

ARM Based Coin Dispensing Facility and Fake Note Detection

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ABSTRACT

At public places like bus station, railway station, mall and park requirement of coins in a day to day life is start increasing. It is the main motivation to design a machine which will full fill requirement of people so that people will not face the problem of change. The project will provide coins equivalent to price of that note. According to that purpose we are developing mechanical model which takes the note inside and will check note is fake or real. If note is real, camera takes image of it then it will find out its value using image processing technique then it find the value of note. According to the value equivalent numbers of coins are dispensed. In this project we have developed a MATLAB algorithm for detecting the value of note. The fake note detection is implemented by using unit ARM processor, UV LED and photodiode. Our aim is to detect fake note and provide change and at same time to create awareness in people about fake note. The whole system consists of ARM Processor, Fake note detection unit camera, DC motor driver, DC motor, etc.

Index Terms: Fake Note Detection, coin dispensing etc.

INTRODUCTION:

In many applications such as automatic selling-goods and vending machines required automatic methods for bank note recognition. From the currency image is essential for accuracy and robustness of the automated system to Extracting sufficient monetary characteristics.

To detect the fake note is a challenging issue for system designers. In RBI (Reserve bank of India) every year face the counterfeit currency notes .In the bank staffs are specially trained to detect fake notes but then also fake notes are comes into the market and circulated through common people. Every year, millions of "fake" notes are comes into market counters and the majority are not identified as real note until they're examined by the bank. Some time fake notes are received from the ATM. This also been reported at some places.

Handling of large volume of fake notes arises additional problems. Therefore, it is essential to develop machines (independently or as assistance to the human experts) for automatic authentication of bank notes.

The common people don't know How to identify the fake note. To identify the fake note we have to check the

bank note-Paper Quality, mark printed in intaglio in which the image is in a slightly raised manner, portrait of Mahatma Gandhi, a promise and guarantee clause, the RBI seal, the emblem of the Asoka Pillar, all serial numbers. Also the number panels on bank note are printed on fluorescent ink. Bank note uses an optical fiber. The one special point of Indian currency note is that it absorbs the UV light at same time fake note reflect the UV light.

1. Block Diagram

Block Diagram Description

- It mainly consists of note placing unit, fake note detection unit, camera, ARM processor, coin dispensing unit, PC.
- When the note is real camera will take image of that note. The image gets stored in a 3D array. The coordinate of the pixel in 2D image is given by the first and second index of the array. The third index stores the RGB (Red-Green-Blue) intensities for each coordinate. Each element of array stores in unsigned 8 bit integer (0-255) format. The resolution of the image gets determined by the limit of first two indices of array. In our project, this limit for

the first index is set to be 640 and for the second index is at 480.

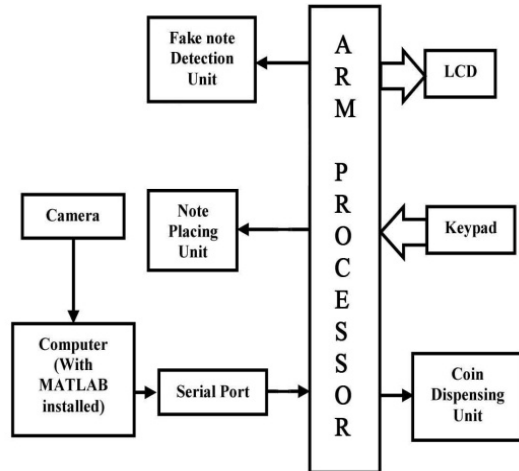


Figure 1: Block Diagram of Coin Dispensing and Fake Note Detection.



Figure 2: Original Image Taken By Camera.



Figure 3: MATLAB Scanned Image.

