

COUNTERFEIT CURRENCY DETECTOR

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Abstract—Since last few years, as a result of the great technological advances in color printing, duplicating and scanning, counterfeiting problems have become more and more serious. In the past, only the printing house has the ability to make counterfeit note, but today it is possible for any person to print counterfeit bank notes simply by using a computer and a laser printer at house. Therefore the issue of efficiently verifying counterfeit banknotes from real ones via automatic machines has become more and more important. Counterfeit notes are a problem of almost every country but India has been hit really hard and has become a very acute problem. There is a need to design a system that will helpful for recognition of paper currency notes with fast speed and in less time. This proposed system describes an approach for verification of Indian banknotes. The currency will be checked out by using image processing techniques. The approach consists of a number of elements including processing of image, detection of edge, image segmentation, drawing out characteristic, comparing both images. The image processing approach is discussed with MATLAB to verify the parameters of note. Image processing involves changing the nature of an image in order to improve its visual information for human interpretation. The image processing software is a collection of functions that extends the capability of the MATLAB numeric computing environment. The result will be whether note is real or fake.

I. INTRODUCTION

With development of modern banking services, automatic methods for note recognition become important in many applications such as in automated teller machines and automatic shop keeper machines. The needs for automatic currency recognition systems encouraged many researchers to develop corresponding robust and reliable techniques. Processing speed and recognition accuracy are generally two important targets in such systems.

A Digital Image processing is an area characterized by the need for extensive experimental stuff to establish the validity of proposed solutions to a given problem. It encompasses processes whose inputs and outputs are images and encompasses processes that extract attributes from images up to and including the verification of individual objects. MATLAB is the computational tool of choice for research, development and analysis. The image formats supported by MATLAB are BMP, HDF, JPEG, PCX, TIFF, XWB, PNG etc.

Characteristic extraction of images is challenging work in digital image processing. It involves extraction of visible and some invisible features of Indian currency notes. A good characteristic extraction scheme should maintain and enhance those characteristics of the input data which make distinct pattern classes separate from each other. The approach consists of a number of steps including image acquisition, gray scale conversion, edge detection, feature extraction, image segmentation and comparison of images.

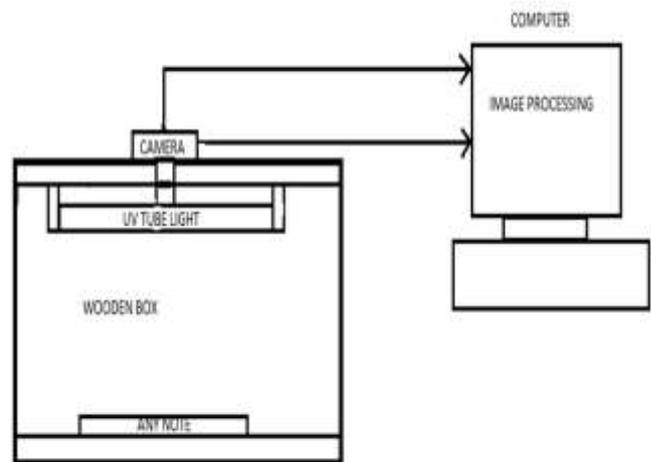


Fig.1 Block Diagram For Counterfeit Currency Detector

II. PROPOSED SYSTEM STUFF

The proposed system will work on two images, one is standard image of the bank note and other is the test image on which verification is to be done. The proposed algorithm is presented as follows-

1. Image of note will be taken by web camera.
2. The taken image is RGB image and then further it will be converted into gray scale.
3. Edge detection will be performed on the whole gray scale image.
4. After detecting edges, the four parameters of the note will be cropped and segmented
5. After segmentation, the parameters of the note will be extracted.
6. The parameters of suspected image are compared with the standard pre-stored image in the system.
7. If it matches then the note is real one otherwise it is fake.

