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Smart Wallet

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Abstract: One of the common problems faced today by common man is the increasing expenses. It is very difficult to keep track of the transactions of day-to-day life. So, there is a need of a smart wallet that would solve this problem. Existing wallets are not smart enough to maintain this record. There is no record of overall count of amount spent. Also, there is no way of getting history of expenses of the entire month. To address this problem, we have designed a Smart Wallet which comprises of features like fake note detection and balance updation which is not available in existing wallets. It helps you to know the balance amount in your wallet along with the fake currency note detection. The detection of currency notes is done by matching all the security features of currency note. If currency is inserted into the wallet, balance will be incremented and if currency is removed from the wallet, balance will be decremented. Owner can view the past transaction details. The output can be seen on the display device provided.

Keywords: Image processing, Pattern Matching, Fake Note Detection, Increment, Decrement.

I. INTRODUCTION

The daily expenses are increasing and busy schedule of people makes it almost difficult to keep a track of money spent. At the same time identifying fake notes is a difficult task. People carry money in wallets. The system proposed is focused on making these wallets smart enough to track the transactions. It provides an additional feature of identifying fake notes. Fake note detection consists of various steps like image acquisition, preprocessing, grayscale conversion, edge detection, image segmentation, extracting features and finally comparing.

The system checks all Indian currency notes and performs required processing to display balance. This wallet can be used by both male and female. It is very important to have an automated system that can eliminate the need of manually counting notes of identifying fake notes as well as memorizing the daily and monthly expenditure.

II. RELATED WORK

Many researches have been done and many systems are available that can be used for fake note detection. Jeremiah Alexander TUCKER-SKOW et al [1] proposed a credit card holder having at least one internal slot for holding a credit card, the internal slot having opposed front and rear plates set at a distance approximately the thickness of a credit card, and also having fixed opposed side guides having credit card side guide surfaces set at a distance from each other of approximately the width of a credit card. In another paper [2], a method for securing a wireless digital transaction is proposed.

It consists of a terminal component that will receive the data related to payment for a service and the mobile device will have a m-card.

The m-card is made by establishing a link to an account associated with a form of currency. In paper [3], focus was on designing a digital wallet that will receive, provide access as well as maintain a list of items which are either marked for deletion or are deleted automatically when an item that corresponds to an item in the digital wallet is purchased online or at a physical store. B.P.

Yadav et al [4] in their paper proposed a system based on MATLAB for recognition of features of Indian currency automatically. It is also interfaced with a camera which is the input and output device that is a LCD display. In addition to this, E.Pilania et al [5] in their paper used image processing for recognizing paper currency.

This extracted ROI can be used with Neural Networks and Pattern Recognition technique. S. R. Darade et al., [6] in their paper proposed a system to check whether the Indian currency notes are fake or original using image acquisition and pre-processing techniques. In paper [7] different template matching methodologies and their various applications are stated. All these works are used for fake note detection and cannot be used for tracking transactions on a daily and monthly basis.

III. SYSTEM COMPONENTS

The proposed system consists of following components

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A. Processor

The processor is responsible for fetching the information from the storage media. It instructs the camera to capture the image of the note being inserted or removed. This information will be processed to check whether it is a fake note or original. If it is an original note, subsequent increment operation will be performed. In the same way, if the note is removed, decrement operation will be performed.

B. Camera

Camera captures the image of the currency note inserted into or removed from the wallet. This will be provided to the processor for further operations.

C. Buzzer

In case the processor detects that the inserted note is fake, the buzzer beeps. This will indicate the user that it is a fake note.

D. Display Device

Whenever the user wants to check the balance, it can be viewed in the display device. It can also be used to view the monthly history. Fake note message will also be displayed on the display device.

E. Storage Media

The details of each and every transaction will be stored in the storage media. This data will be served to the processor upon request.

F. Power Supply

The Power Supply supplies power to the system to operate.

IV. PROPOSED METHODOLOGY

The system works in two parts: Fake note detection and balance display. The IR Sensor will detect whether note is being inserted or removed. On insertion and removal, the camera will capture image of note. This image is provided to the processor that goes through various fake note detection processes and checks whether it is fake or not. In case it is a fake note, buzzer beeps. This will indicate the user about counterfeit note. If the inserted note is real, the balance will get updated and will be displayed on the display screen. The same way when note is removed, the amount will get deducted from total balance and final balance will be displayed in the display screen. The system architecture is as shown in Figure 4.1.

