

# Automatic Recognition of Fake Indian Currency Note

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**Abstract**—In this paper, the automatic system is designed for identification of Indian currency notes and check whether it is fake or original. The automatic system is very useful in banking system and other field also. In India increase in the counterfeit currency notes of 100, 500 and 1000 rupees. As increase in the technology like scanning, colour printing and duplicating because of that there is increase in counterfeit problem. In this paper, recognition of fake Indian currency notes is done by using image processing technique.

In this paper, recognition of fake Indian currency notes is done by using image processing technique. In this technique first the image acquisition is done and applies pre-processing to the image.

In pre-processing crop, smooth and adjust then convert the image into grey colour after conversion apply the image segmentation then extract features and reduce, finally comparing image.

**Keywords**—Fake currency, counterfeit detection, image processing, feature extraction.

## I. INTRODUCTION

Automatic recognition of fake Indian currency note is important in many applications such as automated goods seller machine and automated goods tellers machine. This system is used to detect the valid Indian currency note. The system consists of eight steps including image acquisition, grey scale conversion, edge detection, feature extraction, image segmentation, comparisons of images and output [1]. Automatic machine more helpful in banks because banks faces the problem of counterfeit currency notes or destroyed notes. Therefore involving machine makes note recognition process simpler and systematic.

Automatic machine is more important to detect fake currency note in every country. The system designed to check the Indian currency note 100, 500 and 1000 rupees. The system will display currency is genuine or fake and currency denomination. It is very important to grow automated system to get feature and recognize Indian currency note in various area such as banking, ATM machine, shopping mall, Bus station and railway station [1].

### A. Commonly Used Methods to Detect Fake Notes

#### 1) See Through Register

The small floral design is printed in the middle of the vertical band and next to watermark. The floral designed on the front is hollow and in back is filled up.

The floral design has back to back registration. The design will seen as one floral design when seen against the light [1].

#### 2) Water Marking

The mahatma Gandhi watermark is present on the bank notes. The mahatma Gandhi watermark is with a shade effect and multidirectional lines in watermark [5].



Fig.1. Security Features

#### 3) Optically Variable Ink

Optically variable ink is used for security feature; this type of feature is in the Rs.1000 and Rs.500 bank note. Optically variable ink as security feature for bank note is introduced in Nov.2000. The denomination value is printed with the help of optical variable ink. The colour of numerical 1000 or 500 appear green, when note is flat but change the colour to blue when is held in an angle [4].

#### 4) Fluorescence

Fluorescent ink is used to print number panels of the notes. The note also contains optical fibre. The number panel in fluorescent ink and optical fibre can be seen when exposed to UV light.

### 5) *Security Thread*

The security thread is in 1000 and 500 note, which appears on the left of the Mahatma Gandhi's portrait. In security thread the visible feature of "RBI" and "BHARAT". When note is held against the light, the security thread can be seen as one continuous line [4].

### 6) *Latent Image*

The latent image shows the respective denomination value in numerical. On the observe side of notes, the latent image is present on the right side of Mahatma Gandhi portrait on vertical band. When the note is held horizontally at eye level then the latent image is visible.

### 7) *Micro Lettering*

The micro letter's appears in between the portrait of Mahatma Gandhi and vertical band. Micro letter's contains the denomination value of bank note in micro letters. The denomination value can be seen well under magnifying glass.

### 8) *Identification Mark*

Each note has its special identification mark. There are different shapes of identification mark for different denomination (Rs.100-Triangle, Rs.500-circle and Rs.1000-Diamond). The identification mark is present on the left of water mark [1].

