Value Identification Of Indian Currency Using Image Processing Techniques

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***Abstract*- In this paper we are proposing a technique which would detect the value of the original scanned INR. The technique which is used here is thresholding. In this process primarily the original notes of Indian Currency of INR 10, INR 50, INR 100, INR 500 and INR 2000 are processed and their threshold and dimension values are extracted and stored which are used for identification of the currency scanned. The currency, to be identified is first scanned on an A4 size scanner. The scanned image then firstly converted into black and white image. After that all 3 dimension of the image are extracted using the concepts of arrays and stored. The scanned currency is then thresholded to find the value of the threshold which is later used along with the dimension parameters and then checked by all the above stored values of the original currency to identify the value of scanned currency. We have used the MATLAB software for performing all the operations.**

Keywords- Image Processing, Threshold, Graythresh, Currency, MATLAB

I. INTRODUCTION

Image processing is one of the key areas today for processing the images. Digital Image Processing (DIP) is multidisciplinary science that makes employ the principles from various fields such as optics, computer science, mathematics, surface physics and visual psychophysics [4]. After extraction of features from image, knowledge based technique is to apply for taking recovery scheme from those extracted features with the help of computer and without or with a little human intervention as well [3]. In this paper the image processing tool used is thresholding which is implemented using MATLAB [7]. It is useful in discriminating foreground from the background [2]. Binarization process is easy when applying simple thresholding method onto good quality image [1]. Our technique is based on the ratio percentage of the threshold which identifies the value of the currency mentioned above in the abstract.

II. DESIGN OUTLINE

The process is programmed using the MATLAB software. The overall outline of the working is defined as follows-

1) Scanning of the currency by using an A4 size scanner.
2) Thresholding and grey scaling the image to detect the edges of the image.
3) Using online Photoshop tool [8] to crop the image which has been received after thresholding and greyscaling.
4) Extracting the image's threshold value percentage and dimensions.
5) Matching of the scanned image.

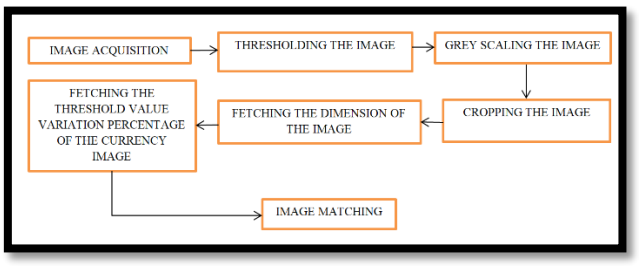

Figure 1: Steps followed to identify the value of the scanned INR currency

III. IMPLEMENTATION

The process of matching the currency and value determination consists of 2 processes-

a. Scanning the original note to gather it's dimension and threshold value ratio percentage.

b. Scanning of any random currency for its value and originality.

c. Scanning the original note to gather its dimension and threshold value ratio percentage- In this process the original currencies are scanned and then their dimensions and threshold value percentage are stored in variables for further use.

A. IMAGE ACQUISITION

In this process we have used a RGB A4 scanner with resolution of 300 dpi to scan the image which is depicted as follows-

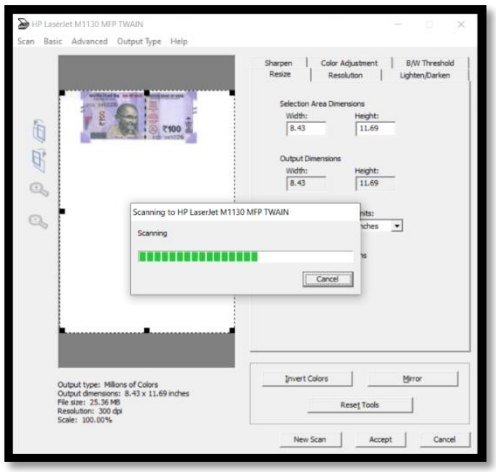

Figure 2: Representation of image acquisition process

B. IMAGE THRESHOLDING

In this process we have thresholded the acquired image using the in-built MATLAB function graythresh() [6]. This function helps to convert the image into binary values of 0's and 1's by the MATLAB function im2bw which is implemented in the next process.

C. IMAGE GREY SCALING

In this process we are grey scaling the thresholded image acquired in the previous step. Now the image is converted into binary values of 0's and 1's by the MATLAB function im2bw [5]. The result is depicted as follows-

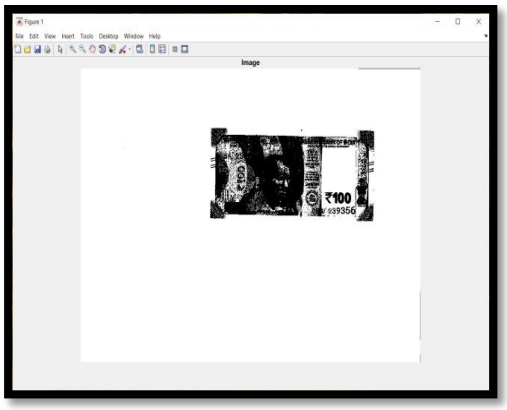

Figure 3: Image after thresholding and grey scaling

D. IMAGE CROPPING

In this process we are cropping the image of the currency from the whole A4 size image. The Perspective tool in Photoshop is used to crop the image. It is depicted as follows-

