INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 4.295
(Volume 4, Issue 2)

Available online at: www.ijariit.com

Detection of Fake Indian Currency

Gouri Sanjay Tele
gouritele14@gmail.com
Datta Meghe Institute of Engineering Technology and Research, Wardha, Maharashtra

Akshay Prakash Kathalkar
akshaykathalkar96@gmail.com
Datta Meghe Institute of Engineering Technology and Research, Wardha, Maharashtra

Sneha Mahakalkar
snehamahakalkar@gmail.com
Datta Meghe Institute of Engineering Technology and Research, Wardha, Maharashtra

Bharat Sahoo
sahoobharat6@gmail.com
Datta Meghe Institute of Engineering Technology and Research, Wardha, Maharashtra

Vaishnavi Dhamane
vaishnavidhamane@gmail.com
Datta Meghe Institute of Engineering Technology and Research, Wardha, Maharashtra

ABSTRACT

Fake currency detection is a serious issue worldwide, affecting the economy of almost every country including India. 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 use of counterfeit detection software that is easily available and is efficient.

Our project will recognize Indian currency notes using a real-time image obtained from a webcam. The background of our topic is image processing technology and applying it for the purpose of verifying valid currency notes. The software will detect fake currency by extracting features of notes. The success rate of this software can be measured in terms of accuracy and speed.

So our aim is to work on those parameters which will be impossible to implement on counterfeit notes so we started working on minutiae parameters which will be enough to differentiate between fake and original notes.

Keywords: *MATLAB, Image Processing, Currency, Feature Extraction, Pre-Processing, Edge Detection, CNN, SURF.*

1. INTRODUCTION

Counterfeiting money stands for the illegal replication of original currency, hence counterfeit currency is a fake currency that has not been authorized by the government. RBI is the only body which has sole responsibility to print currency notes in India. Every year RBI faces the problem of counterfeit currency notes, once filtered and circulated in the market.

The methodology of image processing is based on the extraction of the features of Indian banknotes. Images are processed by using various techniques of image processing and further various features are extracted from the images. The approach consists of a number of components including image processing, characteristic extraction, comparing images. The basic thing of approach is that we extract the features on the basis of which we are going to classify the fake note. Security features of a currency are critical for determining real and fake currency. Common security features include watermarks, latent images, security thread, and optically variable ink.

In the proposed work, an approach for fake currency detection extracts the general attributes latent images and identification mark from the image of currency. Extracting attributes from images of currency notes can get quite complex as it involves the extraction of some visible and invisible features of Indian currency. After demonetization 500 and 2000 are the high valued currency notes existing till date so there is a maximum probability that this notes can be counterfeited in order to avoid this we are using software to detect the fake notes using image processing technique.

2. LITERATURE REVIEW

The methodology of image processing based extraction of the existing features of banknotes are depicted in details to demonstrate the feasibility of software-assisted counterfeit currency detection system. For Bangladeshi bank notes following features are considered. Here, for testing purpose BDT 1000 has taken parameters they used was:

1) Micro-printing 2) Watermark 3) Optically Variable Ink 4) Iridescent Ink 5) Security Thread 6) Ultraviolet Lines.

The proposed approach extracts multiple features from Indian currency and uses them for fake currency detection. The image was acquired using image acquisition device. The security features were extracted using various image processing algorithms and then template matching was done to identify fake currency. We will be overcoming this problem by using different parameters which will be enough sufficient to recognize the difference between fake and original currency notes, this will be implemented using image processing techniques. [1]

We also studied on image classification using Artificial neural networks while studying we came across Neural networks which are the branch of artificial intelligence is generally referred to as artificial neural networks (ANNs). ANN teaches the system to execute a task, instead of programming computational system to do definite tasks. [8]

The another paper we studied was having title Neural Networks for Image Analysis and Processing what we noticed here basic neural network algorithms applied to the imaging process as well as their applications in different areas of technology This is achieved by relying on integral images for image convolutions; by building on the strengths of the leading existing detectors and descriptors and by simplifying these methods to the essential. This leads to a combination of novel detection, description, and matching steps. [8] One of the important points was Artificial neural networks have been used as a tool for image segmentation in the field of echocardiography, it showed that segmented images preserved better the heart structure at the cost of higher fragmentation of the image. They showed that segmented images had sufficient details of the anatomy of the heart to allow medical diagnosis which is really amazing [5] So to overcome the problem of counterfeit notes and to deal with this problem so we will be overcoming this problem by using different minutiae parameters just like deep learning algorithm which will be enough sufficient to recognize the difference between fake and original currency notes this will be implemented using image processing techniques like CNN, pattern recognition, SURF and some algorithms.

