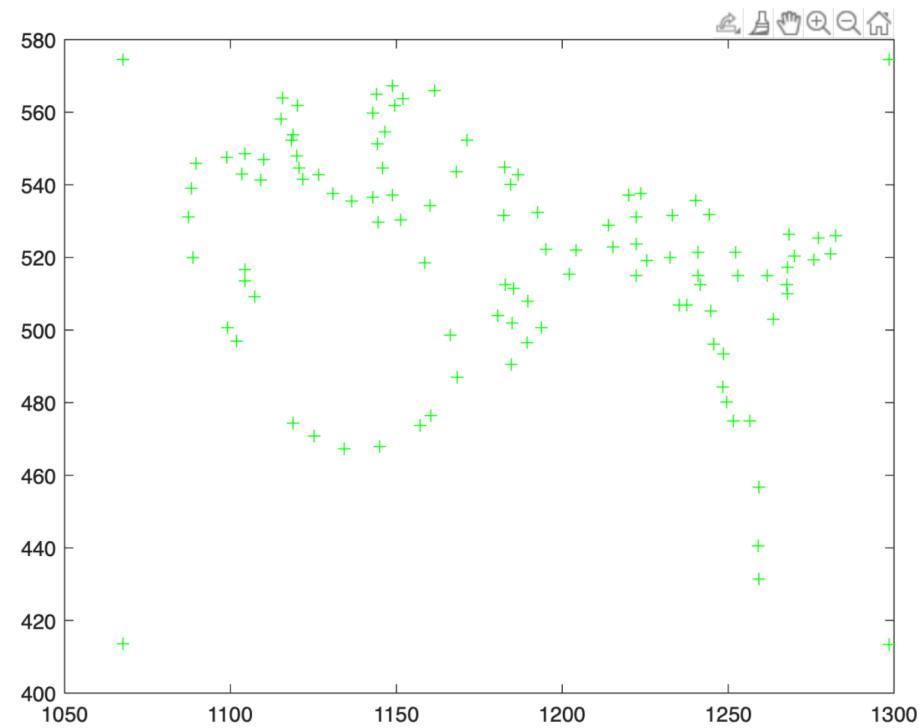
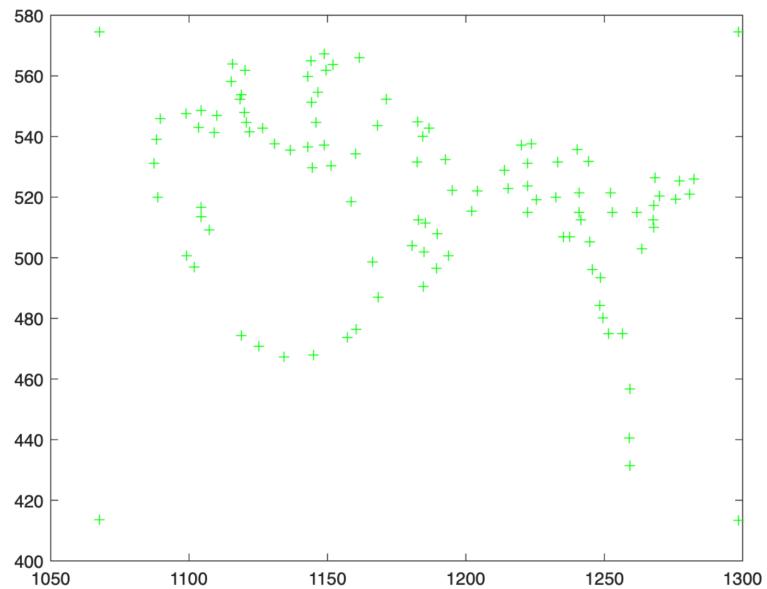
4 × 309061 5002110120 4261601 31

30906111



2. Cheque Signature Verification





Output

Final.m

Cheque Number For Given Image is : 309061

Signature Matched

V. CONCLUSION

Cheque Number Reader & Signature Verification using Image Processing was Implemented in MATLAB. To reduce Human Efforts in primitive Cheque clearance System, this type of system can be used for making payment process faster & easier. Here Cheque Number & signature field was extracted using image processing similar fields like beneficiary name. Amount in words, amount in numbers, date, etc can also be extracted.

