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“Identification of Fake Currency Using Matlab”

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ABSTRACT

The use of counterfeit currency is one of the major issues faced throughout the world nowadays .The counterfeiters are becoming harder to track down because of their use of highly advanced technology. One of the most effective methods to stop counterfeiting can be the outspread use of various counterfeit detection tools/software that are easily available and are efficient .This is a MATLAB based application which will help recognize a bank-note based on its denomination on an application window. The method will be based on image pre-processing followed by a classification of note. 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: Fake Currency, Image Pre-Processing, Feature Extraction, Recognition, SURF

I. 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. Many researchers have been encouraged to develop robust and efficient automatic currency detection machine. Automatic machine which can detect banknotes are now widely used in dispensers of modern products like candies, soft drinks bottle to bus or railway tickets. The technology of currency recognition basically aims for identifying and extracting visible and invisible features of currency notes. Until now, many techniques have been proposed to identify the currency note. But the best way is to use the visible features of the note . For example, color and size. But this way is not helpful

if the note is dirty or torn. If a note is dirty, its color characteristic are changed widely. So it is important that how we extract the features of the image of the currency note and apply proper algorithm to improve accuracy to recognize the note.

We apply here a simple algorithm which works properly. The image of the currency note is captured through a digital camera. The hidden features of the note are highlighted in the ultraviolet light. Now,processing on the image is done on that acquired image using concepts like image segmentation, edge information of image and characteristics feature extraction. 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. This approach consists of different steps like

image acquisition, edge detection, gray scale conversion, feature extraction, image segmentation and decision making. Acquisition of image is process of creating digital images, from a physical scene. Here, the image is captured by a simple digital camera such that all the features are highlighted. Image is then stored for further processing.

II. 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

- a) Acquisition of image of currency note under ultraviolet light by simple digital camera or scanner.
- b) Image acquired is RGB image and now is converted to grayscale image.
- c) Edge detection of whole gray scale image.
- d) Now characteristics features of the paper currency will be cropped and segmented.
- e) After segmentation, characteristics of currency note are extracted.
- f) Intensity of each feature is calculated.
- g) If the condition is satisfied, then the currency note is said as original otherwise fake.

A. 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

1. See through Register : The small floral design printed both on the front (hollow) and back (filled up) of the note in the middle of the vertical band next to the Watermark has an accurate back to back registration. The design will appear as floral design when seen against the light.

2. Water marking : The Mahatma Gandhi Series of banknotes contain the Mahatma Gandhi watermark with a light and shade effect and multi-directional lines in the watermark window.

3. Fluorescence : Number panels of the notes are printed in fluorescent ink. The notes also have optical fibres. Both can be seen when the notes are exposed to ultra-violet lamp.

4. Security Thread : The Rs.500 and Rs.100 notes have a security thread with similar visible features and inscription „Bharat“ (in Hindi), and „RBI“. When held against the light, the security thread on Rs.1000, Rs.500 and Rs.100 can be seen as one continuous line. The Rs.5, Rs.10, Rs.20 and Rs.50 notes contain a readable, fully embedded windowed security thread with the inscription „Bharat“ (in Hindi), and „RBI“. The security thread appears to the left of the Mahatma's portrait

5. Intaglio Printing : The portrait of Mahatma Gandhi, the Reserve Bank seal, guarantee and promise clause, Ashoka Pillar Emblem on the left, RBI Governor's signature are printed in intaglio i.e. in raised prints, which can be felt by touch, in Rs.20, Rs.50, Rs.100, Rs.500 and Rs.1000 notes.

6. Latent image : On the obverse side of Rs.1000, Rs.500, Rs.100, Rs.50 and Rs.20 notes, a vertical band on the right side of the Mahatma Gandhi's portrait contains a latent image showing the respective denominational value in numeral. The latent image is visible only when the note is held horizontally at eye level.

7. Micro lettering : This feature appears between the vertical band and Mahatma Gandhi portrait. It always contains the word „RBI“ in Rs.5 and Rs.10. The notes of Rs.20 and above also contain the denominational value of the notes in micro letters. This feature can be seen well under a magnifying glass.

