COIN DISPENSING UNIT

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Abstract- The requirement of coins or change in a day to day transaction at places like bus stop, railway station, malls and parks is the main motive of designing this project. So we thought to develop an exchanger which will give us coins instead of notes. It is basically a coin dispensing model which accept note as input and checks it is real or fake. If the note is real, the camera takes a snap of it. After which it will find out its value using image processing technique and then accordingly the value equivalent to the number of coins are dispensed. For detecting kind of note the color histogram, color matching algorithm executes and the solution is given to the controller which will give command to the coin container through relays and motors, the user simply presses the keypad for which type of change he wants whether one rupee coins or two rupee coins or five rupee coins and hence in the output we get coins as per requirement.

Keywords- Color Histogram,Relays,Watermarking,Image Acquisition,Grayscale,Canny.

I. INTRODUCTION

This chapter will introduce the reader with Coin Dispensing Unit. It will light up the topics like the description of the project and the problems faced before is what motivated the makers of the project to take a decision to make this project and solve related problems and thus covering up the scope of the project.

II. DESCRIPTION

A. Product Perspective

The Coin Dispensing Unit is a new system that helps the user suffering from problem of changes (coins) at public places such as bus stop, railway station, etc. This product does not require staying connected to any internet so anyone can easily access.

B. Motivation

The need of change has been increase. Rather coins are used more instead in various places like buses, railway station, malls and park even in villages and towns where nowadays also coin telephone system is used. For this many applications places coins are used, so we got an idea to design an exchanger machine which will give us coins instead of note.

Over the past few years, as a result of great technological advances in color printing, duplicating, scanning and counterfeiting problems have become more and more critical. Thus the issue of efficiently differentiating fake bank notes from original ones through automatic fake currency detection system has become more and more important.

C. Proposed Solution

This project provides coins for currency, for this purpose coin dispensing unit can be used, which takes the note inside and checks whether the note is real or fake. If note is real the camera capture the image of it. After which it will determine its value using image processing methods and then according to the value of currency note an equivalent number of coins are dispensed.

For detecting the kind of note color based recognition, pattern based or checking by the watermarking techniques can be preferable. The result is given to the controller which will manipulate coin container through relay and motors. Hence in the output we get coins as per users' requirement.

D. Product Functions

(a) User-The role of the user in this model is to interact with the coin dispensing unit and the system. The interaction of user with dispensing unit includes insertion of notes and with the system is to give the needed input.

(b) Camera-The camera is used to capture the image of the note inserted by the user and forward the image of the note further.

(c) Dispenser-The role of dispenser is to dispense coins for the note inserted by the user.

(d) Fake note detector-It is used to detect whether the inserted note by the user is fake or real. If the note is real it will accept the note and if it is fake it will reject the note.

(e) Controller-The controller device is use to process the input given. A microcontroller is a mini computer on a single IC, memory, and programmable input/output peripherals.

(f) LED light-LED light will display green color if coins are available and will display red color if coins are not available. May be flowchart

E. Operating Environment

(a) OE-1:- The Coin Dispensing Unit can work with many operating systems such as windows.

(b) OE-2:- MATLAB is used to implement various algorithms of image processing for detecting and verifying currency.

(c) OE-3:- A Net bean IDE (Integrated Development Environment) is used to program the code in java for the working of microcontroller.

III. ALGORITHM

A. Image acquisition

Image acquisition in image processing is an action of retrieving an image from some source, so it can be passed through whatever processes need to occur afterward. Image acquisition in image processing is the initial step in the workflow because, without an image, no processing is possible.

The image that is acquired is incomplete and the solution of whatever hardware was used to generate it. One of the ultimate goals of this process is to have image of note as input that operates within controlled and measured guidelines of algorithms.

