

# EFFECTIVE CURRENCY NOTE TO COIN CONVERSION SYSTEM USING IMAGE PROCESSING

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## ABSTRACT

*In Present we all are placing the requirement of coins in our day to day life at social places such as malls, railway stations, and parking places and much more is increasing rapidly. So we have avoided this situation for that our motive of designing such system that simple machine which will solve this problem. Within this project using image processing on the Note for detecting weather, it is real or fake using image processing algorithms such as Local Binary Pattern (LBP), optical character recognition algorithms, etc on the note. In those algorithms we have Text- Pattern based, Color based Recognition Technique Note will be identified. If the note is real then depending upon Value and then according to that value equivalent numbers of coins are dispensed from different Coin Containers.*

**Keyword:** - Conventional Belts, Local Binary Pattern, Optical Character Recognition, Dispatch Unit, Coin Container, RFID

## 1. INTRODUCTION

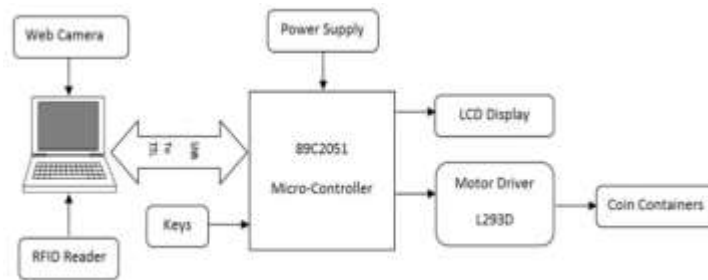
The main objective of this project to efficient retrieval of coins as per user recommendation or automatically with the help of coin containers. First of all for the Identification as well as Security purpose RFID Reader is use, after identification next process is with the help of conventional belts Note is Taken from the User and next process is being done. That is Image processing on the computer with the help of MatLab Algorithm. After the finding note is original then control is passing to the microcontroller, which contains details regarding the number of coins to be dispatch. That will be done with the help of motor driver and motors.

### 1.1 Related Work

In this system give the coins to user according to the currency note in machine along with RFID security. Similar to the ATM Machine conveyor Belt are working same in this system. With the help of conveyor Belt currency note fetching and issue the respective coin to the user. Currency note to coin conversion system identification of the note is important task, for that MATLAB and Image Processing Toolbox is use. MatLab is providing the flexible environment to explore design ideas and create unique solutions for imaging systems.

## 2. IMPLEMENTATION OF NOTE TO COIN CONVERSION SYSTEM

Implementation of such system divided into different units that performs different task. Basically it contains two section software and hardware. In software section image processing algorithms are use and calculation of coin to be dispatch that will be decided. In the Hardware sections with help of microcontroller different operation are performing. Such as image capture, RFID Detection, Coin dispatch etc operations are performing with help of different hardware's. Generally this machine is based on Indian Currency and note which can process of RBI having 10,20,50,100,500,2000,etc and coin such as 1,2,5,10,etc are being used. When machine is get note at first that note scan with help of camera. For further processing is goes into different stages. In the Figure-1 diagram show the different unit.



**Fig -1:** Block Diagram for Note to Coin Conversion

Implementation of system that contains different unit which perform different functionality. It Contains different unit such as the Note Detection Unit, Image Processing Unit, Coin Container Unit and Coin Dispatch Unit etc.

### 2.1 Note Detection Unit

Basically this unit will scan of the note using Mechanical Assembly and Camera. Mechanical assembly which works with the help of motors and conveyor belts note is fetch and place into front side of the camera for scanning the note. That note should not folded or wrong position.

### 2.2 Image Processing Unit

As the note pick unit place note is right position. Controller will send indication to the MATLAB to take a snapshot of the note. After the taking snapshot image which is captured to the computer. On that perform the image processing.

### 2.3 Coin Container's Unit

This unit is contains different coin contains which hold the coins. 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, the mix coins will be let out to the user.

### 2.4 Coin Dispatch Unit

Main Task of Micro-controller to Issue the coin to user as per input note that done with the help of L293D Motor Driver to rotation the motor.

## 3. IMAGE PROCESSING WITH MATLAB

There are the lots of technique to detect the Indian currency is real or not. Using such technique we have to perform the image processing on images which have taken snapshot of note. Some of the techniques as Texture, Pattern based, checking watermarks, checking the micro lettering, color based recognition technique are mostly use for image processing on the currency note. Before applying any image processing we need to perform following step:

**Image Capture:** - Camera is used to capture the image which is an input image given to Matlab for processing. A webcam captures and it sends the data to the computer.