3. METHODOLOGY

Being inspired by the recent developments in the field of image processing and availability of low-cost image acquisition devices, we present an approach for fake currency detection based on image processing. The proposed approach extracts multiple features from Indian currency and uses them for fake currency detection. The outline of the proposed work is presented in system architecture.

The image is acquired using image acquisition technique. The security features are extracted using various image processing algorithms and then template matching is done to identify fake currency. The novelty of the approach is in image processing applied for extraction of security features from the given image of currency. Another novelty is to use multiple security features rather than the single feature.

A. Currency Features

The features extracted so far may be categorized as general features. The general features are basically application independent features such as texture, color and contrast, and shape. Fake currency detection system varies depending on specific features of notes of a country.

For Indian notes following features are considered:

- Latent Image
- Identification Marks

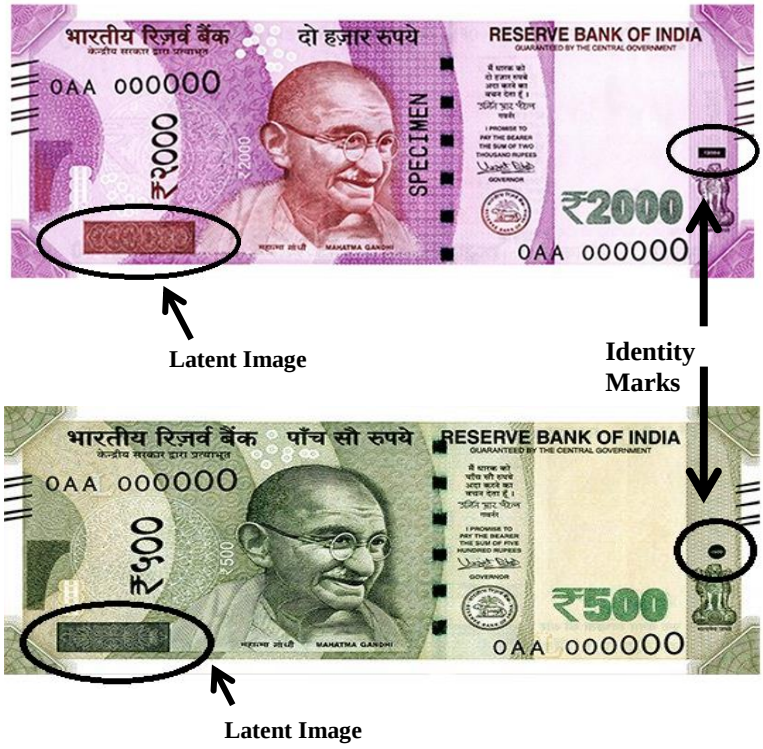

Fig.1.1: Security Features of Indian Currency

Feature extraction refers to the retrieval of information about the image by applying image processing algorithms. The images of a currency note were acquired using a digital camera or scanning the currency using a scanner. After acquiring the image, first pre-processing and then feature extraction is done to extract features. Both the steps are described in this section:

a. Pre-Processing:

In pre-processing the operations normally initial to main data analysis and extraction of information. In this unwanted distortion are suppressed and enhance some image features that are important to further processing. It includes image adjusting and image smoothening. After these two pre-processing steps, the images of the currency were applied for feature extraction.

b. Feature Extraction:

Feature extraction employs the selection and extraction of some of the Effective and important features, among the largest data set of the features which are extremely important for the recognition of fake currency. Some Features of an image are Latent image and Identification Mark. We first create a database of a number of authentic Indian notes and then extract their features. The extracted features are used for detection of fake currency.

