

Embedded Based Semi-Automatic Money Denomination System

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Abstract— Today living in 21st century, despite epic amount of technological booms, there is still existence of devotional sites wherein Hundials contribute a major role as donation pot. The donation amounts are being slotted and summed manually. Most of the examples are Arulmigu Dhandayuthapani Swami Temple, Palani and Tirumala Tirupati Devasthanam (TTD) in India has deployed about 50 of its employees to segregate and clear the account of the currency notes and coins on daily and monthly basis. This standalone summary of project work attempts to make hundial amount summing automated which in turn reduces man power and automates the process. Initially, slider and fan is used to straighten the crushed and crumpled currencies. A filter then segregates coins, currencies and others. Following which, coin counting can be done on a separate slot. Currencies are snapped and inputted to a system with MATLAB incorporated, which ensures currency recognition and counting based on the size of the same. On the whole, total counts are summed up and displayed in LCD using microcontroller.

Index Terms—Crumpled Currency, Hundial, Matlab, Standalone.

I. INTRODUCTION

In the existing method, money counting is done using automatic cash counter machines where, it can count only same set of currencies say, it counts bundle of 1000 rupees or bundle of 500 rupees. In ATM, money denomination is done for different currencies. Such methodology is adopted in counting amount. Especially for Hundials, money counting seems to be a very large process where, government spends lakhs of money per day to pay for the volunteers involved for counting, to provide accommodation, to provide security, to provide electricity and comfort for volunteers. Our project aims in overcoming all sorts of disadvantages by designing a system which automatically segregates currency, coins, and other currencies recognize it and display the total amount available. In the initial stage, Optical Character Recognition (OCR) based recognition is developed and it was changed into size based denomination system. The reason is the OCR based system consumes more time delay to recognize a particular currency.

II. METHODOLOGY

The methodology initially involves in segregating currency and coin using a coin sized filter. The currencies are then passed through the slider where a person is involved in straightening the crushed notes and arranging notes. These currencies are captured via camera module. The output of camera module is given through matlab which recognizes the currency and identifies the value of currency. Such that, the incoming image of all the currencies stored in a folder. Finally the recognized values are summed up and the total gets displayed. On the contrary coins are recognized through mechanical setup based on their sizes and their values are displayed. In total both of coin and currency values are summed up and total count gets displayed in LCD.

III. HARDWARE DESCRIPTION

The designed hardware includes a regulated power supply, PIC16F877A Microcontroller, Display unit, coin slider, coin filter and coin and currency recognition unit. The coins and currency are collected from the hundial and they are applied to the slider unit, where a high speed fan is used to separate the currency from coins. Then the separated coins are passed to slider in which, different slots are provided for different coins. Collected coins are stored in a container after summing up them in a microcontroller unit. Fake note detection is also provided in the system. It is detected by comparing the note with the already stored database. There is a separate slot is allotted for collecting other donations such as jewels, gold coins and ornaments.

A. PIC16F877A Microcontroller

Microcontroller PIC16F877A is one of the PIC Micro Family microcontroller which is popular at this moment, start from beginner until all professionals because of its very easy using PIC16F877A and FLASH memory technology so that can be write-erase until thousand times. This RISC Microcontroller compared with other microcontroller 8-bit especially at a speed of and the code compression has high superior. PIC16F877A have 40 pin by 33 path of I/O.