## II. RELEATED WORK

Over the years a lot of researches have been done in this field of Currency note recognition. The authors have done recognition based on Color, texture, security features etc. There are many system existing for recognition of fake Indian currency using different technique. many of the system uses various steps like image acquisition, feature extraction and classification system using various algorithm. There are other fake currency detection technique follows: i) Commonly Used Methods to Detect Fake Currency ii) Digital Image Processing Method To Detect Fake Currency iii) MATLAB technique iv) Counterfeit Detection Pen and v) Ultraviolet counterfeit detection scanner. In comparative to other existing system in our proposed system we uses the camera for image acquisition, conveyor unit and automatic sorting unit. Mostly all other existing system uses scanner for image acquisition. In the proposed system Principal Component Analysis (PCA) is used for recognition. The proposed system consisted of: i) Dataset Preparation ii) Feature Extraction iii) Principal Component Analysis.

## III. PROPOSED SYSTEM

Manual testing of notes in transactions is very time consuming and confusing process and also there is a chance of tearing while handling notes. Therefore automatic methods for bank note recognition are required in many applications such as automatic selling goods. In designing of

this system one challenging case is to design system that is extraction of characteristics from currency image for accuracy of the automated system.

### 1) *Microcontroller*

The control of process is done by microcontroller. The work of controller is to clarify data from fake note detection unit to check whether currency is fake or genuine. Also control and synchronization of note feeding mechanism is done by microcontroller. The microcontroller gives instruction to PC to capture image using camera and interpret the data from PC.

### 2) *PC*

In PC the MATLAB is used for this system. This is used for image processing and to apply User Interface which runs on the PC. Communication with the microcontroller is done using serial communication. In MATLAB the PCA technique is used for recognition of Indian currency.

### 3) *Note Feeding Unit*

It will accept note from the user. In note feeding unit rollers are used to take the note from user.

### 4) *Fake Note Detection Unit*

The system uses signal conditioning to identify whether the note is fake or real. For this, note goes through UV light to detect the originality of the note. The original currency absorbs the UV light and the fake currency reflects the UV light. The conditioning and testing is done using a UV LED transmitter and UV receiver.

### 5) *Image Acquisition Unit*

Camera is used for image acquisition. It will take picture of incoming note and picture is forward to processing unit. After suitable image processing signal will be produced.

### 6) *Conveyor Unit*

This unit is used to carry the note from note feeding unit to the sorting unit, after passing through the fake note detection and image acquisition units.

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.

In image adjusting, when the image obtained from scanner the size of image is large therefore to reduce the size of image, image adjusting is used. In this for image adjusting interpolation is used [8].

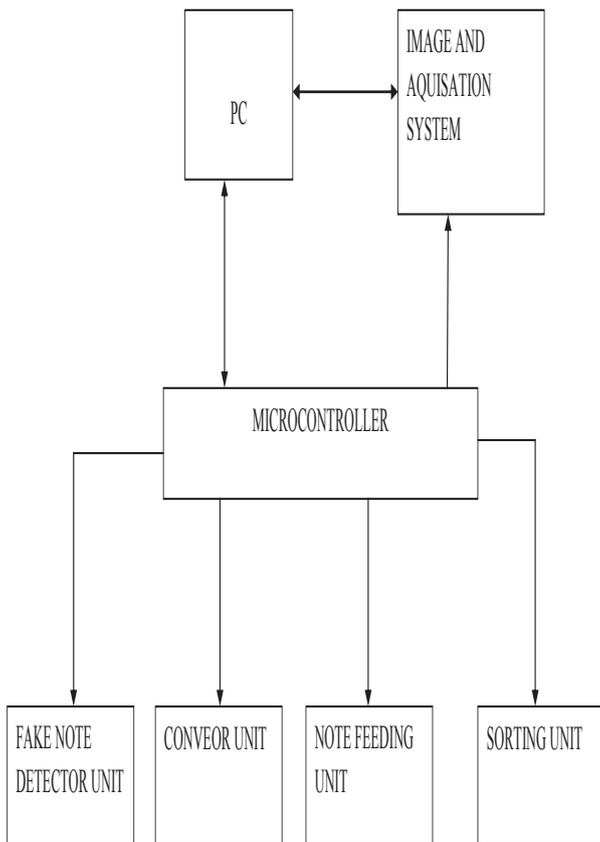


Fig.2. Block Diagram for Proposed System

### 7) Sorting Unit

On the basis of suitable processing, signal is produced and sent to the sorting unit. It makes use of a select and drop mechanism in the system. The select and drop mechanism is performed using a sorting table with a twister mechanism.

