

CURRENCY RECOGNITION SYSTEM USING IMAGE PROCESSING

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ABSTRACT

In this paper, we will propose an implementation of an automatic currency recognition system using image processing techniques. This method can be used for recognizing both the country of origin as well as the denomination value of the bank note. This method works by first identifying the country of origin using certain predefined areas and then extracting the denomination value using some different predefined areas. We have considered two different currencies i.e., Rupee and Yen and their denominations as well. Our system is able to accurately and quickly identify test notes.

Keywords— Digital Image Processing, Feature extraction, Currency recognition.

1. INTRODUCTION

Around 180+ currencies are presently circulating in the world. Each of these currencies differ in their size, color and texture. Unlike the olden times, the trade and commerce between countries has increased in all sorts of levels. The need for acquiring knowledge about all the currencies by the banks has been extremely important. It becomes difficult for a normal human being to identify each note accurately. Thus, an efficient automated system that identifies a currency note is pivotal in the future.

In this paper, we propose an automated system for currency recognition using Image processing techniques. Our system works for two different currencies and their denominations. These currencies are Yen and Rupee.

The method used for identification is shown in the block diagram in Fig. 1. The currency note is first processed using image processing and converted into a usable input to extract various pictorial information. The system then extracts the region of interest (ROI) based on different features. Using these regions of interest, the system first determines the country of origin of the currency note and then the denomination.

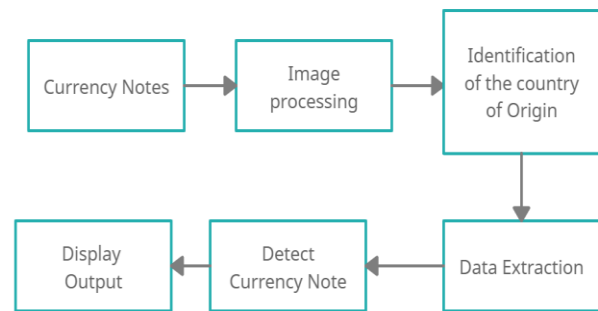


Figure 1: Block Diagram of the proposed System

2. PROPOSED METHODOLOGY

In order to differentiate the currency based on two different parameters (country of origin, and denomination), we segment the problem into two steps:

- First, identify the country of origin
- Identify the denomination (value) of the note

The reason behind choosing this approach was on the observation that various bank notes of different denominations of the same country have similar characteristics.

The full method is described below.

A. Pre- processing

The image of the bank note has to be pre-processed before for better extraction. The image is converted to a binary image and also the features using Canny Edge detection. This allows us to identify the empty regions of the banknote and also the features. The processed used for Canny Edge Detection is shown in the block diagram in Fig. 2.

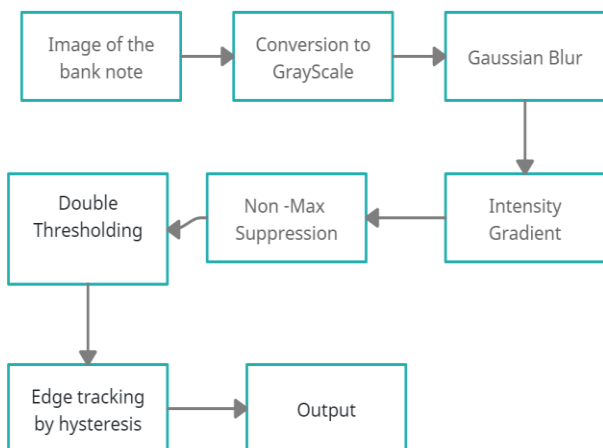


Figure 2: Block Diagram of Canny Edge Detection System



Figure 3: Original Image of the Bank Note



Figure 4: Image of the Bank Note after Canny Edge Detection

B. Identify the country of origin

Once the preprocessing steps are done, we can identify which regions of the bank note are relatively empty (black pixels). This is done on a predefined area. All the currencies are clustered into the country of origin based on which regions of the note are relatively empty.