Code:

```
vid=videoinput ('winvideo',1,'RGB24_640x480');%takes video as input from user
k=waitforbuttonpress;% waits for user to press key & when key is pressed live video starts
        preview(vid)%this command shows live video in figure window
        pause %waits till user presses a key
frame = getsnapshot(vid);%takes a snap and stores it in frame variable
```

B. Gray scale conversion

All grayscale algorithms follow the three-step process as given below:

   a. Get the red, green, and blue values of a pixel.

   b. Use fancy math to turn those numbers into a single gray value.

   c. Replace the original red, green, and blue values with the new gray value.

Gray = (Red + Green + Blue) / 3.

Suppose you have a color image:

Figure 1. Original Image of note

And you want to convert it to a grayscale image. At first, you might think you can add the blue, green, and red color values, and divide by 3:

Gray = (Red + Green + Blue)/3.

If you do that, this is what you'll get:

Recognize that the actual code to implement such an algorithm in MATLAB looks like:

d_10=imread('F:\Matlab\DATABASE\10rs.jpg');

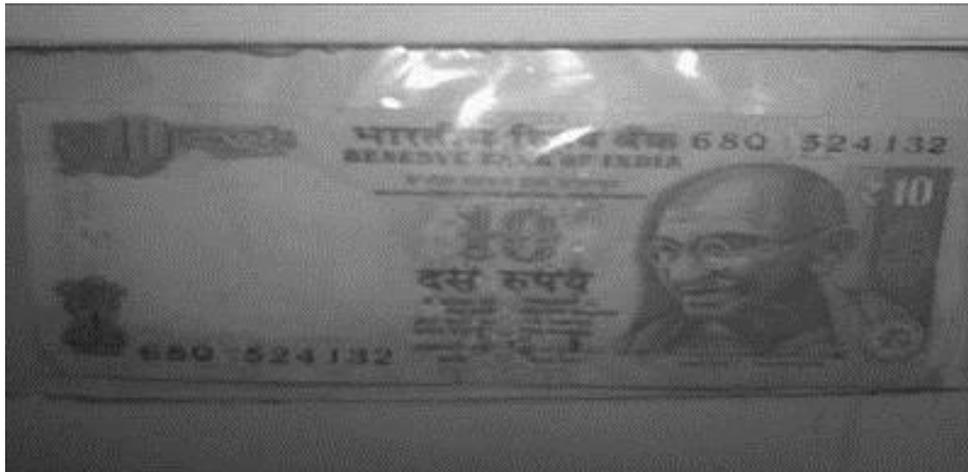a=imresize(d_10,[200 400]);

a=rgb2gray(a);

imshow(a)

Figure 2. Grayscale image of note

C. Edge detection

Edge detection is a process of detecting and locating sharp discontinuities in an image. The discontinuities are changes in pixel intensity which characterize and show boundaries of objects in a scene.

For our topic we have used the Canny edge detection method:

It is a technique which is used to extract useful structural information from different vision objects and reduce the amount of data to be processed.

The steps of the canny edge detection method are given bellow:

