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Intelligent Note to Coin Exchanger With Fake Note Detection

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ABSTRACT

Requirement of coins in a day to day transaction at places like bus station, railway station, mall and park is the main motive of designing an efficient and simple machine which will fulfill need of coins for transactions so that people will not face problem of coins. This project will provide coins for note, for this purpose we have developed mechanical coin dispensing model which takes the note inside and checks whether note is fake or real, if note is real camera takes picture of it. After that it will find out its value using image processing technique and then according to the value equivalent number of coins are dispensed. In this way we are trying to design an efficient machine which will be having low production cost as compared to other existing machines. In this project we have developed a MATLAB algorithm for image binarization to detect the value of note. And we have implemented a fake note detection unit using UV LED and photodiode. Manual testing of all notes in transactions is very time consuming and untidy process and also there is a chance of tearing while handing notes. Therefore Automatic methods for bank note recognition are required in many applications such as automatic selling-goods and vending machines. Extracting sufficient monetary characteristics from the currency image is essential for accuracy and robustness of the automated system. This is a challenging issue to system designers. Every year RBI (Reserve bank of India) face the counterfeit currency notes or destroyed notes. Handling of large volume of counterfeit notes imposes additional problems. Therefore, involving machines (independently or as assistance to the human experts) makes notes recognition process simpler and efficient. Automatic method for detection of fake currency note is very important in every country. In this project we have made fake currency note detection technique using MATLAB and feature extraction with HSV color space and other applications of image processing. In the project setup, note is placed in front of camera to check whether it is fake or genuine. The camera pictures of notes are analyzed by MATLAB program installed on computer. The project is meant to check Indian currency notes of 100, 500 and 1000 rupees. If the note is genuine, the respective message is appeared on the screen and vice-versa.

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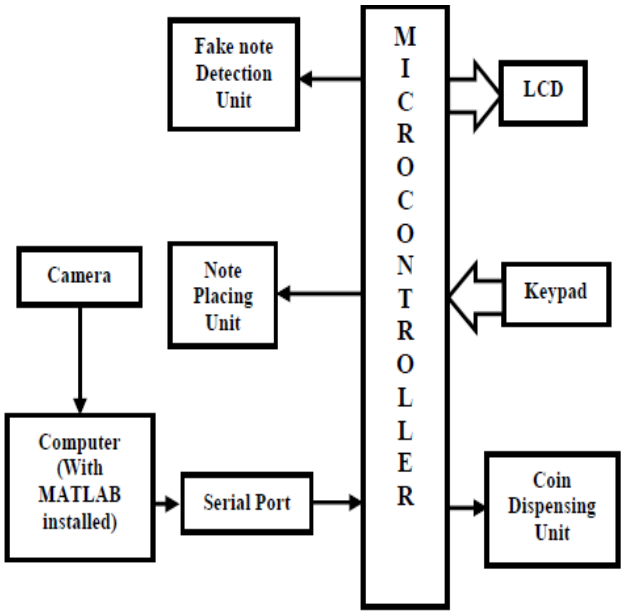
I. INTRODUCTION

The aim of this project is to provide coins equivalent to note. The circuit uses microcontroller with mechanical structure which have motors to perform requested tasks. Here the machine accepts note and checks whether a note is fake or real. If a note is real, camera takes picture of note and with help of computer having MATLAB program checks which note it is (Rs 10 or Rs 20). Once the note is recognized coins will be dispensed by coin dispensing unit. In all walks of life, machine automation is essential to make sophisticated approach to the mankind. Of course the machines cannot be replaced by human beings in exact recognition of coins. Nowadays, most of the work of the

human being is replaced by machines. The coin classification of various denominations and finding the sum of the coins is a tedious process. Coin counting machine is user friendly and makes customer operation a breeze. This machine is equipped with an operating system. This counting machine has a display and prompts the customer to operate the system. Coin sorting machine is attached with required number of tagged bags to collect appropriate denominations of coin. Dirty coins require machine cleaning frequently. In this paper, the variations in images obtained between new and old coins are also discussed. The polar coordinate of coins outer edge with coin center which represents radii is used for recognition of the coin.