- The camera's output of is connected to the PC. Image of note is send to the PC for MATLAB programming in which image processing technique is used. There are lots of other methods to detect a fake note.
- The mostly used method among all of these is color based recognition. It is done by counting the number of pixels of each color.
- The camera will take its picture and passes the information to the PC MATLAB if and only if the note is real. Program in the MATLAB scans the note according to color. The colors the 10 Rupee note and 20 Rupee note are different. In the PC MATLAB algorithm this mechanism is used. It will assign 1 to the 10 Rupee note and 2 to the 20 Rupee note.
- This data of 1's and 2's is sent from PC to the ARM processor.

- The ARM processor will identify the data which is sent by the PC MATLAB in the form of 1's and 2's. The processor get that
a.1 = 10 rupee NOTE.
b.2 = 20 rupee NOTE.
- Now it will generate coins in the multiples of 5 and 1 or mix coins.
- The user interface used is Keypad. The following are 4 keys on keypad:
Start
1rupee coins
5rupee coins
Mix coins.
- The monitor of PC will display the exchange of currency note.

2. COMMONLY USED METHODS TO DETECT FAKE NOTES

A. WATERMARKING

The banknote of The Mahatma Gandhi Series contains the Mahatma Gandhi watermark with a light and shade effect and multi-directional lines in the watermark window. It also contains the watermark of the price of note which is visible in the presence of light and glows in UV.

B. SECURITY THREAD

The security thread with similar visible features and inscription 'Bharat' (in Hindi), and 'RBI' is present on the Rs.100 and Rs.500 notes. We can see one continuous line when we held against the light, the security thread on Rs.100, Rs.500 and Rs.1000 notes. A readable and fully embedded windowed security thread with the inscription 'Bharat' (in Hindi), and 'RBI' is appear on the Rs.5, Rs.10, Rs.20 and Rs.50 notes. To the left of the Mahatma's portrait, this security thread appears.

C. LATENT IMAGE

A vertical band on the right side of the Mahatma Gandhi's portrait contains a latent image that shows the respective denominational value in numeral format on the obverse side of Rs.20, Rs.50, Rs.100, Rs.500 and Rs. 1000notes. When we held the note horizontally at eye level then and then only the latent image is visible.

D. MICRO LETTERING

The micro letters appears between the Mahatma Gandhi portrait and vertical band. The Rs.5 and Rs.10 note contains the word RBI. The notes of Rs.20 and above all notes also contain the denominational value of that notes in micro letters. Under a magnifying glass Currency Counting Machine with Fake Note Detection we can see this feature more clearly.

E. INTAGLIO PRINTING

In Rs.20, Rs.50, Rs.100, Rs.500 and Rs.1000 notes the portrait of Mahatma Gandhi, RBI, guarantee and promise clause, Ashoka Pillar Emblem on the left, Governor's signature and the Reserve Bank seal are printed in intaglio i.e. in raised prints, which can be felt by touch.

F. IDENTIFICATION MARK

On the left of the watermark window on all notes except Rs.10/- note a special feature in intaglio has been introduced. There are different shapes for various denominations (Rs.20-Vertical Rectangle, Rs.50-Square, Rs.100-Triangle, Rs.500-Circle, Rs.1000-Diamond) which helps the visually challenged to identify the denomination i.e. price of that note.

G. FLUORESCENCE

When the notes are exposed to ultra-violet light, the number panels of the notes which are printed in fluorescent ink and the optical fibers of note can be seen. When the note is fake note its letter and mainly the numeric values all are irregular in shape. For a real note, the letters and numbers will be regular and when held against ultra violet light, the letter printed with fluorescent ink shines. For fake note these number will be comparatively smaller as compared to the real note.

H. OPTICALLY VARIABLE INK

In this method, on the obverse side of Rs.1000 and Rs.500 notes the numeral 1000 and 500 respectively are printed in optically variable ink viz., a color-shifting ink. When the note is held flat the color of the numeral 1000/500 appears green but when note is held at an angle it will change to blue.

I. SEE THROUGH REGISTER

In the middle of the vertical band next to the Watermark on the front (hollow) and back (filled up) of the note small floral design printed which has an accurate back to back registration. When seen against the light the design will appear as one floral design.