REFERENCES

1. <http://in.mathworks.com/help/>
2. <http://cvr.ac.in/ojs/index.php/cvracin/article/view/321>
3. Rupesh Sancheti ,Ajay MarchyaMohit Mehta, and, “Automatic Cheque Processing System”, International Journal of Computer and Electrical Engineering, Vol. 2, No. 4, August, 2010.

cOde

```
clc;
clear all;
```

```
%Input Image of Cheque
I=imread('Axis.jpg');
% INput Image of Reference Signature
I2=imread('sir1.jpg');
```

```
ChequeNo(I)
Sign(I,I2)
```

```
function ChequeNo(I)

I3=rgb2gray(I);
I3=im2double(I3);
I3=im2bw(I,0.9);
figure,imshow(I3);

[rows,cols]=size(I3);
```

```
% finding location of white space
xstart=cols;
xend=1;
ystart=rows;
yend=1;
for r=1:rows
for c=1:cols
if((I3(r,c)==1))
if (r<ystart)
ystart=r;
end
if((r>yend))
yend=r;
end
if (c<xstart)
xstart=c;
end
if (c>xend)
xend=c;
end
end
end
end
```

```
%Crop the image of cheque & store it in another martix
for i=ystart:yend
for j=xstart:xend
im((i-ystart+1),(j-xstart+1))=I3(i,j);
end
end
```

```
%resize the new image
I3=imresize(im,[500,1000]);
[x y]=size(I3)
figure,imshow(I3);
```

```
%crop the row which contain cheque number information
im=imcrop(I3,[1,440,1000,40]);
```

```
%Find Digits
im=imfilter(im,[1,1]);
blackPixel=1000;
[r c]=size(im);
for m=1:r
```

```

for n=1:c
if((im(m,n)==0))
if (n<blackPixel && n>100)
blackPixel=n;
end
end
end
end
im=imcrop(im,[blackPixel,1,1000-blackPixel,40]);

```

```

%Crop the cheque number
im=imcrop(im,[15,1,110,40]);
figure,imshow(im);

```

%Do Pre-processing on Cheque Number Image

```

[r,c]=size(im)
figure,imshow(im);

```

```

[r,c]=size(im)

```

```

blackFound=0;

```

```

right=c;

```

```

for i=1:6

```

%Finding First Comma

```

for j=1:r

```

```

for k=1:c

```

```

if(im(j,k)==0)

```

```

if(k<right)

```

```

right=k;

```

```

end

```

```

end

```

```

end

```

```

end

```

```

finish=right;

```

```

pureWhiteFound=0;

```

%finding the next pure white column

```

while(pureWhiteFound==0 && finish~=c+1)

```

```

row=1;

```

```

blackFound=0;

```

```

while(blackFound==0 && row~=(r+1))

```

%If a black pixel is found in the column step to the next coloumn

```

if(im(row,finish)==0)

```

```

blackFound=1;

```

```

else

```

```

row=row+1;

```

```

end
end
%If non black pixel is found in the current column
if(blackFound==0)
pureWhiteFound=1;
else
finish=finish+1;
end
end
I=imcrop(im,[right,1,finish-right-1,r]);
%Removing Extra Space
ystart=r;
yend=1;
[p q]=size(I);
for m=1:p
for n=1:q
if((I(m,n)==0))
if (m<ystart)
ystart=m;
end
if((m>yend))
yend=m;
end
end
end
end

%Crop Digits of Cheque Number
number(:,:,i)=imresize(imcrop(im,[right,ystart,finish-right-1,yend-ystart]),[40,20]);
%Image Contain Digits which are not Cropped yet.
im=imcrop(im,[finish,1,c,r]);
[r,c]=size(im);
right=c;
end
for i=1:6
figure,imshow(number(:,:,i));
end

%Importing Sample Templates
sample(:,:,1)=im2bw(imresize(rgb2gray(imread('one.jpg')),[128 128]));
sample(:,:,2)=im2bw(imresize(rgb2gray(imread('two.jpg')),[128 128]));
sample(:,:,3)=im2bw(imresize(rgb2gray(imread('three.jpg')),[128 128]));
sample(:,:,4)=im2bw(imresize(rgb2gray(imread('four.jpg')),[128 128]));
sample(:,:,5)=im2bw(imresize(rgb2gray(imread('five.jpg')),[128 128]));
sample(:,:,6)=im2bw(imresize(rgb2gray(imread('six.jpg')),[128 128]));
sample(:,:,7)=im2bw(imresize(rgb2gray(imread('seven.jpg')),[128 128]));
sample(:,:,8)=im2bw(imresize(rgb2gray(imread('eight.jpg')),[128 128]));
sample(:,:,9)=im2bw(imresize(rgb2gray(imread('nine.jpg')),[128 128]));