8. Identification Mark : Each note has a unique mark of it. A special feature in intaglio has been

introduced on the left of the watermark window on all notes except Rs.10/- note. This feature is in different shapes for various denominations (Rs. 20- Vertical Rectangle, Rs.50- Square, Rs.100-Triangle, Rs.500-Circle, and Rs.1000- Diamond) and helps the visually impaired to identify the denomination.

B. Digital Image Processing Method To Detect Fake Currency

The design flow of fake currency detection system includes eight stages: Image acquisition, pre-processing, gray scale conversion, edge detection, image segmentation, feature extraction, comparison and output . This system is works on two images, one is test currency image on which authentication is to performed and other is the original currency image.

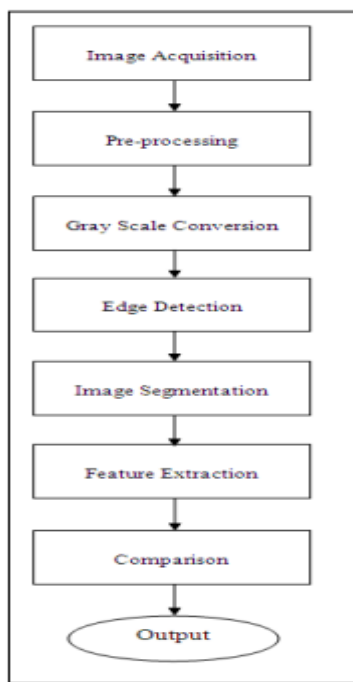


Figure 1. Flow Chart of Digital Image Processing Method To Detect Fake Notes

III. RESULTS AND DISCUSSION

1. Image Acquisition : There are various ways to acquire image such as with the help of camera or scanner. Acquired image should retain all the features..

2. Pre-Processing : Pre-processing of image are those operations that are normally required prior to the main data analysis and extraction of information. The aim of image pre-processing is to suppress undesired distortions or enhance some image features that are important for further processing or analysis.

It includes

2.1 Image Adjusting : When we get the image from a scanner, the size of the image is so big. In order to reduce the calculation, we decrease the size of image. Image Adjusting is done with the help of image interpolation. Interpolation is the technique mostly used for tasks such as zooming, rotating, shrinking, and for geometric corrections.

2.2 Image smoothinging : When using a camera or a scanner and perform image transfers, some noise will appear on the image. Image noise is the random variation of brightness in images. Removing the noise is an important step when image processing is being performed. However noise may affect segmentation and

pattern matching. When performing smoothing process on a pixel, the neighbour of the pixel is used to do some transforming. After that a new value of the pixel is created. The neighbour of the pixel is consisting with some other pixels and they build up a matrix, the size of the matrix is odd number, the target pixel is located on the middle of the matrix. Convolution is used to perform image smoothing. Also image smoothinging can be done with the help of median filter which more effective than convolution when goal is to simultaneously reduce the noise preserving edges. Median filter

replaces a pixel via the median pixel of all the neighbourhoods .

3. Gray-scale conversion: The image acquired is in RGB color. It is converted into gray scale because it carries only the intensity information which is easy to process instead of processing three components R (Red), G(Green), B(Blue)..

4. Edge detection : Edge detection is a fundamental tool in image processing and computer vision, particularly in the areas of feature detection and feature extraction, which aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. Edge detection is one of the fundamental steps in image processing, image analysis, image pattern recognition, and computer vision techniques.

5. Image segmentation : the image into its constituent regions or objects. The level to which sub division is carried depends on the problem being solved. Segmentation algorithm for monochrome images generally are based on one of the two basic properties of image intensity values

- Discontinuity
- Similarity.

In the first category, the approach is to partition an image based on abrupt changes in intensity such as edges in an image. The approach in the second category is based on partitioning an image into regions that are similar according to a set of predefined criteria.

6. Feature Extraction In pattern recognition and in image processing, feature extraction is the special form of dimensionality reduction. It is the method of capturing the visual content of images for indexing and retrieval. When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant (much data but not much information) then the input data will

be transformed into a reduced representation set of features (also named feature vector). If the attributes extracted are carefully chosen, it is expected that the attributes set will extract the relevant information from the input data in order to perform the desired task using this reduced representation instead of the full size input.

