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INTELLIGENT INDIAN CURRENCY DETECTION WITH NOTE TO COIN EXCHANGER

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Abstract: Requirement of coins in a daily transaction at places like bus station, railway station, mall and park is the main purpose of designing an efficient and simple machine which will fulfil need of coins for transactions so that people will not face any problem of coins. This project will provide coins for note, for this purpose we have developed mechanical coin dispensing project which takes the note inside and checks whether note is fake or real, if note is real camera takes picture of it and after that it will find out its value using image processing technique and then according to the value of note equivalent number of coins are dispensed. In this way we are trying to design an efficient machine which will be having low cost as compared to other existing machines. In this project we have developed algorithm in MATLAB for image binarization to detect the value of note. And we have implemented a fake note detection unit using UV LED and photodiode.

Key Words: Fake Note Detection, coin dispensing model, Image binarization.



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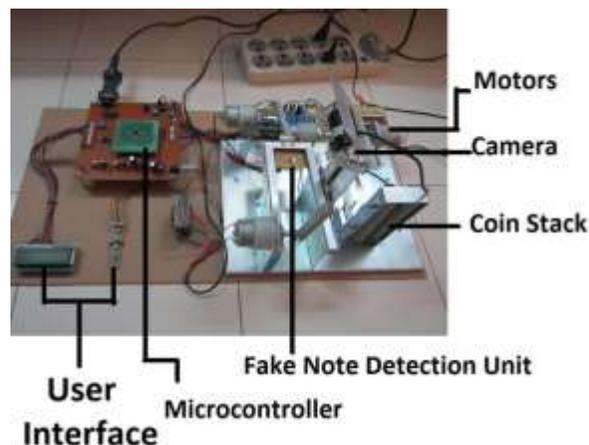
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INTRODUCTION

In today's world due to increase in the value of money the term coins or cent rarely have a value that it use to have in the earlier days. In the olden days, the value of coin was much more than what it is today. Even a single rupee used to mean a lot. Even we can remember our childhood when our parents use to give a 25 paisa or 50 paisa coin as a pocket money.

Nowadays people prefer note over coin just because coins make one's purse a bit bulky. Also one feel uncomfortable will carrying coins. As a matter of fact today people have changed their mentality about coins which is acceptable. This is because carrying a 10 rupee note is preferable than carrying ten coins of 1 rupee. Also coins tend to make a lot of sound which can be irritating for someone. Such people face problem when they go out in the market.



In our daily life people come across with the problem of not getting coin at various public places such as railway stations, malls, bus stations etc. People find it very difficult to get denomination at such places. This results in frustration. Suppose you purchased ticket which cost five rupees and you give a 10 or a 20 rupee note at the ticket counter. The person asks for a change and you don't have it, what will you do? Then you go around looking for a change at the station and you don't get it. At that time either you leave the change at that counter or sometimes you are forced to purchase certain things that are unnecessary for you at that time which results in wastage of money.

So in order to help people we are developing an interactive system that generates currency recognition system using localization and colour recognition with the help of MATLAB. The proposed system will be useful in day to day life of every common man where people have to

suffer for change at many public places. As mentioned in the applications this project is a real time application for all real time places. In the future this system can also be applied in the buses itself. This will be a relief for the conductors and passengers.

A change machine is a machine that accepts large denominations of currency and returns ansame amount of currency in smaller bills or coins. Typically these machines are used to provide coins in exchange for paper currency.

An Automated Recognition of Fake Indian Currency Notes

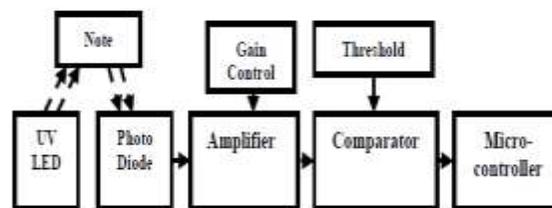


Fig. Block diagram of fake note detection unit

The main objective of this project is to find out the counterfeit banknotes with the help of hardware's. The system is built in MALAB software where different tools and algorithms will help us to process the templates of note. Notes are available in nominal values of 5, 10, 20, 50, 100 etc rupees and these notes have their own dimensions. So it is very necessary to first calculate the dimensions of each note and put their values in database. This role is played by the machine where a camera is fitted which will scan the whole note at once. With sharp-eyed sensors, machine will scan the entire banknote in high-resolution detail. This machine has qualities to enhance your business to ensure trouble free adjustment to your future and current needs. The keen sighted scanner detects all defective banknotes, in contrast to other low level detector and scanning techniques.