**Image Conversion:** - image conversion purpose first removes the noise from the image. Then perform the RGB (red, green, and blue) that refers to the computer based representation of color. Red, green, and blue can be combined in various proportions to obtain any color in the visible spectrum. Levels of R, G, and B can each range from 0 to 100 percent of full intensity. Each level is represented by the range of decimal numbers from 0 to 255.

**Grayscale Images Representation:** - A grayscale (or gray level) image is simply one in which the only colors are shades of gray. The reason for differentiating such images from any other sort of color image is that less information needs to be provided for each pixel. In fact a 'gray' color is one in which the red, green and blue components all have equal intensity in RGB space, and so it is only necessary to specify a single intensity value for each pixel, as

opposed to the three intensities needed to specify each pixel in a full color image. The grayscale intensity is stored as an 8-bit integer giving 256 possible different shades of gray from black to white

### 3.1 Preprocessing Of Image

**Image Acquisition:** it is used to perform the numeric computing environment and support wide range of image acquisition operations. Once the images are obtained, they were further processed using programs to extract whatever information is desired.

**Image Pre-Processing:-** image pre-processing is to suppress undesired distortions or enhance some image features that are important for further processing or analysis. It includes the results and discussion may be combined into a common section or obtainable separately. They may also be broken into subsets with short, revealing captions.

**Image Adjusting:** - After the image is obtained from a digital camera, the size of the image is too big. In order to reduce the calculation, the size of the image should be reduced. Image adjusting is done with the help of image interpolation.

**Image Smoothing:** - Removing the noise is an important step when image processing is being performed. However noise may affect segmentation and pattern matching. Mask values can be used to determine the degree of smoothing and to reduce noise.

## 4. COMPONENTS APPLIED

**Camera:** - The camera acts as a digital eye for input to computer system. It is used to give the input to computer system as the snapshot of note.



Fig : - Camera

As shown in the figure, it recognizes the note and sends it to the computer, which is then processed by MATLAB.

**Controller 89C2051:-** The AT89C2051 is a low-voltage, high-performance CMOS 8-bit microcomputer with 2K bytes of Flash programmable and erasable read-only memory (PEROM). AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications. In addition, the AT89C2051 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

**RFID Security:** - it provides a unique identifier for that object. And, just as a bar code must be scanned to get the information, the RFID device must be scanned to retrieve the identifying information. Radio-Frequency Identification (RFID) is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked.



Fig: RFID Tag & Reader

### USB to TTL:-

USB to TTL is used for the serial communication between microcontroller and computer system. We can't connect directly microcontroller and computer system. Inside the big USB plug is a USB<->Serial conversion chip and at the

end of the 36" cable are four wire - red power, black ground, white RX into USB port, and green TX out of the USB port.



**Fig: - USB to TTL**

#### **Motor Driver:-**

Motor are can't connect directly to the microcontroller, for that we are use L293D motor driver. L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC, Dual H-bridge Motor Driver integrated circuit (IC). The L293d can drive small and quiet big motors as well.



**Fig: - L293D Motor Driver**

## **5. ALGORITHM**

First of all using general techniques to process the image such as capture, conversion, representation of image. after that using following algorithms image processing done with the help of matlab.

### **5.1. Local Binary Pattern (LBP)**

A local binary pattern (LBP) is a type of visual descriptor used for classification in computer vision. LBP is the particular case of the Texture Spectrum model proposed. It has since been found to be a powerful feature for texture classification. The LBP feature vector, in its simplest form, is created in the following manner: Divide the examined window into cells (e.g. 16x16 pixels for each cell).

- For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.
- Where the center pixel's value is greater than the neighbor's value, write "0". Otherwise, write "1". This gives an 8-digit binary number (which is usually converted to decimal for convenience).
- Compute the histogram, over the cell, of the frequency of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the center). This histogram can be seen as a 256-dimensional feature vector.
- Optionally normalize the histogram.
- Concatenate (normalized) histograms of all cells.