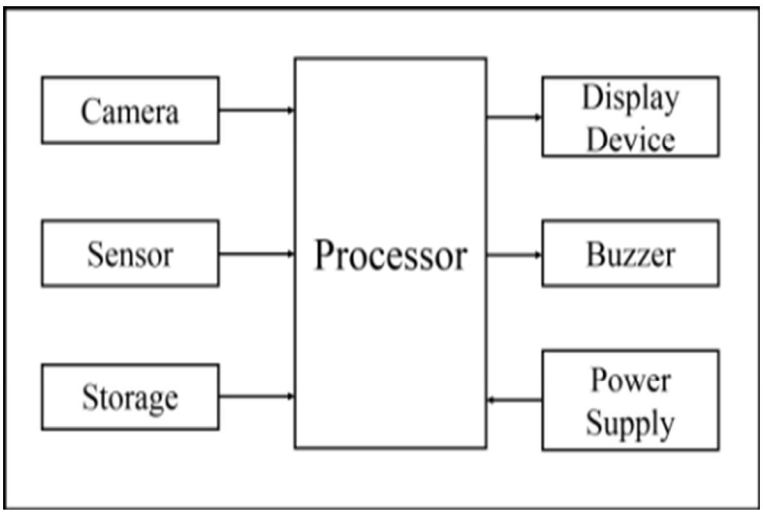

Figure 4.1. Typical Hardware Architecture

A. Features used

As shown in Figure 4.2, around 12 features are available that can be used to check whether note is fake or not using image processing techniques. The watermark feature is the most important. It has excellent quality and there are some features in

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watermark that cannot be found in fake notes. Another feature is latent image found on the lower border. This feature is also difficult to duplicate. Many other small features are also present that can be checked to identify fake notes and gives exactness and accuracy.

Figure 4.2. Features of original currency note

The features of currency note are:

1) See-through register
2) Latent imag
3) Denomination numeral in Devanagari
4) Mahatma Gandhi's portrait in center facing to right
5) Security thread
6) Guarantee clause
7) Portrait and electrotype watermarks.
8) Number panel
9) Denomination in numerals with rupee symbol
10) Ashoka pillar emble
11) . Circle with Rs 50
12) Five bleed lines on left and right in raised print

B. Design Flow of Identification of Fake Currency Notes

It consists of 8 steps. The image of the note that is captured will get compared with the one that is already stored. Figure 4.3 gives fake note detection flowchart.

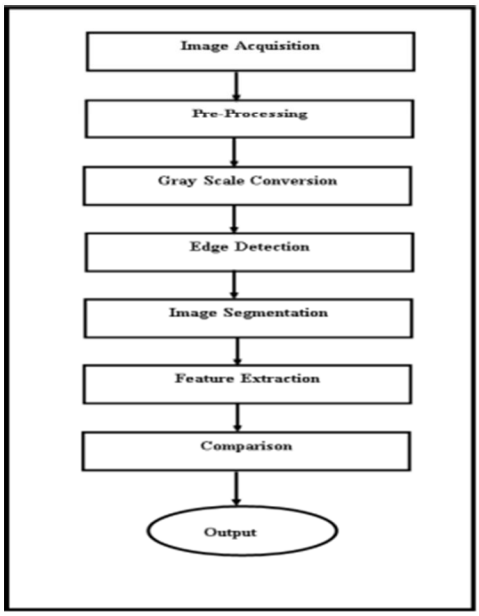

Figure 4.3. Flowchart of fake note detection

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1) Image Acquisition: The image is captured using camera. The captured image should contain all features of note.

Figure 4.4. Acquired image

2) Pre-Processing: The image captured contains noise. The noise has to be removed for further processing. It also involves image resizing.

3) Gray Scale Conversion: The image obtained is RGB image. This has to be converted into grey scale which is easy to process. This is shown in Figure 4.5

Figure 4.5. Grayscale image

4) Edge Detection: In this step, the edges of grey scale are identified.

5) Image Segmentation: Here image is cropped and then divided.

6) Feature Extraction: In feature extraction, the features are extracted for comparison. Consider Figure 4.6.1 and 4.6.2

Figure 4.6.1. Edge based segmentation of Mahatma Gandhi portrait.

Figure 4.6.2. Edge based segmentation of serial number

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7) Comparison: The features extracted from the input image is compared with the extracted features of the original image.
8) Output: The final output will be displayed on the output device. The output is that the note is original or fake.

V. RESULTS

The system must be provided samples for comparison. After fake note detection, the original notes will be identified and this will be then used to increment the total balance and display to the user. Similarly, during removal, captured image will be compared with the sample provided which will then be used to decrement the balance display it.
A sample example of implementation is as shown:
Initially, there is zero balance in the wallet. Hence total is indicated as 0. This can be seen in Figure 5.1.