We have used Ultraviolet rays in order to determine so. The rays will be incident on the note using a UV bar which radiates UV light. If the note is real then the silver strips on the note will illuminate in green color and an image of the note will be taken. By using the HSV algorithm only the green components of that note is assigned to one that is white portion and zero is assigned to the rest portion of note. If these green strip which is in white portion are found to be in between 1 to 8 in numbers then the note is real.

The Reserve bank of India estimates that there is at least Rs.2 trillion fake rupee notes in across India. It is suspected that almost all of these notes originate from security presses located elsewhere. A common person does not know what to do when he gets a fake note. There are some points to keep in mind while checking the bank note- Visual Fake Currency Detection, Paper Quality, mark printed in intaglio in which the image is in a slightly raised manner, a promise and guarantee clause, the emblem of the Ashoka Pillar, portrait of Mahatma Gandhi, the RBI seal, all serial numbers

Security Features on Indian Banknote

1. Watermark-

The Mahatma Gandhi Series of banknotes contain the watermark of Mahatma Gandhi with a light and shade effect and multi-directional lines in the watermark window.

2. Fluorescence

Panel number of the notes are printed in fluorescent ink. The notes have optical fibers. All can be seen when the notes are exposed to ultra-violet lamp

3. Micro lettering

This feature appears between the Mahatma Gandhi portrait and vertical band. It contains the word 'RBI' in Rs.10 and Rs.5. The notes of Rs.20 and also contain the denominational value of the notes in micro letters. This feature can be seen better under a magnifying glass.

4. 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 Gandhi's portrait contains a latent image showing the associate denominational value in numeral. The latent image is visible only if the note is held horizontally at eye level.

5. Optically Variable Ink

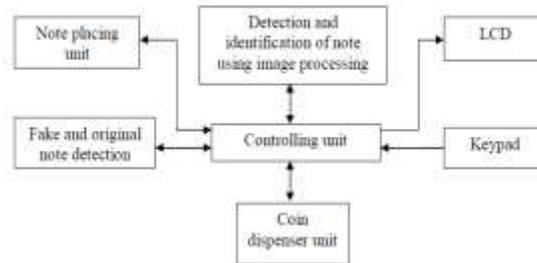
This is a recent security feature incorporated in the Rs.500 and Rs.1000 notes with revised color scheme introduced in November 2000. The numeral 500 and 1000 on the obverse of Rs.500 and Rs.1000 notes respectively is printed in optically variable ink viz, a colour-shifting ink. The colour of the numeral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

6. Serial Numbers

Every banknote has its own serial number, so it is important to check whether the number is repeated or wrong.

Note to Coin Exchanger

The techniques used in this project are Color based recognition technique. The image obtained from the camera may not be directly used for requires enhancement and localization. It involves applying some procedures like “Noise Reduction” Contrast “Enhancement” and “Normalization”. Next we subtract the background from the image and convert it from RGB to gray. After this conversion of the image, we detect the edges present in the image using some edge detection techniques present in the Image Processing Toolbox of Matlab software. Canny operator is selected in our technique to detect the edges prominent in the note. Currency note localization is done by applying scan line algorithm on the image after edge detection. The number of pixels present in each line is counted while the image is scanned from left to right line by line. The line that contains the number of pixels greater than the set threshold is highlighted. Likewise is applied from top to bottom.



After the localization of Indian currency note, our next step in the algorithm is color matching. The Color Threshold module is used to remove parts of the image that fall within a specified color range. This module can be used to detect objects of consistent color values. The interface displays the Red, Green and Blue histograms. Histograms chart has pixel value (0-255) on the X axis and number of pixels (0-image size) corresponding to that color value on the Y axis. Using histograms, we can filter pixels with those values out of the image leaving the desired object in view. The three RGB components is the minimum and maximum threshold limit present in any currency note and is determined by experimenting on various different values.