```

```

sample(:,:,10)=im2bw(imresize(rgb2gray(imread('zero.jpg')),[128 128]));

%Resizing & pre-processing on Sample Image
for i=1:10
xstart=128;
xend=1;
ystart=128;
yend=1;
for r=1:128
for c=1:128
if((sample(r,c,i)==0))
if (r<ystart)
ystart=r;
end
if((r>yend))
yend=r;
end
if (c<xstart)
xstart=c;
end
if (c>xend)
xend=c;
end
end
end
end
end

samplecut(:,:,i)=imresize(imcrop(sample(:,:,i),[xstart,ystart,xend-xstart,yend-ystart]),[40 20]);
end

```

```

%Comparing Digits with sample Image
for i=1:6
percentage=0;
picsize=40*20;
for j=1:10
matchingPixels=0;
for m=1:40
for n=1:20
if(number(m,n,i)==samplecut(m,n,j))
matchingPixels=matchingPixels+1;
end
end
end
matchingPercentage=(matchingPixels/picsize)*100;
if(matchingPercentage>percentage)
percentage=matchingPercentage;
if(j==1)
num(i)=1;
elseif(j==2)

```

```

num(i)=2;
    elseif(j==3)
        num(i)=3;
    elseif(j==4)
        num(i)=4;
    elseif(j==5)
        num(i)=5;
    elseif(j==6)
        num(i)=6;
    elseif(j==7)
        num(i)=7;
    elseif(j==8)
        num(i)=8;
    elseif(j==9)
        num(i)=9;
    else
        num(i)=0;
    end
end
end

```

%Cheque number
chequeNumber=num(1)*10^5+num(2)*10^4+num(3)*10^3+num(4)*10^2+num(5)*10+num(6);

%formatting the cheque number in case of zeros at the beginning

```

str=int2str(chequeNumber);
l=length(str);
for i=l:5
    str=strcmp('0',str);
end
ChequeNumber=str;
%Output
fprintf("Cheque Number For Given Image is : %s\n\n",ChequeNumber);

```

end

```

function Sign(I,I2)
im=imresize(I,[500,1000]);
[x y]=size(im);
I1=im(300:370,1850:1950);
figure,imshow(I1);
I1(:,:,4)=[];
I2(:,:,4)=[];
I1=rgb2gray(I1);

```

```

I2=rgb2gray(I2);

subplot(2,1,1)
imshow(I1)
figure;
subplot(2,1,2);
imshow(I2)

figure;
points1=detectHarrisFeatures(I1);plot(points1);
figure;
points2=detectHarrisFeatures(I2);plot(points2);

[features1,valid_points1]=extractFeatures(I1,points1);
[features2,valid_points2]=extractFeatures(I2,points2);

indexPairs=matchFeatures(features1,features2);

matchedPoints1=valid_points1(indexPairs(:,1),:);
matchedPoints2=valid_points2(indexPairs(:,2),:);

figure;
showMatchedFeatures(I1,I2,matchedPoints1,matchedPoints2);

u=matchedPoints2.Metric-matchedPoints1.Metric;

if abs(u)<=0.04
    disp(" Signature Matched ");
else
    disp(" Signature Not Matched ");
end
end

```