B. System Block Diagram

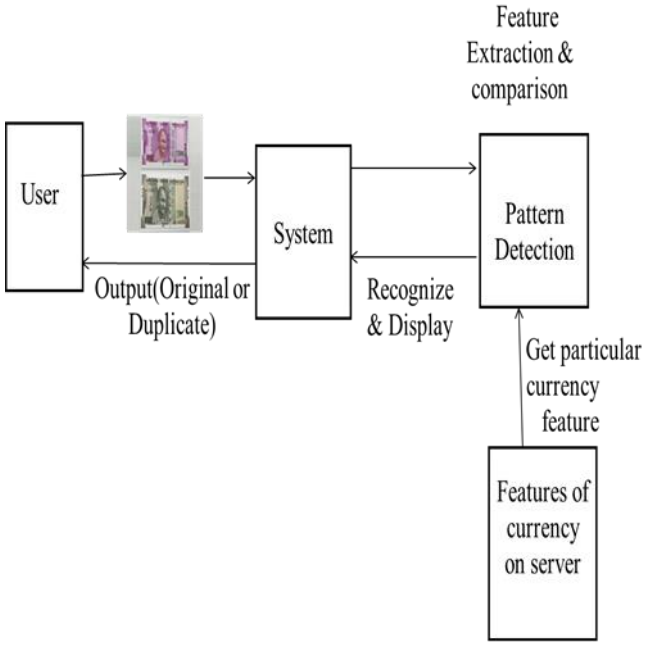

Fig.1.2: System Block Diagram

C. Steps of Implemented System

Image processing based currency recognition technique consists of few basic steps like image acquisition, its pre-processing and finally recognition of the currency.

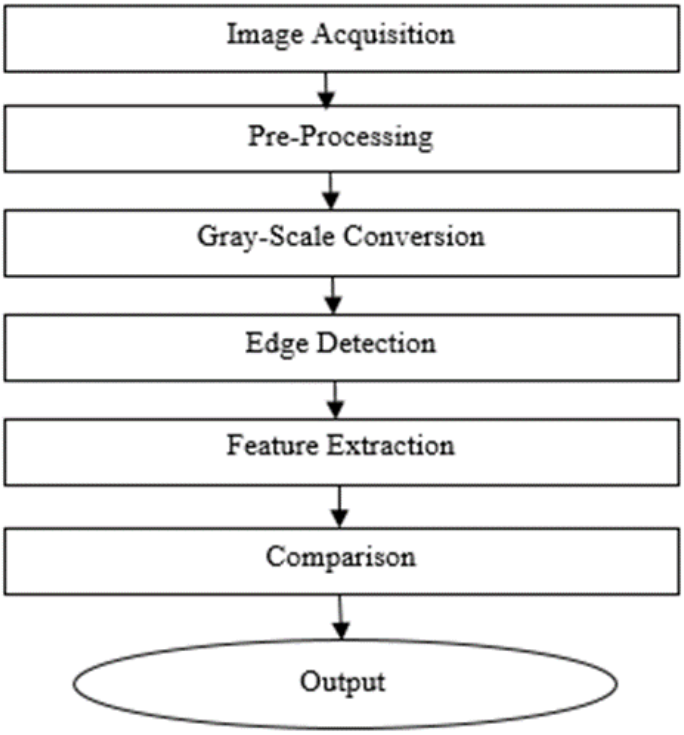

Fig.1.3: Steps involved in Currency Recognition

Image processing generally involves five steps:

i. Image Acquisition: Importing an image with a webcam.

ii. Performing Image pre-processing techniques such as:

- Image Adjusting: Reduces the calculations and complexity of the size of the image and used for rotating, zooming, shrinking and for geometric corrections.
- Image Smoothening: Reduces the noise introduced in the image.

iii. Detect the edges of the note and partition it from the surrounding background of the image.

iv. Perform feature extraction on the note to detect whether the note is real or fake by comparing the features of the note with the stored database.

v. After feature extraction, the application will detect and recognize the note. The final result will be an output.

D. The Major Units of this Proposed System

Speeded Up Robust Feature (SURF)

The standard version of SURF is several times faster than SIFT and claimed by its authors to be more robust against different image transformations than SIFT.
i. The first step is "Detection step", in this step interest points are selected at distinctive locations in the origin image, such as corners.

ii. "Description step", in this step interest points should have unique identifiers does not depend on features scale and rotations which are called descriptor.

iii. The third step is "Matching step", in this step descriptor vectors are compared between the object image and the new input or original image, the matching score is calculated based on the distance between vectors.