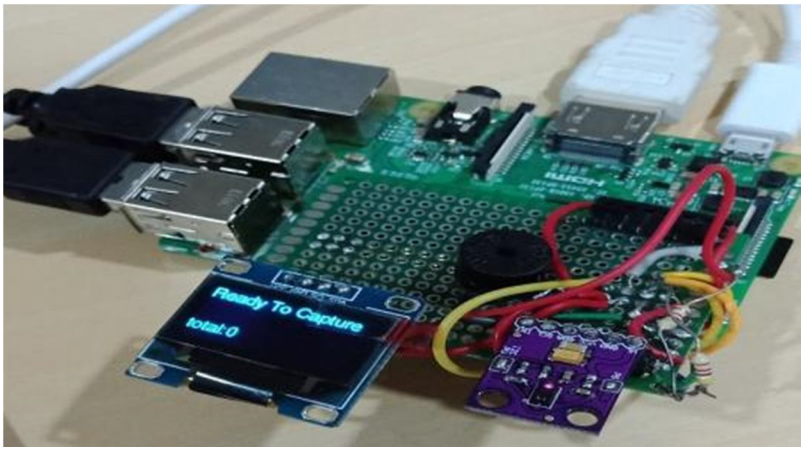

Figure 5.1. Initial stage

Now user inserts a fake note and so the balance will remain 0. The buzzer will beep and fake note detected message will be displayed on the display screen. Figure 5.2 depicts the same.

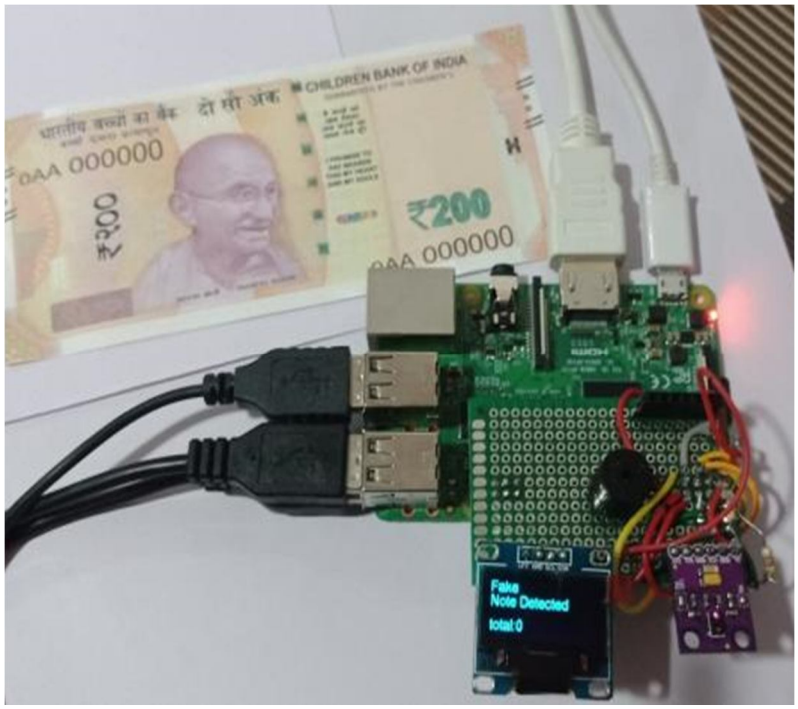

Figure 5.2. Fake note detection

Next, the user inserts Rs.100/- original note. Thus, the final balance is displayed on the display screen as shown in Figure 5.3.1

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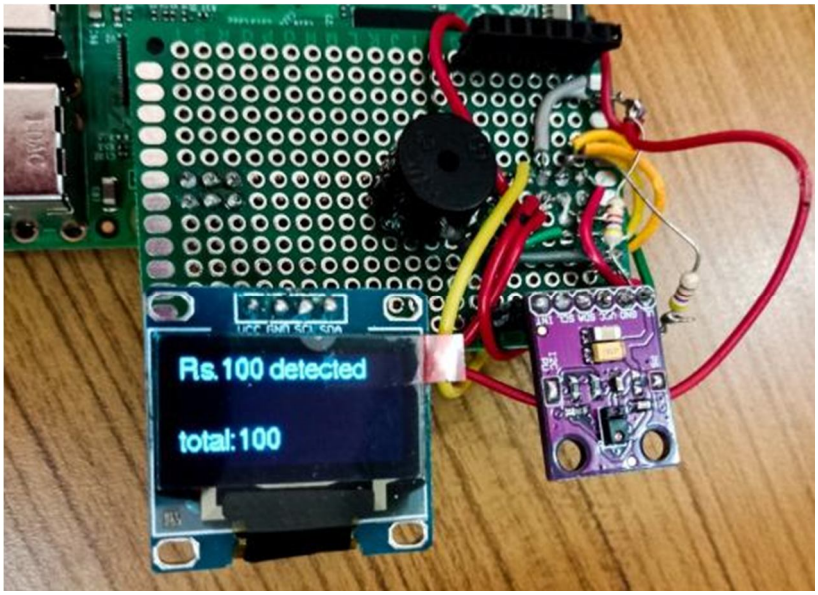