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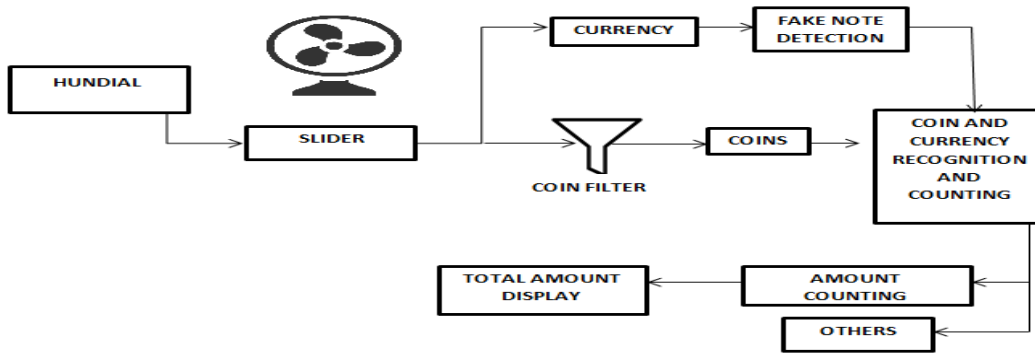


Figure.1. Block Diagram of the proposed Model

IV. OPTICAL CHARACTER RECOGNITION

Optical character recognition is the mechanical or electronic conversion system of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo) or from subtitle text superimposed on an image (for example from a television broadcast).

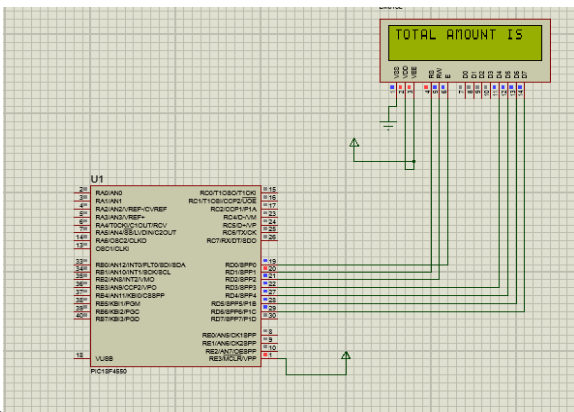


Figure 2 Microcontroller based Hardware

B. Liquid Crystal Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), and animations.

C. Coin Sorting Unit

The coin sorting unit consists of different slots with different size. The collected coins are passed to the sorter, where each size coin was deposited in its container through the corresponding size slot.



Figure 3 Coin Sorting Model

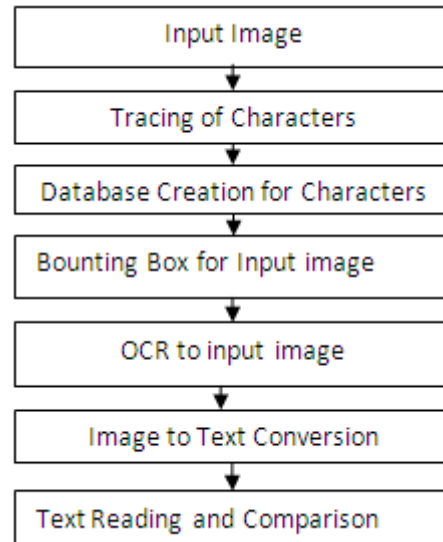


Figure 4 OCR Based Recognition

It is widely used as a form of information entry from printed paper data records, whether passport documents, invoices, bank statements, computerised receipts, business cards, mail, printouts of static-data, or any suitable documentation. The flow diagram of OCR based recognition is illustrated in figure 4. It is a common method of digitising printed texts so that they can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as cognitive computing, machine translation, (extracted) text-to-speech, key data and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

V CURRENCY SIZE BASED RECOGNITION (CSBR)

Since OCR may have reasonable drawbacks, we prefer classification based on size of the amount. Extraction of features and classification may be prone to light settings,

contrast of image taken and environmental conditions. Also serial number also have numerical character which may lead to false recognition, hence we prefer classification based on size of the currency. The actual size of all Indian currencies is listed in Table.

