Feature Extraction and Identification of Indian Currency for Visuallu Impaired People

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***Abstract*—The advancement of color printing technology has increased the rate of fake currency note printing and duplicating the notes on a very large scale. Few years back, the printing could be done in a print house, but now anyone can print a currency note with maximum accuracy using a simple laser printer. As a result the issue of fake notes instead of the genuine ones has been increased very largely. Advancement in technology leads towards many automated systems which are capable of performing tasks without interference of humans. Money deposit machines, automatic ticket machines are one of such automated systems. In such systems it is necessary to identify the counterfeit and denomination of currency automatically. This article describes extraction of various features of Indian currency notes. MATLAB software is used to extract the features of the note. The proposed system has got advantages like simplicity and high performance speed. The result will predict whether the currency note is fake or not.**

Keywords; Denomination;recognition;currency notes

1 INTRODUCTION

Technology is growing very fast these days. Consequently the banking sector is also getting modern day by day. This brings a deep need of automatic fake currency detection in automatic teller machine and automatic goods seller machine. MATLAB is the perfect tool for computational work, and analysis. Feature extraction of images is challenging task in digital image processing. It involves extraction of invisible and visible features of Indian currency notes[4-5]. This approach consists of different steps like image acquisition, edge detection, gray scale conversion, feature extraction,image segmentation and decision making. Normally human brain is capable of identifying the fake currency on the basis of check points printed on the currency. So it is necessary to develop a system which can automatically recognize the denomination of currency and check whether the currency is real or fake.

II.INDIAN BANKNOTE FEATURES

This section gives a brief description of the Indian currency features that have been used for banknote recognition in the proposed method. These features, as shown in Fig. 1, are: The Central Numeral (A), Ashoka Pillar Emblem (B), Identification mark (C) and the Colour Band (D). The monetary value of the Indian currency monetary value is printed in both figures and words. The central numeral depicts the monetary value of the currency note most prominently. This feature is unique for each currency denomination. The Ashoka Pillar Emblem, present on the lower left hand side of the note in all Indian currency denominations, has been used to distinguish the rupee from other currencies. The Identification Mark is a special feature in intaglio printing located on the left-hand side middle portion of the banknote. The shapes are different for each denomination of Indian currency and aid the visually impaired in identifying the currency value. The colour band runs along the right border of the note and is different for different currency values. It can thus be used to distinguish between currency denominations.

Fig.1.Indian banknote for currency identification

A. Central Numeral

The Central Numeral is the most distinguishing feature in every denomination of the Indian currency. A bag of features

B. Ashoka Pillar Emblem Recognition

The emblem is a distinctive feature of the Indian currency with a nearly constant aspect ratio.

C. Identification Mark

The identification mark is recognized using normalized correlation technique through template matching.

D. Colour Recognition

The CIE LAB Colour Space model has been employed for colour analysis of the banknotes. This colour space model defined by CIE has two colour channels (a and b) and a single

channel for luminance (lightness), making it an opponent colour based system

III. METHODOLOGY

The system proposed here work here on the image of currency note under ultraviolet light acquired by a digital camera. The algorithm which is applied here is as follows

1. Acquisition of image of currency note under ultraviolet light by simple digital camera or scanner.
2. Image acquired is RGB image and now is converted to grayscale image.
3. Edge detection of whole gray scale image.
4. Now characteristics features of the paper currency will be cropped and segmented.
5. After segmentation, characteristics of currency note are extracted.
6. Intensity of each feature is calculated.
7. If the condition is satisfied, then the currency note is said as original otherwise fake. In this method, characteristics of currencies are employed which are used by common people for differentiating for different banknote denomination. The characteristics that can be used to check the authentication of currency note are

*A. **Security Thread***

It is a 3mm windowed security thread with inscriptions of India in Hindi, RBI and 2000/500 on banknotes with color shift. Color of the thread changes from green to blue when the note is tilted.

*B. **Serial Number***

Serial number panel with banknote number growing from small to big on the top left side and bottom right side.

*C. **Latent image***

A vertical band on front side of denomination at right hand size. It contains latent image showing numeral of denomination when banknote is held horizontally at eye level.

*D. **Watermark***

The portrait of Mahatma Gandhi, and multidirectional lines and a mark showing the denominational numeral appear which can be viewed when held against light.