Figure 5.3 Insertion of Rs.100/-note

Now if user removes Rs.100/- note, final balance will be displayed as shown in Figure 5.4

Figure 5.4. Removal of Rs.100/- note

VI. CONCLUSION

In this paper we have presented a method in which Image Processing and Pattern Recognition Techniques are applied for designing a Smart Wallet to track daily cash transactions and identify fake currency. It is a new solution to curb the increasing expenses. In this it is shown that, how certain features can be extracted from currency note that can be used for comparison. Then it uses fake note detection algorithm to comprehend the analysis. Such monitoring will play a great role in curbing the increasing number of fake notes. This information can be used by third party users so that they can provide the appropriate recommendation.

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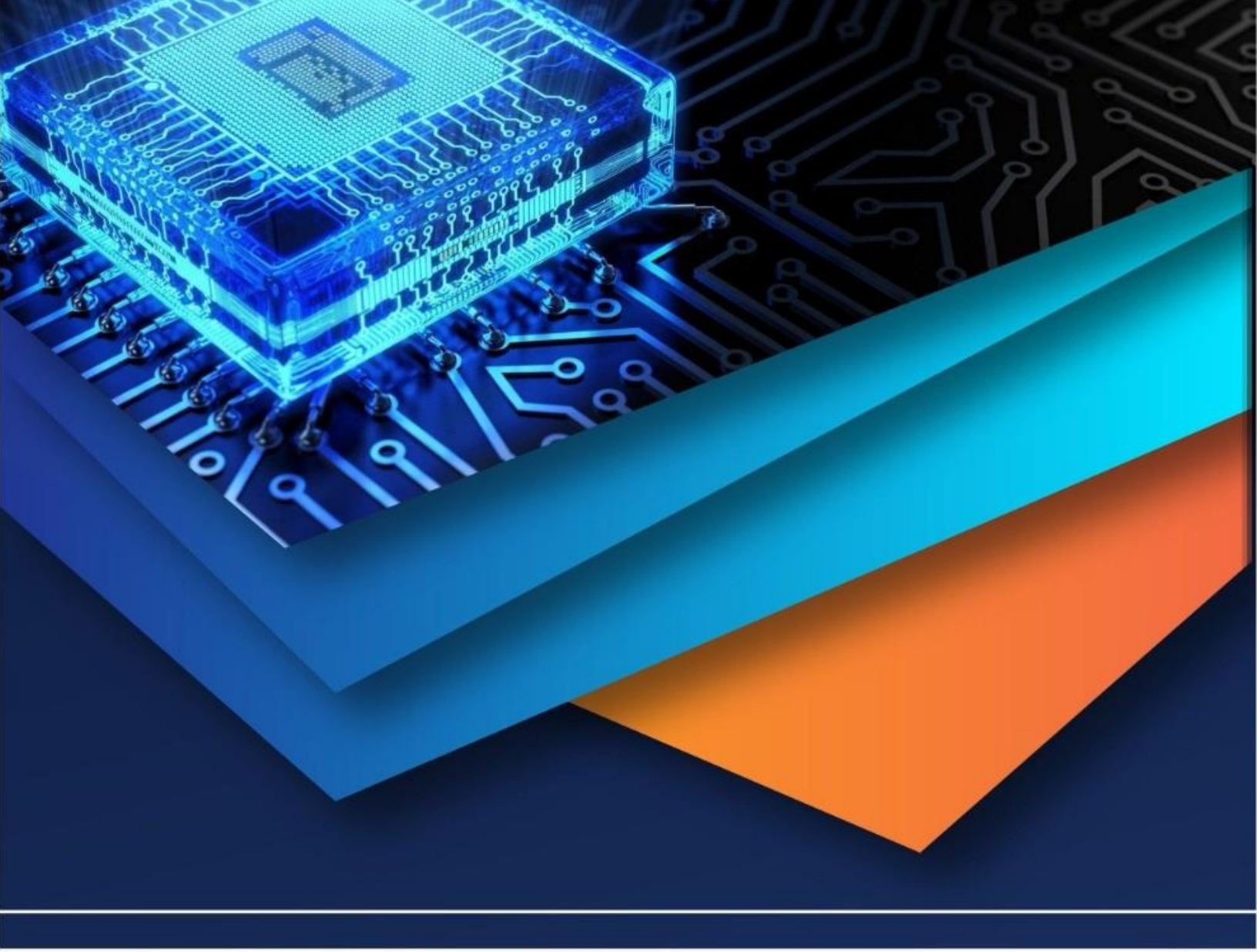

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