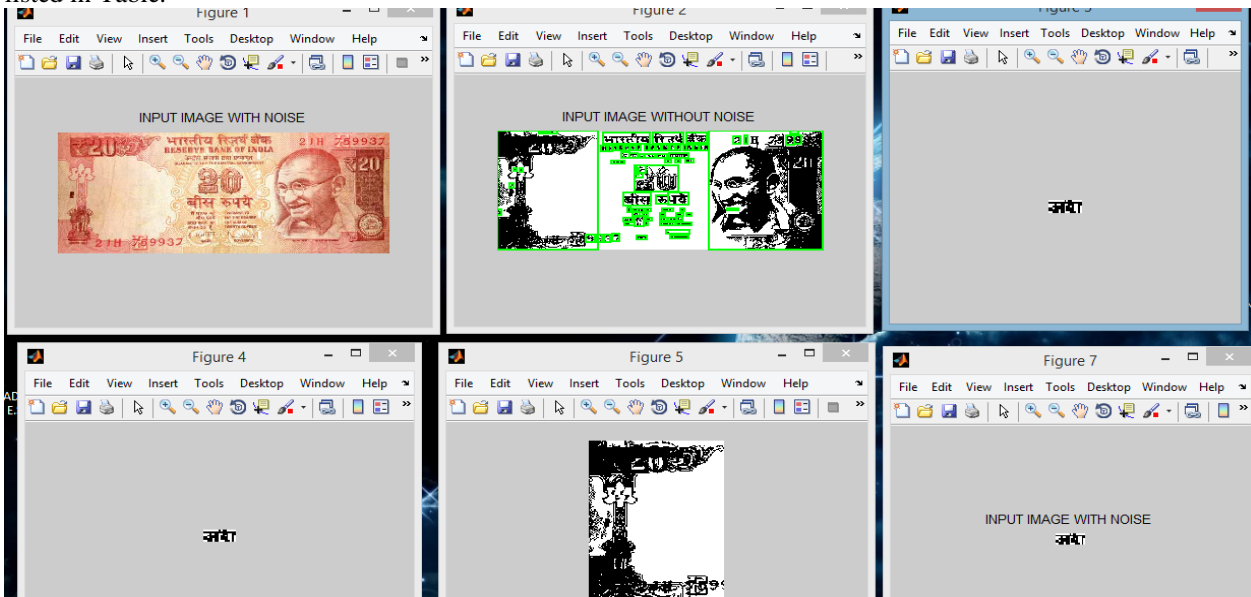


Figure 5.Feature extracted images

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Editor - C:\Users\RAMZZ\Desktop\dinesh.m
ramseditable.m  autocrop.m  dinesh.m  graythresh.m
1 - clc;
2 - clear all;
3 - close all;
4 - tic
5 - ten=0;
6 - twenty=0;
7 - fifty=0;
8 - hundred=0;
9 - fivehundred=0;
10 - thousand=0;total=0;
11
12 - srcFiles = dir('C:\Users\RAMZZ\Desktop\New folder\*.jpg'); % the folder in wr
13 - for i = 1 : length(srcFiles)
14 -     filename = strcat('C:\Users\RAMZZ\Desktop\New folder\',srcFiles(i).name);
15 -     A{i} = imread(filename);
16 -     figure,
17 -     imshow(A{i});
18 -     size=size(A{i});

```

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Command Window
New to MATLAB? Watch this Video, see Examples, or read Getting Started.
amount is 500 rupees
2
THE TOTAL AMOUNT IS
1330
Elapsed time is 7.653003 seconds.
>>

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Figure 6 Sample Matlab code for simulation

Table.1.Comparison of different Currency Recognition rates

Sl.No.	Rupees Value	No. of Notes tested	Recognition Rate (%)			
			Edge Detection Based Recognition	CPNN Based Recognition	OCR Based Recognition	Proposed method (CSBR Algorithm)
1	5	218	96.3303	97.2477	98.1651	99.5413
2	10	195	96.9231	97.4359	98.4615	99.4872
3	20	184	96.7391	97.8261	98.913	99.4565
4	50	188	96.8085	97.3404	98.4043	99.4681
5	100	200	97	97.5	98.5	99.5
6	500	197	96.9543	97.9695	98.9848	99.4924
7	1000	113	96.4602	97.3451	98.2301	99.115
Average rate			96.7451	97.5235	98.5227	99.4372

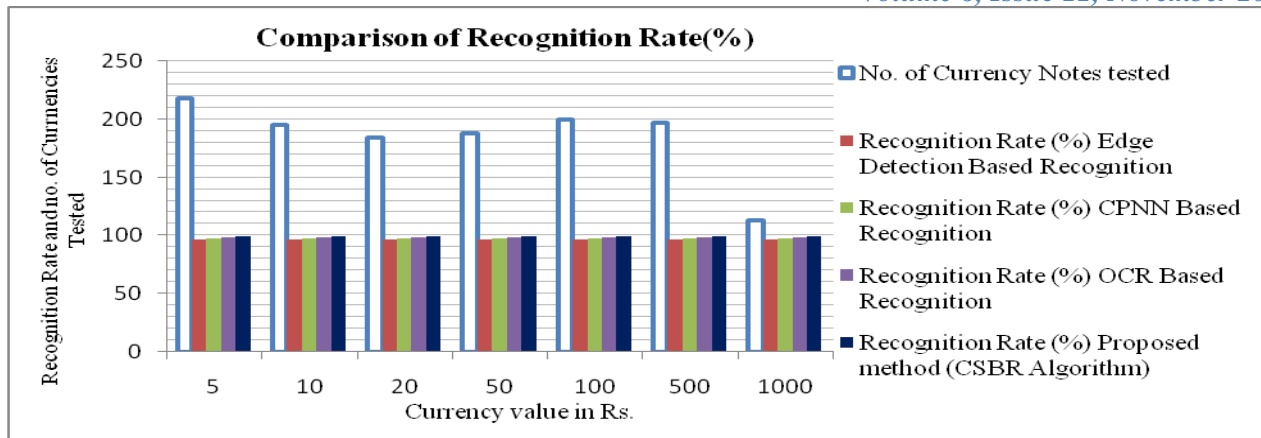


Figure 7. Comparison of Recognition rate

From the results it is shown that, edge detection method produce minimum rate of 96.33 for Indian rupee of Rs.5 and maximum rate of 96.95 for Indian rupee of Rs.500. CPNN based technique produce a minimum rate of 97.24 for Indian rupee of Rs.5 and a maximum rate of 97.96% for the Indian rupee of Rs.500. OCR based recognition produce a minimum of 98.16% for Indian rupee of Rs.5 and a maximum rate of 98.98% for the Indian rupee of Rs.500. Finally, the proposed recognition system produces a minimum recognition rate of 99.11% for Rs.500 and a maximum recognition rate of 99.54% for Rs.5.

A Simulation Results and Discussion

Simulation results are carried out using Matlab programs. The simulated results are shown in figure 6. Indian rupees of values 10, 20, 50, 100, 500 and 1000 are taken for analysis. Sample Matlab programme is illustrated in figure 6. Table 1 shows the comparison of currency recognition rate for different techniques. A bar chart comparison also illustrated in figure 7. The existing methods such as edge based recognition and CPNN based techniques are compared with OCR based technique and the proposed Currency Size Based Recognition technique. Totally 1295 Indian currency notes are tested for finding the recognition rate.

VI. CONCLUSION

This paper aims in overcoming the difficulties of present scenario. The conventional manual methods for collection and counting of coins and Indian currency require a lot of man power and space. It is also a time consuming process. The proposed methodology gives a solution to count the coins and as well as sorting the Indian rupees very efficiently. The proposed method is tested with 1295 number of different Indian currency notes and 1568 number of different new and old Indian coins. The results of the proposed method are compared with edge detection method, CPNN based method and OCR based method. As per the currency recognition rate is concerned, the proposed method produces maximum rate for all the Indian rupees compared with other techniques. OCR is also give better result, but it consumes more processing time. The future enhancement involves in making it fully automated avoiding the involvement of individual.

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