We have used ATmega16 controller. The main task or function of this controller is to control the action of each and every block. It checks whether the note is inserted or not, it also controls the coin dispenser unit. According to the indication from MATLAB software it will display the respective notification. Controller performs some mathematical operation in order to check the amount inserted by user in terms of coin is exactly matched with the amount of note or not. All the DC motors used for various purposes are controlled by this unit only.

Algorithm

Algorithm For Detection For Note (Fake Or Real)

1. Start
2. Initializing LCD
3. Display Project name “Intelligent Indian Currency Detection with Note to Coin Exchanger”
4. If note placed on the plate? No, go to step 2

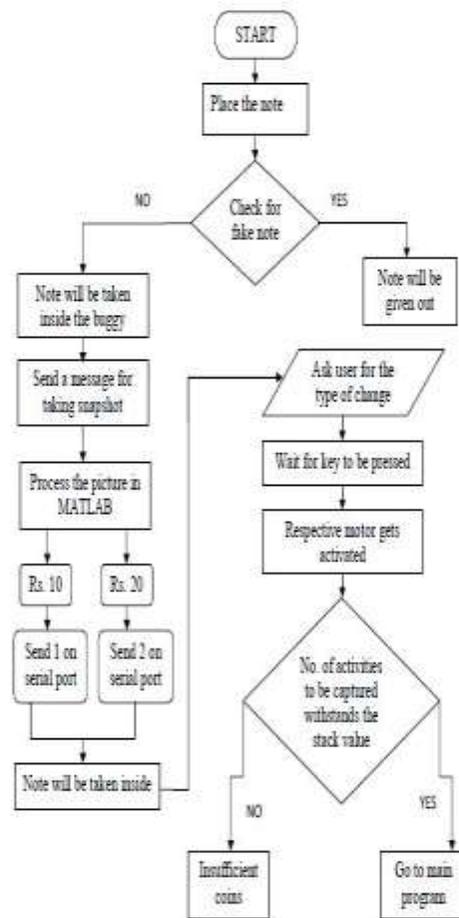


5. Yes, note is taken inside the model using dc motor.
6. Send the indication to MATLAB software on PC via RS232
7. MATLAB will take the snap of note using color segmentation and give us the reading in RGB format.



8. If MATLAB software sends '1' then go to next step else go to step 21.
9. Display "*ORIGINAL NOTE*" and send the indication to MATLAB software on PC via RS232. MATLAB software will take the snap of note using color segmentation and give us the reading in RGB function format.
10. Again wait for the indication of MATLAB software via RS232 cable.
11. If it receives "1" then go to next step else go to step 14.
12. Display *Rs. 10 NOTE*, and go to step 15
13. Display *Rs. 20 NOTE*, and go to step 15
14. Wait for Keyboard input from user for denomination in 1, 2 or 5 Rs coin.
15. Equate the amount entered by user with amount of the note.
16. If amount same then go to step 19 else go to next step.
17. Display "*Amount Not Matched*" Rotate motor in reverse direction to eject the note, and go to step 22.
18. Turn ON DC motor, Deposit the Note in the container.
19. Turn on the Coin dispensing mechanism to give the respective number of coins according to coin denominations, go to step 22.
20. Display "*FAKE NOTE*", and Rotate motor in reverse direction to eject the note.
21. Display "THANK YOU... TRY AGAIN" and go to step 1.

Overall Flowchart



CONCLUSION

As per the Aim of our project we have successfully developed a machine that will provide change to the user. The efficiency of our project is around 95%. Original and fake note are detected very perfectly and is accurate in detection of 10 and 20 rupee note. This Project provides an interactive system that generates currency recognition system using binarization technique and color model with the help of MATLAB software. IR sensor detects the note. And captured image is converted from RGB to HSV format. Different operations like image enhancement operation, subtraction operation, gray scale operation, binary operation, opening operation and after that no. of green strips are counted to detect the original and fake note. Depending on the choice of user change of the same amount of coin provided.

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