Convolutional Neural Networks (CNNs)

Convolutional neural networks (CNNs) are widely used in pattern and image-recognition problems as they have a number of advantages compared to other techniques.Typical CNNs use 5 to 25 distinct layers of pattern recognition. CNNs Takes CNNs take raw data, without the need for an initial separate pre-processing or feature extraction stage: in a CNN, the feature extraction and classification occur naturally within a single framework.

E. Matlab

In MATLAB(Matrix Laboratory) technique, we have created different classes of Digital Image Processing steps including Image Acquisition, Edge detection, Characteristics Extraction and Comparison of Images. MATLAB is a programming language developed by MathWorks. It started out as a matrix programming language where linear algebra programming was simple. Each class has its own attributes and methods represented in the following Table 2.1.

Table 2.1: Representation of Classes and Methods

Sr. No.	Name of Class	Methods
1.	Image Acquisition	imread();
2.	Edge Detection	figure; imshow();
3.	Characteristics Extraction	figure; imshow();
4.	Comparison of Images	disp(':');

4. FUNCTIONS

I2=imresize(I,[312 ,312]);
Reducing the size of the image.

I3=rgb2gray(I2);
RGB to grayscale conversion.Converts the true color image RGB to the grayscale intensity image I3.(Fig.3.3)

I3=im2bw(I3);
Converting image to black and white.(Fig.3.4)

imshow(I3);
Displays image I3 in a figure, where I3 is a grayscale, RGB (true color), or binary image. For binary images, imshow() displays pixels with the value 0 (zero) as black and 1 as white. imshow() optimizes figure, axes, and image object properties for image display.

I3 = bwmorph(I3, 'thin', inf);
figure,imshow(I3);
Thining the image.

points = detectSURFFeatures(I3);
plot(points.selectStrongest(100));
The detectSURFFeatures() function implements the Speeded-Up Robust Features (SURF) algorithm.Display locations of interest in image. Returns a SURF Points object.

SURF Points class
The object for storing SURF interest points.
This object provides the ability to pass data between the detectSURFFeatures and extract Features functions. It can also be used to manipulate and plot the data returned by these functions. You can use the object to fill the points interactively.

strong=points.selectStrongest(NumberOfPoints);
strong.Location
plot(strong);
Display [x y] coordinates for the 100 strongest points on the command line.

[features,validPoints] = extractFeatures(I,points)
Returns extracted feature vectors, also known as descriptors, and their corresponding locations, from a binary or intensity image.

indexPairs = matchFeatures(features1,features2)
Returns indices of the matching features in the two input feature sets.

showMatchedFeatures(I1,I2,matchedPoints1,matchedPoints2,method)
Displays images I1 and I2 using the visualization style specified by the method parameter.(Fig.3.5)