This gives a feature vector for the entire window. The following notation is used for the LBP operator:  $LBPP, Ru2$ . The subscript represents using the operator in a (P,R) neighborhood. Superscript u2 stands for using only uniform patterns and labeling all remaining patterns with a single label. After the LBP labeled image  $fl(x,y)$  has been obtained, the LBP histogram can be defined as:

$$Hi = \sum_{x,y} I\{fl(x,y)=i\}, i=0, \dots, n-1, (1)$$

When the image patches whose histograms are to be compared have different sizes, the histograms must be normalized to get a coherent description:

$$N_i = H_i \sum_{j=1}^n - 1j = 0H_j. (2)$$

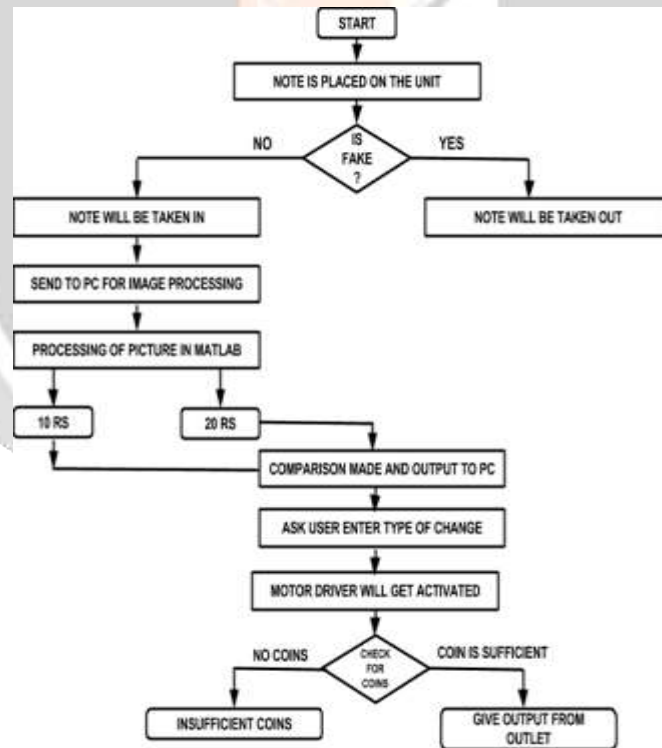
The LBP methodology has led to significant progress in texture analysis. It is widely used all over the world both in research and applications. Due to its discriminative power and computational simplicity, the method has been very successful in many such computer vision problems which were not earlier even regarded as texture problems, such as face analysis and motion analysis used for the LBP operator: LBPP, Ru2. The subscript represents using the operator in a (P,R) neighborhood. Superscript u2 stands for using only uniform patterns and labeling all remaining patterns with a single label. After the LBP labeled image  $f_l(x,y)$  has been obtained, the LBP histogram.

**5.2. Optical Character Recognition (OCR) Technique**

Character Recognition is a process of detecting and recognizing characters from input image and converts it into American Standard Code for Information Interchange (ASCII) or other equivalent machine editable form. In which Matrix Matching converts each character into a pattern within a matrix, and then compares the pattern with an index of known characters.

OCR Technology Provides Reproductive Systems By Scanning And Imaging Systems The Ability To Convert Images Of Characters In A Font Of Machine Character Can Be Understood Or Recognized By A Computer. Thus, Images Of Characters In A Font Of Machine Are Drawn From A Bitmap Of The Image Reproduced By The Scanner. Thus, Images Of Characters In A Font Of Machine Are Drawn From A Bitmap Of The Image Reproduced By The Scanner. The OCR Process Involves Several Aspects Such As Segmentation, Feature Extraction And Classification. Image Processing Toolbox For MATLAB Provides A Feature Set That Extends The Product's Capabilities To Develop New Algorithms And Applications In The Field Of Process And Image Analysis.

**6. FLOWCHART**



**Fig: - Operational Flowchart**

**6.1. Operation**

1. Initially As the input of note given, to the PC containing the image processing module. The circuit responds to the command given by the PC.



2. The data is received via USB to TTL to the microcontroller, which further the processes to which motor driver to activate according to the requirement of 1, 2 and 5 rupees coin.
3. Depending upon the need of the user which was given to PC input we can have mixed output of 1, 2 and 5 rupee coins.
4. So the motor driver enables the motor for by giving the command to rotate the motor to open the lid for the said coin.

## 7. APPLICATIONS

- Ticket Counter
- Parking
- Toll plaza
- Shopping

## 8. FUTURE DEVELOPMENTS

- Extend the capacity of coin
- Currency conversion unit can be developed, so that foreigners can easily convert their currency into INR.
- Development of software that can improve the processing speed, which will save time of user.
- A unit can be developed where all sought of notes and coins can be inserted and dispensed respectively.

## 9. CONCLUSION

Generally there are problem with coin is appeared in social places those can be reduce with help of this paper. In this paper we are use MATLAB for Identification of currency note, also RFID is used for security aspect and with help of this model we are successfully reduce the problem of change for user.

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