In the proposed method parameters of notes are employed that are used by people for differentiating different banknote denominations. Basically, at first instance, people may not pay attention to the details and exact characteristics of banknotes for their recognition, rather they consider the common characteristics of banknotes such as the size, the background color (the basic color), and texture present on the banknotes. In this method, these characteristics will be used to differentiate between different banknote denominations-

III. RBI PARAMETERS



Fig.2 RBI Parameters For Indian Currency Notes

RBI Parameters for counterfeit detection

1. Watermark of Ashoka Pillar emblem is clearly seen when held against the light as a light and shade effect.
2. The legend 'Reserve Bank of India', '500', printed in the centre of the note, the promise clause in Hindi and English, Ashoka Pillar emblem, Mahatma Gandhi portrait, language panel, five small black lines on the left side of the note meant to be an identification mark for the blind are in raised printing, known as intaglio. The raised printing can be felt by touch.
3. Both the panels containing the serial number of the note are printed in fluorescent ink and glow when the note is held against an ultra violet lamp.
4. There is a latent image of the numeral '500' and the word RBI in the horizontal green belt that is below the portrait of Mahatma Gandhi. The latent image of '500' can be seen when the note is held horizontally at the eye level and 'RBI' can be seen when the note is held vertically at the same level.
5. The note contains the security thread on the left hand side of the note.

To help public identify genuine notes in the new series of Rs.500, the security features of these notes that can be seen with naked eyes are given below:

1. Rs.500 denomination notes issued in Mahatma Gandhi series have the portrait of Mahatma Gandhi in the watermark. The watermark is in the white space seen on the left of the notes.
2. The portrait of Mahatma Gandhi can be clearly seen in the watermark as a light and shade effect when held against light.
3. The security thread in a note is placed on the right hand side of the note and can be easily identified as a broken silver line; but if held against light, this silver line can be seen as a continuous black line. The security thread contains the word "RBI" and clearly written alternatively on it which can be seen only on the front side of the note.
4. Several important features have been embossed or printed in raised manner, called intaglio, on both sides of the notes - front and back. The portrait of Mahatma Gandhi, numeral 500, RBI seal, an arch-like pattern which can be seen below the RBI legend and in between watermark and the portrait of the Mahatma Gandhi, guarantee and promise clauses,

Ashoka Pillar which is placed on the bottom left side of the watermark, as also, the RBI Governor's signature - are all embossed on these notes. These can be felt by touch.

5. The notes also have solid circle in black in raised printing in between the flower and the Ashoka Pillar emblem on the left side of the watermark. This is to help the visually impaired to identify the note by touch.

The following security features in the new series of Rs. 500 note can also be seen when the note is closely examined:

1. The note has a latent image of the numeral '500' in the green vertical band placed on the right side of the note. The latent image can be seen only when the note is held against light at eye level.
2. The flower on the left hand side of the watermark window slightly above the Ashoka Pillar emblem has a hollow design in front with solid on the back. When note is held against light, the solid fits into the hollow perfectly.
3. The number panels are printed in fluorescent ink; the notes also have optical fibres. Both can be seen when the notes are exposed to ultraviolet lamp.
4. Between the head of the Mahatma Gandhi portrait and the green panel, the notes have very fine line design. When seen through a magnifying glass, the design will actually show "RBI" and denominational value '500' written in very small letters.
5. Watermark window contains criss-cross lines that can be seen through a magnifying glass.

All notes have a unique crackle sound.

IV. DESIGN FLOW

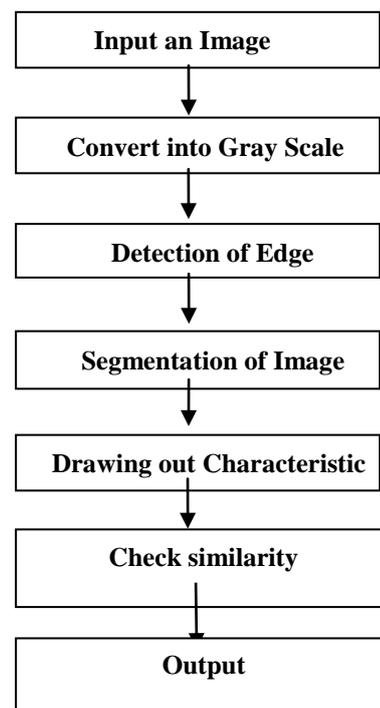


Fig.3 Design Flow For Counterfeit Currency Detector

V. PREDICTED CONCLUSION

In our project we are dealing with single 500 rupee note. But for a future scope we can add all the details about remaining currency in our software program that will indeed help us to identify remaining counterfeits. Machines available today are not only fake note detector but they provide an extra facility of counting them. This feature can be added with our device that would make it as most reliable counterfeit currency detector along with counting feature that would be helpful for banking purpose.

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