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Fake Currency Detection using Image Processing

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ABSTRACT

Coins and note currency are widely used in our daily life such as vending machines, parking meters, telephone booths and so on. In addition to being used as currency, people enjoy collecting coins and notes as they usually have artistic value and can give a vivid insight to the social life in history. However, in recent years, a lot of illegal counterfeiting rings manufacture and sell fake coins and at the same time fake note currency is printed as well, which have caused great loss and damage to the society. Thus it is imperative to be able to detect fake currency. We propose a new approach to detect fake Indian coins and notes using their images. A currency image is represented in the dissimilarity space, which is a vector space constructed by comparing the image with a set of prototypes. Each dimension measures the dissimilarity between the image under consideration and a prototype. In order to obtain the dissimilarity between two coin images, the local key points on each image are detected and described. Based on the characteristics of the coin, the matched key points between the two images can be identified in an efficient manner. A post processing procedure is further proposed to remove mismatched key points. Due to the limited number of fake currency in real life, one-class learning is conducted for fake currency detection, so only genuine currency are needed to train the classifier.

Keywords : Fake currency, fake currency detection, currency image representation, dissimilarity space

I. INTRODUCTION

Human rapid approach is towards mechanization and manpower removal of the service work as much as possible and using this force in the development of scientific and research issues. This approach will lead to advances in science and technology. Automated payment systems, including mechanized systems are considered more in recent years over the past and many activities in this regard is yielded. One of the main parts in most automated payment systems is vision systems. One of the important science that is used in vision systems is science image processing. Image processing has flexibility and as a result it provides stronger algorithms in the field of creativity. Efficient algorithms (in automatic payment systems) have two factors of speed and the ability to tolerate noise. Banknote recognition system is a device that is able to recognize the value of banknotes intelligently and approve their forgery. 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 2000 rupees. The system will display

currency is genuine or fake and currency denomination.

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].

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 pannel 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].

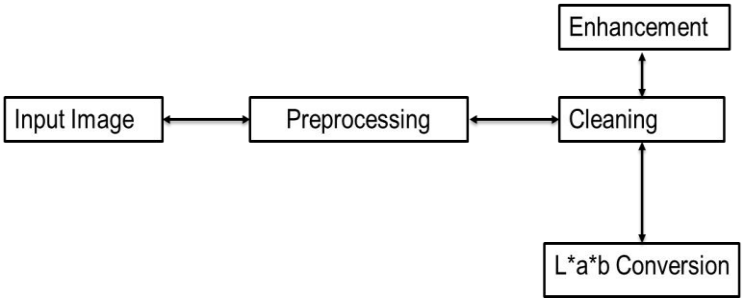
II. PROPOSED METHODOLOGY

The proposed work is planned to be carried out in the following manner

Phase 1

Currency Pre-processing

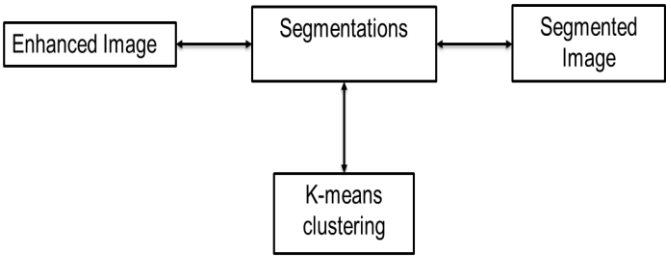
Images are enhanced by sharpening and removing unwanted outliers.



Phase 2

Segmentation

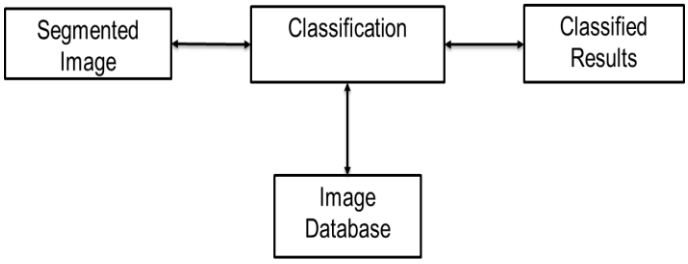
Image will be segmented to fetch out the image edges and then detected all required parameters



Phase 3

Recognition and Classification

Ones the image is segmented it can be tested to recognize it first and then classify it into original or fraud image using SVM algorithm.



In the proposed work, we will develop a system to detect fraud coins and notes currency for Indian Notes. Clustering will be done using k-means algorithm. Recognition and classification will be done using SVM algorithm.

K-means Algorithm

k-means clustering is a method of vector quantization, originally from signal processing, that is popular for cluster analysis in data mining. k-means clustering aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean, serving as a prototype of the cluster. The algorithm has a loose relationship to the k-nearest neighbor classifier, a popular machine learning technique for classification that is often confused with k-means because of the k in the name. One can apply the 1-nearest neighbor classifier on the cluster centers obtained by k-means to classify new data into the existing clusters. This is known as nearest centroid classifier or Rocchio algorithm.

SVM Algorithm

In machine learning, support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier (although methods such as Platt scaling exist to use SVM in a probabilistic classification setting). An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible.

In addition to performing linear classification, SVMs can efficiently perform a non-linear classification using what is called the kernel trick, implicitly mapping their inputs into high-dimensional feature spaces.

When data are not labeled, supervised learning is not possible, and an unsupervised learning approach is required, which attempts to find natural clustering of the data to groups, and then map new data to these formed groups. The clustering algorithm which provides an improvement to the support vector machines is called support vector clustering and is often used in industrial applications either when data are not labeled or when only some data are labeled as a preprocessing for a classification pass.

III. CONCLUSION

By using digital image processing, analysis of Currency image is more accurate as well as this method is efficient in terms of cost and time consuming compared to existing techniques. MATLAB Software use for this analysis .Day by day research work is increasing in this field and various image processing techniques are implemented in order to get more accurate result. The proposed system is worked effectively for extracting feature of Indian currency images. Extracted features of currency image will be using for currency value recognition as well as for its verification. Application based system shall be designed to get proper result whether currency image is fake or genuine.

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