Modernization of the financial system is a milestone in protecting the economic prosperity, and maintaining social harmony. The Reserve Bank of India is only one which has the full authority to issue bank notes in India. But some unsocial group of people are prone to make these fake currencies. Fake Indian Currency of 100, 500 and 1000 seems to have flooded the system and there is no proper way to deal with them for a common person. Common Person fall prey to this currencies. The value of money is increasing and Rs. 1000 and Rs. 500 is the highest value currency existing till date and maximum fake is done in them. From few years, along with the original currency, Fake Currency is also circulating in the society and unbalancing the social harmony of the society. Many of the transaction are also carried out with it. Fake currency detection means finding fake currency from the currencies. With the advancement of the modern banking services, automatic methods for paper currency detection has become important in most of the applications such as in automated teller machines and automatic goods seller machines. Images are processed by using various techniques of image processing and further various features are extracted from the images.

II. SYSTEM DESIGN



III. MODULE DESIGN

1. Note placing unit

It will accept note from the user. It consists mechanical design of relays to take the respective note from the user. It takes 12v to dive the DC motor of 10RPM.This information is sent to the microcontroller for further processing.

2. Fake note detection unit

The speciality of Indian currency note is that it absorbs the UV light and a fake note reflects the UV light. Fake note detection unit consist of UV LED, photodiode, amplifier and comparator. The UV LED source transmits the UV rays, if the note is real it will absorb some amount of UV rays and if the note is fake then the all rays will be reflected back towards the photodiode. This output of the UV Photodiode is given to amplifier. This output is amplified and then given to comparator. Threshold voltage is applied to comparator. According to threshold voltage output of the comparator is then given to the microcontroller for further processing.

3. Microcontroller

The work of controller is to identify the data sent by PC MATLAB in the form of 2's & 1's.The controller knows that,(a) 1= 10 rupee note, (b) 2= 20 rupee note. The controller knows that now it has to generate coins in the multiples of 5 & 1 or mix coins.

4. Camera

It is used to capture the image of note.

5. LCD

It is used to display whether the sufficient coins are available or not. If the coins as per the need of user are not present in the coin container, then a message will be displayed on the LCD "Insufficient coins".

6. Coin container

In coin container coins are present. In case of mix coins, the controller will check for availability of coins in the coin container and then as per the wants of the user from the keypad, the mix coins will be late out to the user. If the coins as per the user wants are not present in the coin container, then a message will be displayed on the LCD "Insufficient coins".

III.I Need of fake note detection:

Manual testing of all notes in transactions is very time consuming and untidy process and also there is a chance of tearing while handing notes. Therefore Automatic methods for bank note recognition are required in many applications such as automatic selling-goods and vending machines. Extracting sufficient monetary characteristics from the currency image is essential for accuracy and robustness of the automated system. This is a challenging issue to system designers. Every year RBI (Reserve bank of India) face the counterfeit currency notes or destroyed notes. Handling of large volume of counterfeit notes imposes additional problems. Therefore, involving machines (independently or as assistance to the human experts) makes

notes recognition process simpler and efficient. Automatic method for detection of fake currency note is very important in every country. In this project we have made fake currency note detection technique using MATLAB and feature extraction with HSV color space and other applications of image processing. In the project setup, note is placed in front of camera to check whether it is fake or genuine. The camera pictures of notes are analyzed by MATLAB program installed on computer. The project is meant to check Indian currency notes of 100, 500 and 1000 rupees. If the note is genuine, the respective message is appeared on the screen and vice-versa.

III.II Fake note detection unit:

The speciality of Indian currency note is that it absorbs the UV light and a fake note reflects the UV light. Fake note detection unit consist of UV LED, photodiode, amplifier and comparator. The UV LED source transmits the UV rays, if the note is real it will absorb some amount of UV rays and if the note is fake then the all rays will be reflected back towards the photodiode. This output of the UV Photodiode is given to amplifier. This output is amplified and then given to comparator. Threshold voltage is applied to comparator. According to threshold voltage output of the comparator is then given to the microcontroller for further processing.