Feature extraction involves simplifying the amount of resources required to describe the large set of data

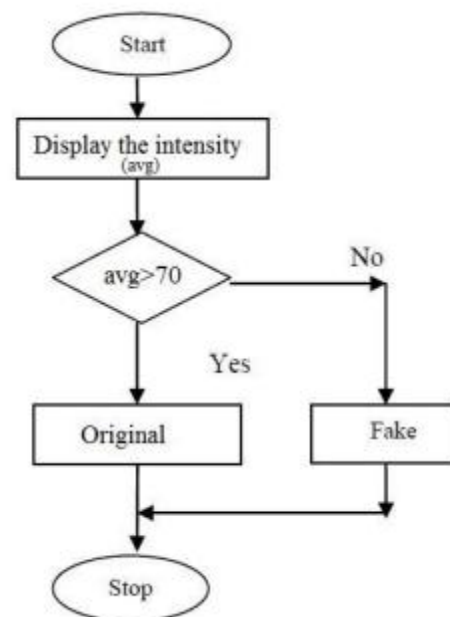


Figure 2. Flow Chart for decision making

IV. CONCLUSION

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. The system is capable of extracting features even if the note has scribbles on it. The algorithm processed here works suitably for the newly

introduced 500 and 2000 denomination.. Hardware implementation of the proposed system can also be done using suitable processor so that to increase the speed of detection. An automatic railway ticket booking system can also be proposed which includes currency detection as one of its part. . In Future, Mobile app can be developed which would be useful for normal as well as visually impaired persons, the same system can be developed for the remaining Indian currency notes and other country's currency notes. Also the app's interface can be further modified as per the user requirements.

V. REFERENCES

- [1]. D.Alekhyia, G.DeviSuryaPrabha and G.VenkataDurgaRao, "Fake Currency Detection Using Image Processing and Other Standard Methods" International Journal of Research in Computer and Communication Technology, Vol 3, Issue 1, pp.128-131, January- 2014 Coleri, S., Ergen, M., Puri, A., and Bahai, A., "Channel Estimation Techniques Based on Pilot Arrangement in OFDM Systems," IEEE Transactions on Broadcasting, vol. 48, pp. 223–229, Sept.
- [2]. Kishan Chakraborty, Jordan Basumatary, Debasmita Dasgupta, Subra Mukherjee, Jagadish Chandra Kalita "RECENT DEVELOPMENTS IN PAPER CURRENCY RECOGNITION SYSTEM" IJRET: International Journal of Research in Engineering and Technology, Vol.2, Issue 11, pp.222-226
- [3]. Megha Thakur, Amrit Kaur, "VARIOUS FAKE CURRENCY DETECTION TECHNIQUES" International Journal For Technological Research In Engineering Volume 1, Issue 11, pp.1309-1313, July-2014
- [4]. Raymond M. Klein, Simon Gadbois, John J. Christie, "Perception and Detection of Counterfeit Currency in Canada: Note Quality, Training and Security Features" IS&T/SPIE 16th International Symposium Electronic Imaging: Science and Technology, session on Optical Security and Counterfeit Deterrence Techniques V. Volume 5310 (January, 2004 San Jose, Ca)
- [5]. Vishnu R, Bini Omman, "Principal component Analysis on Indian Currency Recognition" 2014 5th International Conference on Computer and Communication Technology 978-1-4799-6758-2/14/\$31.00 2014 IEEE 291, pp.291-296, 2014
- [6]. Prof. Sowmyashree, ShreyaShetty, TruptiGhotkar, ChirayuYadav, SurajKanojia, "Currency Recognition and Fake Note Detection." IJREAT:
- [7]. International Journal of Research in Engineering & Advanced Technology, Volume 3, Issue 5, pp.179-182, ISSN: 2320-8791, , Oct-Nov, 2015 ShreyaShetty, TruptiGhotkar, ChirayuYadav, SurajKanojia, Prof. Sowmyshree, "Currency Denomination", IJSRD, NCTAA-2016, January 2016
- [8]. <http://searchmobilecomputing.techtarget.com/definition/text-to-speech>
- [9]. https://en.wikipedia.org/wiki/Median_filter
- [10]. <http://www.oalib.com/paper/2090901#.Vv1xrHpRJdg/>