## IV. PERFORMANCE ANALYSIS

### A. Design Flow of Automatic Recognition of Genuine and Fake Indian Notes.

The design flow of fake currency detection system consists of eight stages. This system works on two images one is original currency image and other is image of currency used for authentication purpose.

#### 1) Image Acquisition

The camera or scanner is used for image acquisition. The acquired image should consist of all the features.

#### 2) Pre-processing

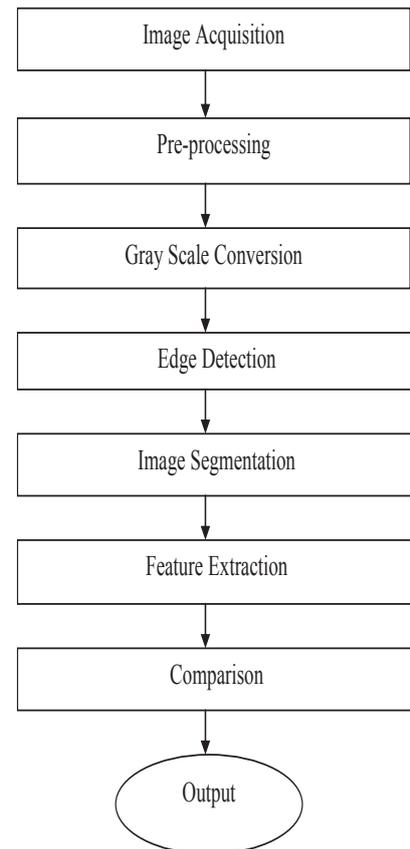


Fig.3. Flow Chart of Digital Image Processing Method to Detect Fake Note

In image smoothening, while using camera or scanner and perform image transfer, some noise will appear on the image. The important step of removing noise is done by image smoothening. For image smoothening convolution is used.

#### 3) Gray Scale Conversion

The image obtained is in RGB colour. It is transformed into gray scale because it takes only the intensity information which is easy to process than processing of three components RGB [6].

#### 4) Edge Detection

The Edge detection is a basic tool in image analysis, image processing, image pattern recognition and computer vision techniques. Edge detection is basic tool particularly in the area of feature detection and feature extraction [7].

#### 5) Image Segmentation

In image segmentation, the image is divided into regions or objects depending on problem the segmentation is done. Segmentation algorithms for monochrome image are based on two basic properties of image intensity.

#### 6) Feature Extraction

Feature extraction is the specific form of dimensionality reduction. It is the method of capturing the visual content of image for retrieval and indexing. When input to the algorithm is too large to be proceeding and it is having much data but not more information. Then input data will be converted into reduced representation set of features.

Feature extraction makes simple the amount of resources required to describe the large set of data [3].

#### 7) Comparison

In comparison, the extracted feature of input image and extracted feature of original image is compared.

#### 8) Output

The output is displayed on LCD display. The output is currency denomination or currency is fake or original.

### V. RESULTS

In this section result is obtained by performing image processing Operations. In the system image acquisition is done by using the camera and acquired image is send to the processing unit. As shown in the GUI the acquired image is the test image. After that we have to select the control button for respective denominations. Then the test image is then converted into gray scale image, segmented image, cropped image and resized image. Then comparison of cropped and resized image with the images saved in the data base is done. Then the result is displayed in the result panel. The start button is used for starting the acquisition process, clear button is used to clear previous data and exit button is used to exit the system.