*E. **Identification Mark***

A mark with intaglio print which can be felt by touch, helps blind person to identify the denomination. In 500 denomination the mark is of five lines while in 2000 line the mark is of seven lines

IV.IMPLEMENTATION

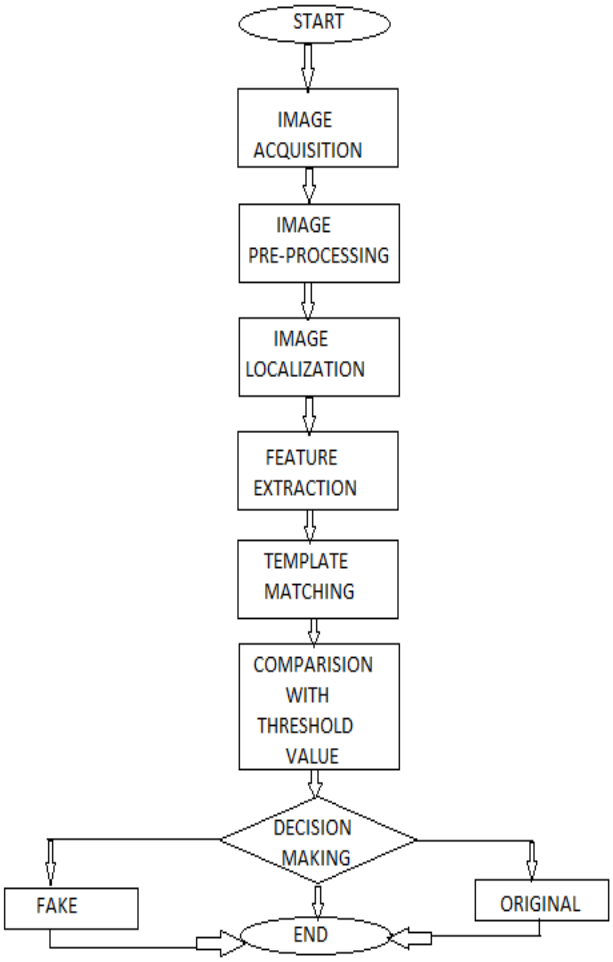

Figure 2: Flow graph of image processing algorithm.

A. Image acquisition: Image acquisition is a process of acquiring an image with the help of device, the acquired image is stored for further processing.

B. Image pre-processing: Image pre-processing is done to enhance some image features important for further processing and analysis.

- Resizing: The size of the image is reduced by using MATLAB function ‘imresize’.
- Removing noise: When image is captured there are chances that image get blurred and noise may be added to the image and it’s necessary that this should be removed and image should be smoothened.[1]

C. Image localization: When web camera capture the image of currency then the image contains background maintained below currency, for processing of an image and to get correct results it is necessary to remove the background and keep the image of currency as it is.

D. Feature extraction: Using feature extraction technique it is possible to extract the feature of available image and these extracted features are compared with known features to detect counterfeit and denomination of currency [2].

E. Tempate matching: Template matching technique is used to identify denomination of currency [3].

F. Comparison with threshold values: Once all the results obtained from above mentioned algorithms now these obtained results will be compared with threshold values.

RESULT

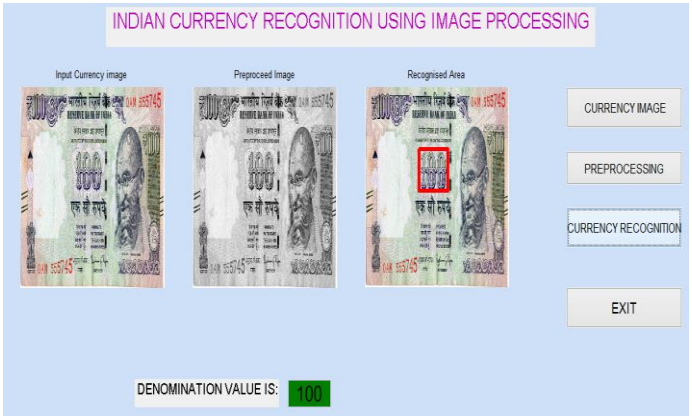

Figure 3: 100 rupees denomination recognition

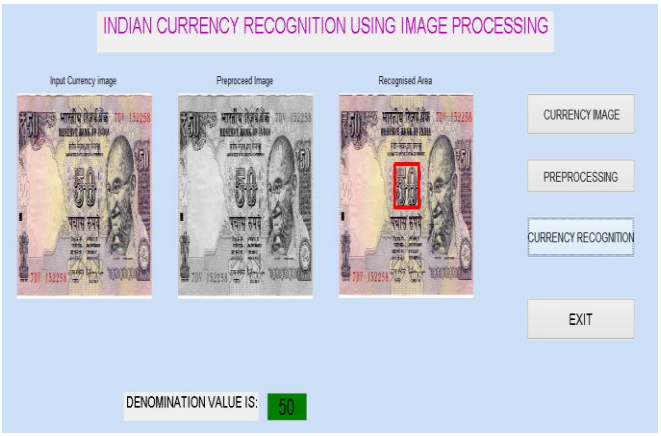

Figure 4: 50 rupees denomination recogniti

CONCULSION

The fake currency detection using image processing was implemented on MATLAB. Features of currency note like serial number, security thread, Identification mark, Mahatma Gandhi portrait were extracted. The process starts from image acquisition to calculation of intensity of each extracted feature. With the help of above proposed method, it is possible to develop a system which will easily detect the denomination of Indian currency and also it checks the originality of Indian currency with the help of basic image processing algorithm. The system is capable of extracting features even if the note has scribbles on it.

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