3. SOFTWARE OVERVIEW

A. MATLAB

In our project we use MATLAB which is a high-level technical computing language and interactive environment for algorithm development, data visualization, data analysis and numeric computation. We can solve technical computing problems faster than with traditional programming languages, such as C, C++ and FORTRAN, using the features of MATLAB.

The MATLAB language is a high-level matrix/array language with control flow statements, data structures, functions, input/output and object-oriented programming features. It allows both "programming in

the small" to rapidly create quick programs where we do not intend to reuse also we can do "programming in the large" to create complex application programs intended for reuse.

B. ALGORITHM

1. Initialize
2. As per the stack of Rs 1 and Rs 5 set the coin counter.
3. Wait for eject key to be pressed.
4. The motor gets actuates and tray comes out when eject key is pressed.
5. Now fake note detection circuit will check the fake note.
6. When 1 is received from fake note detection circuit then note will give out.
7. When 0 is received camera takes picture and will send it to PC.
8. Then to check denomination the MATLAB code gets executed.
9. If 1 is received by processor from PC denomination of that note is Rs.10 and if 2 is received then Rs.20.
10. Processor waits for choice of coins entered by user.
11. Processor will check coin counter which indicates sufficient coins present in coin stack.
12. If sufficient coins are present then motor rotates as per choice entered which will dispense the coins.
13. After dispensing of coins, motor again actuates to feed the note inside the machine.

C. FLOWCHART

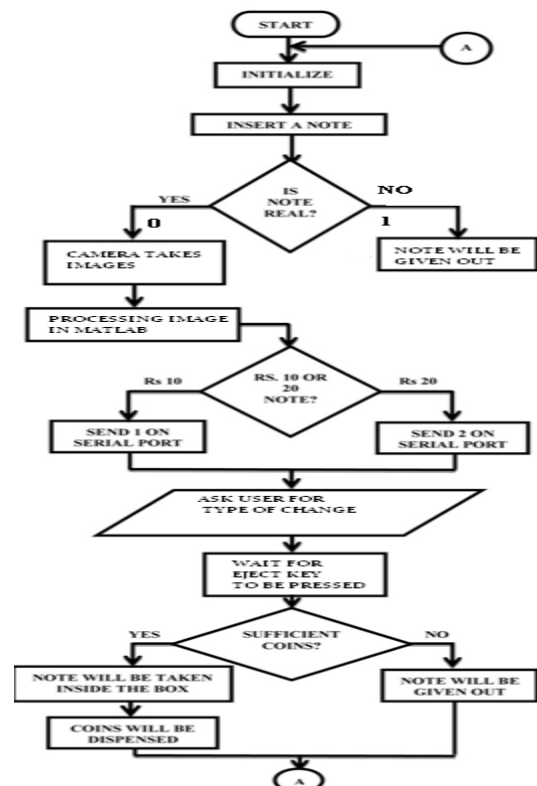


Figure 4: Flowchart of Coin Dispensing and Fake Note Detection.

4. ADVANTAGES AND DISADVANTAGES

A. ADVANTAGES

- User friendly
- Reliable
- Requires less power supply
- Fully automate system

B. DISADVANTAGES

- Time consuming system.
- System is complex.

5. APPLICATION AND FEATURE SCOPE

A. APPLICATIONS:

- Railway Stations Where people need change for the tickets
- Mall's and Parks
- Bus stations
- To make call from the coin box

B. FUTURE SCOPE:

In the future, we can extend note and coin capacity up to 50, 100, 500 and 1000 rupee notes. We can make provision for the system to recognize the difference between 1 and 2 rupee coin. This will make the system equipped with 2 rupee coin. In the future this system can also be applied in the buses itself. This will be a relief for the conductors and passengers. Also we can build our project using other fake note detection methods.

6. CONCLUSION:

We develop an interactive system that generates note recognition system using color 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.

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