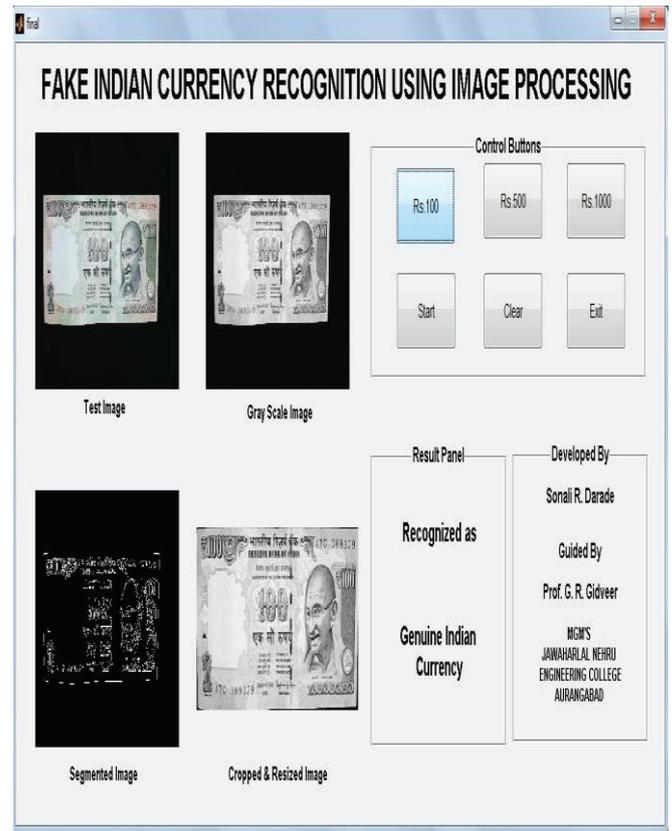


Fig -4: Recognition of Genuine Indian Currency Note

In the above image the 100 Rs Indian currency note is Recognised as genuine indian currency. And recognition for fake indian currency for 100 Rs is shown in figure 5.

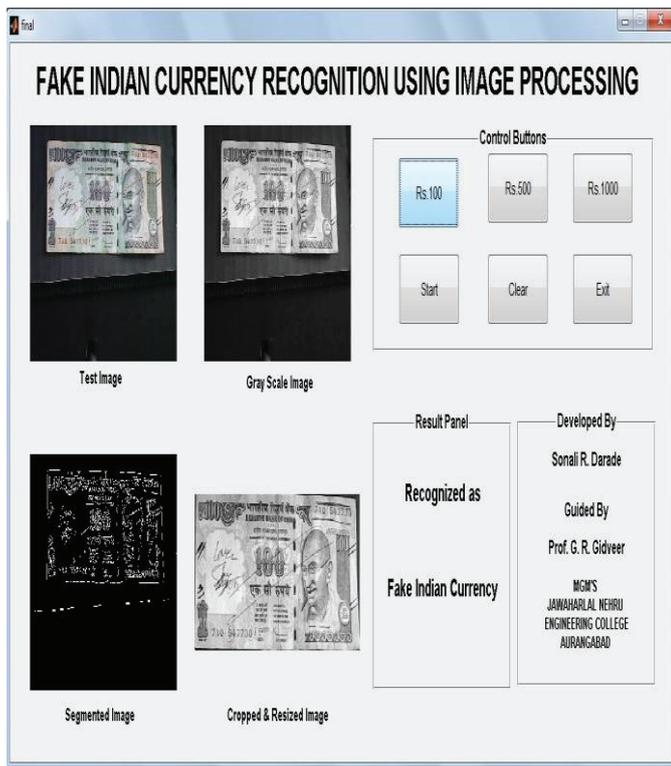


Fig -5: Recognition of Fake Indian Currency Note

## VI. CONCLUSION

In this project, detection of fake Indian currency note is done by using image processing principle. This is the low cost system. The system works for denomination of 100, 500 and 1000 for Indian currency. The system also provides accurate and valid results. The process of detection of fake note is quick and easy. In this system input is taken by CCD camera and output is displayed on PC.

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