5. OUTPUT

Fig.3.1: Original Note of Rs. 2000 and Rs. 500 as input

Fig.3.3: Grayscale Conversion of Rs.500 and Rs.2000 Note

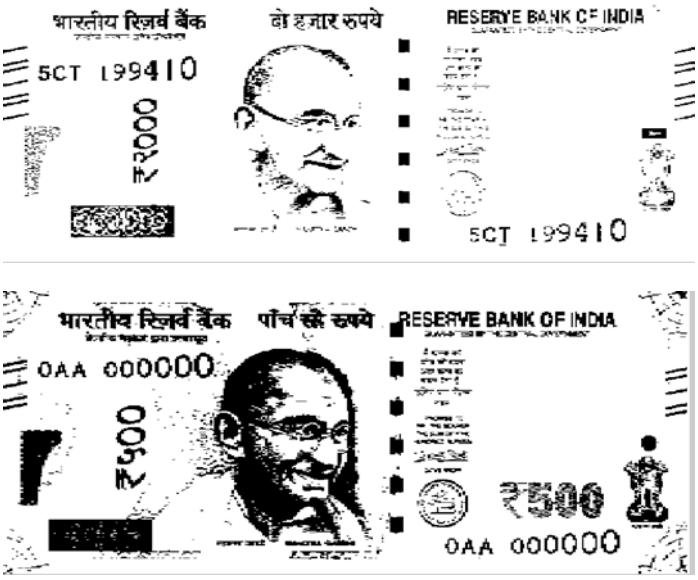

Fig.3.4: Grayscale Image to Black and White

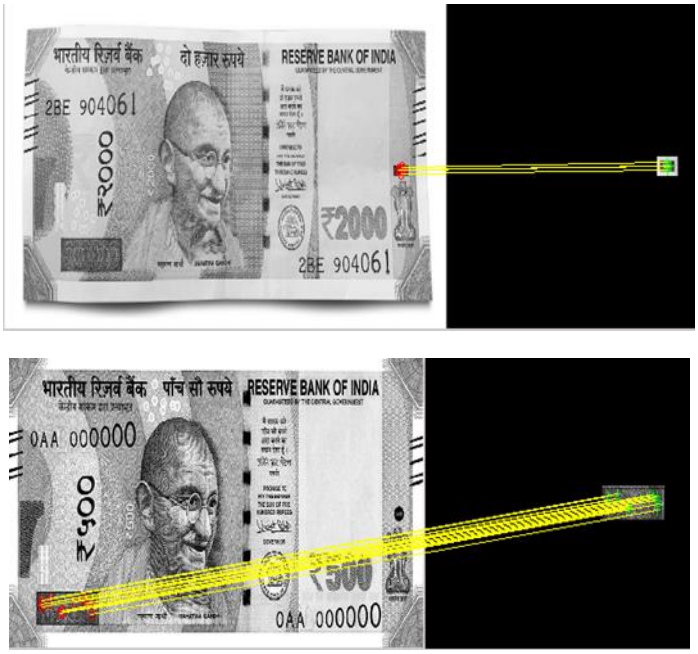

Fig.3.5: Matched Features

6. SOFTWARE REQUIREMENT

MATLAB

7. FUTURE SCOPE

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.

8. CONCLUSION

A technique for verifying Indian paper currency. The approach gives an efficient method of fake currency detection based on physical appearance. The work will surely be very useful for minimizing the counterfeit currency. Through this application, we are able to see the missing parameters which the fake note doesn't have as compared to the original notes. Original Currency is being detected using Image Processing Technique.

9. REFERENCES

[1] Zahid Ahmed, Sabina Yasmin, Md Nahidul Islam, Raihan Uddin Ahmed "Image Processing Based Feature Extraction of Bangladesh Banknotes"
[2] Shital Mahajan & K.P.Rane. "A Survey on Counterfeit Paper Currency Recognition and Detection." in International Conference on Industrial Automation and Computing (ICIAC), April 2015.
[3] Prof. Renuka Nagpure, Shreya Shetty, Trupti Ghotkar, Chirayu Yadav, Suraj Kanojiya "Currency Recognition and Fake Note Detection" in International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE), March 2016.
[4] NeeruRathee, ArunKadian, RajatSachdeva "Feature Fusion for Fake Indian Currency Detection".
[5] D.Alekhya , G.DeviSuryaPrabha , G.VenkataDurgaRao "Fake Currency Detection using Image Processing and Other Standard Methods" in International Journal of Research in Computer and Communication Technology (IJRCCT).
[6] Snehlata, Vipin Saxena "Identification of Fake Currency: A Case Study of Indian Scenario" in International Journal of Advanced Research in Computer Science.
[7] E. Pilania and B. Arora, "Recognition of Fake Currency Based on Security Thread Feature of Currency," International Journal of Engineering and Computer Science, 2016, vol. 5, issue 7, pp. 17136-17140.
[8] N. Rathee, A. Kadian, and R. Sachdeva, "Feature fusion for fake Indian currency detection," Computing for Sustainable Global Development (INDIACom), 2016 3rd International Conference on IEEE, 2016.
[9] A. Abdallah, M. A. Maarof, and A. Zainal, "Fraud detection system: A survey," Journal of Network and Computer Applications, 2016, vol. 68, pp. 90–113.
[10] R. C and D. H. K. G, "Image Processing Approach for INR Currency Note Number Recognition System for Automated Teller Machines," International Journal of Computer Applications Technology and Research, 2016, vol. 5, no. 8, pp. 539–542.