C. Identify the denomination

Once the country has been correctly identified in the previous step, we can try to identify the value of the note.

This is done by comparing the ratio of the number of black pixels to the number of white pixels in a specific area defined for all the notes. The bank notes having different values will have different numeral values in the bank notes and thereby the ratio will be different for each and every currency note.

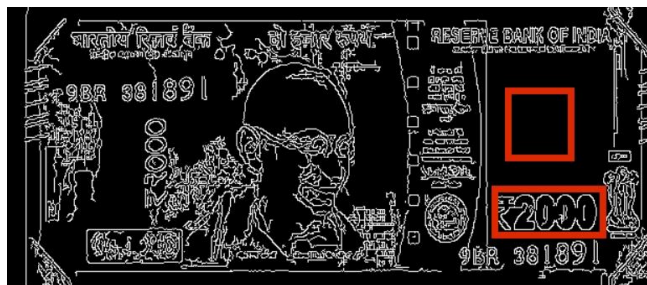


Figure 5: The above box out of the two detects the country of origin and the below detects the denomination. (Rupee)

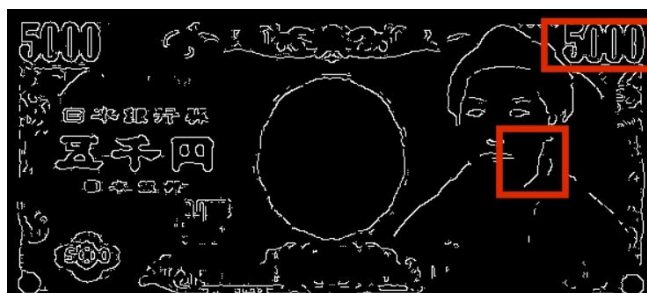


Figure 6: The below box out of the two detects the country of origin and the above detects the denomination. (Yen)

| Denomination (YEN) | Ratio of Black to White Pixels |
|--------------------|--------------------------------|
| 1000 | 6.828 |
| 2000 | 7.027 |
| 5000 | 6.893 |
| 10000 | 5.4565 |

Figure 7: Ratio of black to white pixels for yen

| Denomination (RUPEE) | Ratio of Black to White Pixels |
|-------------------------|-----------------------------------|
| 10 | 8.946 |
| 50 | 8.242 |
| 100 | 5.361 |
| 200 | 9.200 |
| 500 | 7.398 |
| 2000 | 7.436 |

Figure 8: Ratio of black to white pixels for Rupee

3. RESULTS

The ratio of black to white pixels of the specified part were mapped to the dataset to determine the country of origin as well as the denomination.

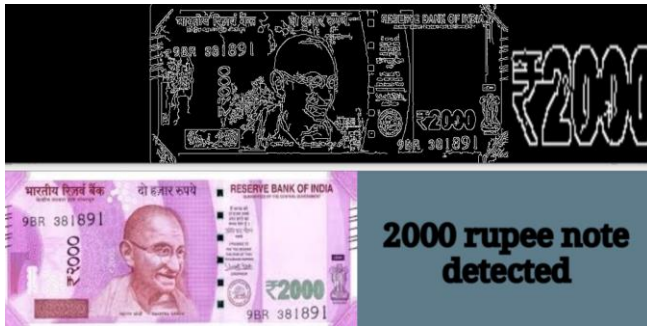


Figure 9: Output as shown when the currency recognition system is run (For Rupee)



Figure 10: Output as shown when the currency recognition system is run (For Yen)

4. CONCLUSION

In this paper, we have designed a system that accurately identifies both the currency of origin and the denomination of a given bank note. The features extracted from the bank notes were used to determine the results. The proposed method was developed and tested on currencies of two different country of origins i.e., India and Japan. There are 180+ currencies that can be included in the system, and we have chosen to only do for two of the currencies. This can be worked on in the future.

5. REFERENCES

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