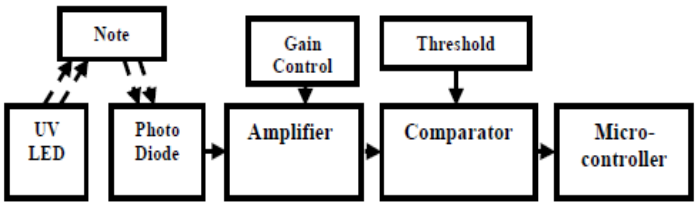


Fig :- Block diagram of fake note detection unit

IV. COMMONLY USED METHODS TO DETECT FAKE NOTES

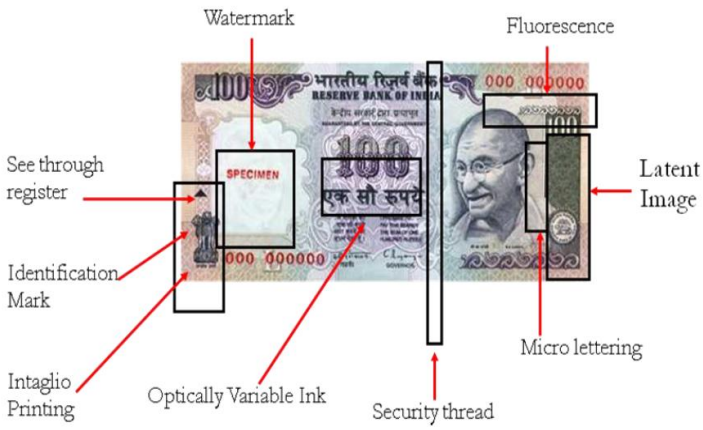


Fig : Security features of Indian currency notes.

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. Optically variable ink

This is a new feature included in the Rs.1000 and Rs.500 notes with revised color scheme introduced in November 2000. The numeral 1000 and 500 on the obverse of Rs.1000 and Rs.500 notes respectively is printed in optically variable ink viz., a color-shifting ink. The colour of the numeral 1000/500 appears green when the note is held flat but would change to blue when the note is held at an angle.

4. Fluorescence:

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

5. 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.

6. 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.

7. 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.

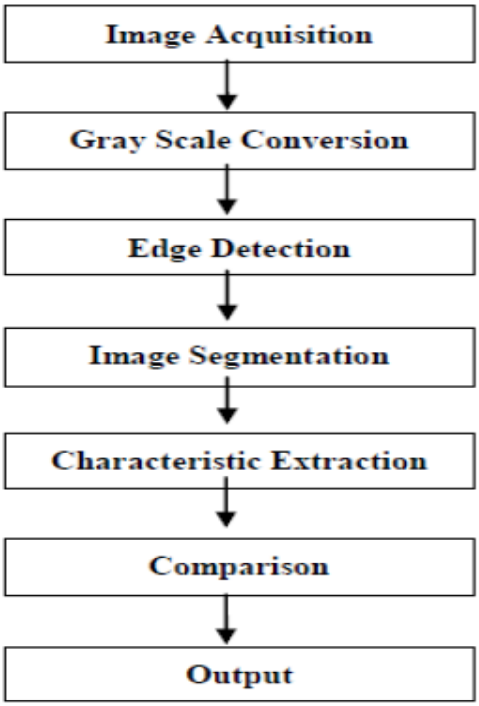
8. Micro lettering

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.

9. Identification mark

Each note has an unique mark of it. A special feature in intaglio has been introduced on the left of the watermark window. This feature is in different shapes for various denominations (100-Triangle, Rs.500-Circle, and Rs.1000- Diamond) and helps the visually impaired to identify the denomination.

V. DESIGN FLOW OF AUTOMATIC RECOGNITION OF GENUINE AND FAKE INDIAN NOTES



VI. CONCLUSION

Coin recognition using morphological operations shows positive signs for coin identification. Image segmentation used as the first step reduces total time requires executing the program. Edge enhancement provides the clear edges of the coins to improve accuracy for coin detection. Also blob measurements are provided to give precise results.

Future works will include modifications of the technique and also merging of other image processing techniques, such as, Neural Networks training using Edge detection which would extricate the process from the dependency over standard light intensity and standard distance between coin and camera during image acquisition adding on to the accuracy of the process.

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