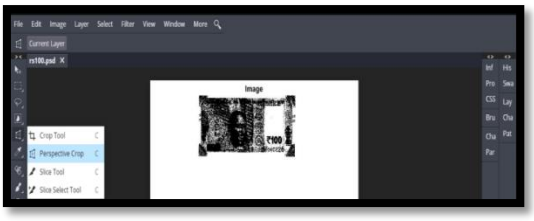

Figure 4: Perspective tool used for image cropping

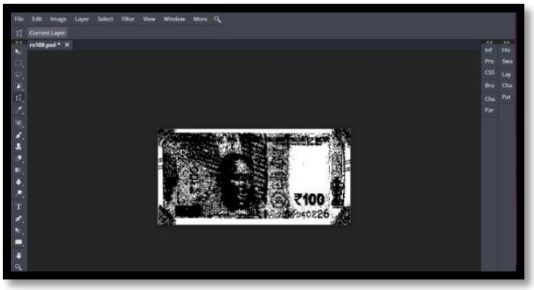

Figure 5: Representation of the image after cropping

E. FETCHING THE DIMENSIONS OF THE IMAGE

After the image is cropped the dimension of each of INR mentioned above are extracted and stored in an array. The size() of MATLAB is used to fetch the size of any image file in an array. The following is the code to store the dimensions of the cropped currency image.

SYNTAX:

```
[x,y,z] = size(image.jpg);
```

CODE:

```
I3=imread('cRs100.jpg');
level=graythresh(I3);
c4=im2bw(I3,level);
[x1,y1] = size(c4);
```

OUTPUT OF THE ABOVE CODE:

Figure 6: The total size of the image

F. FETCHING THE THRESHOLD VALUE VARIATION RATIO PERCENTAGE OF THE SCANNED IMAGE

This step is used to calculate the threshold value percentage of the above image. In this process the image is traversed. As, the image thresholded have either the value 0 or 1. The total number of 0's or 1's upon dividing by the total no. of the pixels of the image gives us the threshold ratio

percentage of that particular currency note. The following segment of the code is used to store the threshold vales of all the taken INR's in variable.

CODE:

```
[x1,y1] = size(c3); %The total size of the image is extracted
t3=x1*y1; %The total size of the image is stored in the variable t3
for i=1:x1 %The image is traversed from 1 to the maximum size of the 1st index x1
    for j=1:y1 %The image is traversed from 1 to the maximum size of the 2nd index y1
        if(c3(i,j)==0) %The points having 0 as their threshold values are checked
            count3=count3+1; %Total points having 0 values are store in count3
        end
    end
end
```

d. Scanning of any random currency for its value- After all the values of the dimensions and the threshold value percentage is stored in the variables in the above processes we are now ready to check any random currency for its value.

G. IMAGE MATCHING

A random note is now scanned to and the processed all the above steps to calculate its dimension, threshold value variation ratio percentage and then the values are stored in the variables which are further matched with the previously acquired values for matching of the specific currency. The code is as follows-

CODE:

```
readImage=imread('cRs100.jpg');
[x,y,z] = size(readImage);
level=graythresh(readImage);
c=im2bw(readImage,level);
count=0;
t=0;
p=0;
t=x*y;
for i=1:x
    for j=1:y
        if(c(i,j)==0)
        count=count+1;
        end
    end
p=(count/t)*100;
if (x==125) && (y==241) && (z==3) && (p>=71) && (p<=73)
disp('The scanned currency is of Rs10');
elseif (x==128) && (y==267) && (z==3) && (p>=52) && (p<=55)
disp('The scanned currency is of Rs50');
elseif (x==142) && (y==281) && (z==3) && (p>=53) && (p<=57)
disp('The scanned currency is of Rs100');
elseif (x==129) && (y==298) && (z==3) && (p>=65) && (p<=67)
disp('The scanned currency is of Rs500');
elseif (x==129) && (y==345) && (z==3) && (p>=48) && (p<=53)
disp('The scanned currency is of Rs2000');
else
disp('The scanned currency is not present in the database') end
```

The above code is used to fetch the dimension and the threshold value of the currently scanned currency. And after this process is completed the matching process is started. The code used for matching the random currency is represented as follows-

The output of the above code is follows-

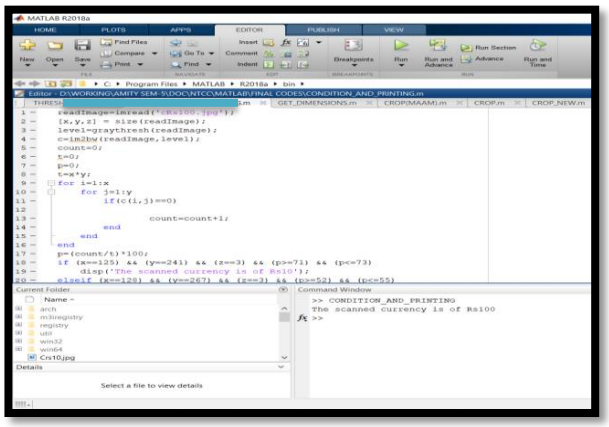

Figure 7: The output window illustrating the currency scanned is of INR 100

IV. FINDINGS AND RESULT

The technique used here to identify the value of the original currency work fairly well in probably all environments taken for testing. The technique is also very efficient as the execution of the code is fast. The proposed approach which has been followed for the implementation is accurately compatible with the scope defined for the research.

V. FUTURE SCOPE

The proposed method uses the perspective tool of Photoshop to crop the image. The method of automating the cropping process would reduce any human error caused in this process. Also by involving the use of other parameters of image processing this technique can be enhanced as the result will be more perfect when more parameters are used. We can also add feature extraction techniques to extract the security thread present within the currency notes to have a more improved security check for checking for fake currency.

VI. CONCLUSION

We came across that the proposed methods works effectively well whenever an original currency is scanned for value determination. We need a very high responsive and efficient process which would scan the currency for its value. In this paper we have focused on identifying the value based upon different image processing tools and methods and the results obtained are approximately correct.

ACKNOWLEDGMENT

We would like to thank our faculty Prof. Tannisha Kundu for the continuous guidance and belief she had on us throughout the process.

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