1. Noise filtering through a Gaussian kernel
2. Computing the gradient's module and direction

3. Non-maxima suppression of the gradient's module
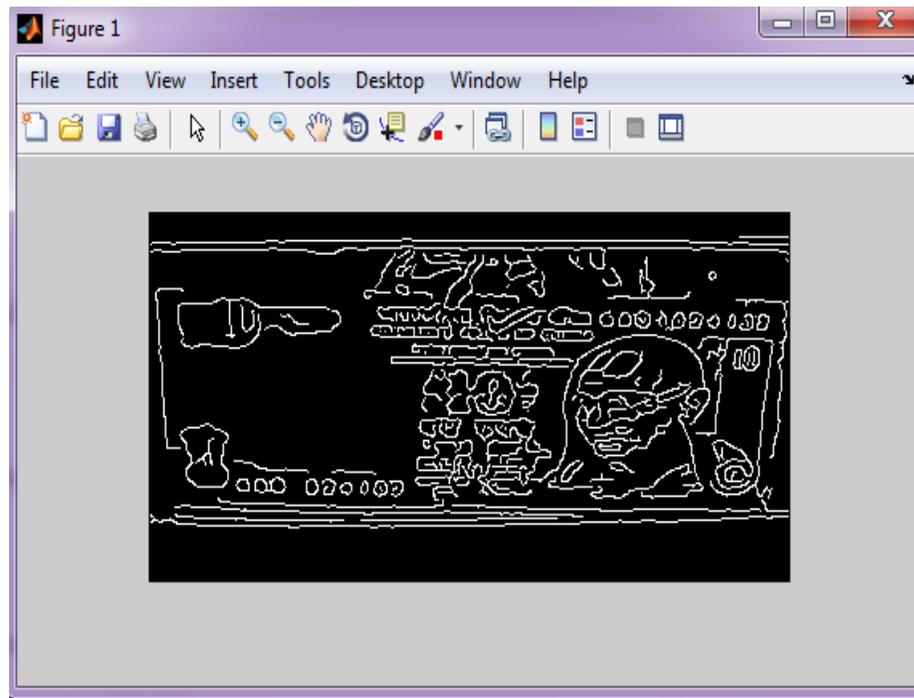4. Edge linking through adaptive hysteresis thresholding.

Figure3.Image of note after applying canny edge detection

D. Correlation

In this technique, the image of note stored in database is compared to the acquired image. For finding correlation between these two notes a function called corr2 in matlab is used. The value of correlation is 1 if the features of note in database match the features of acquired image otherwise the user may get any other positive or negative value other than 1 if both the images are not same. So the basic function of corr2 is to detect which note it is. Figure 4 shows snapshot of correlation value when 10rs.note matches.
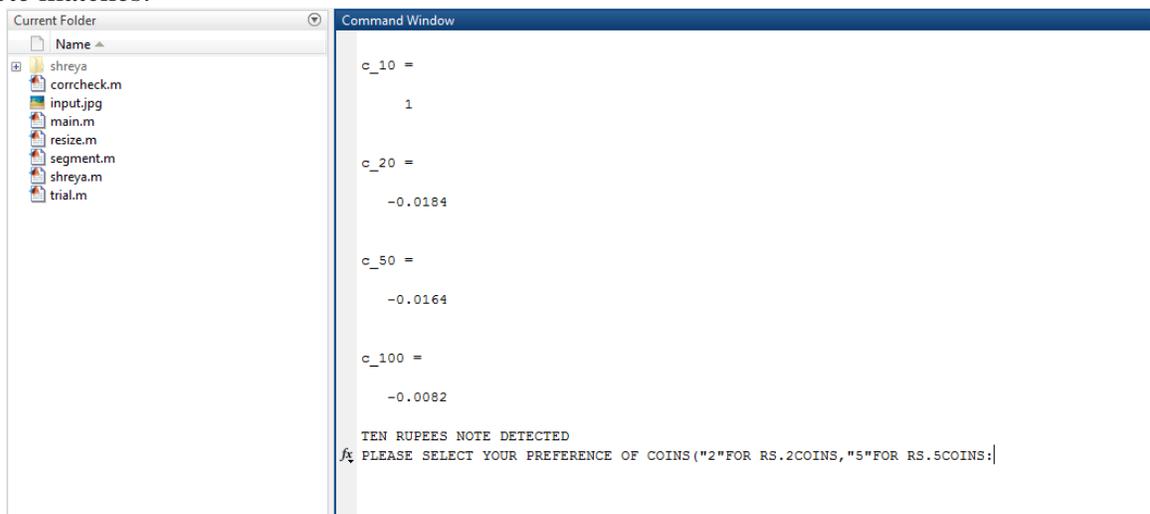

Figure 4.Correlation of ten rupee note

IV. IMPLEMENTATION

1. Hardware Components:

A. UNO R3 Development Board ATmega328P ATmega16U2 :

- The Uno is a microcontroller board based on the ATmega328P.
- It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button.
- It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started..
- You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

B. DC motors.

2. Software Components :
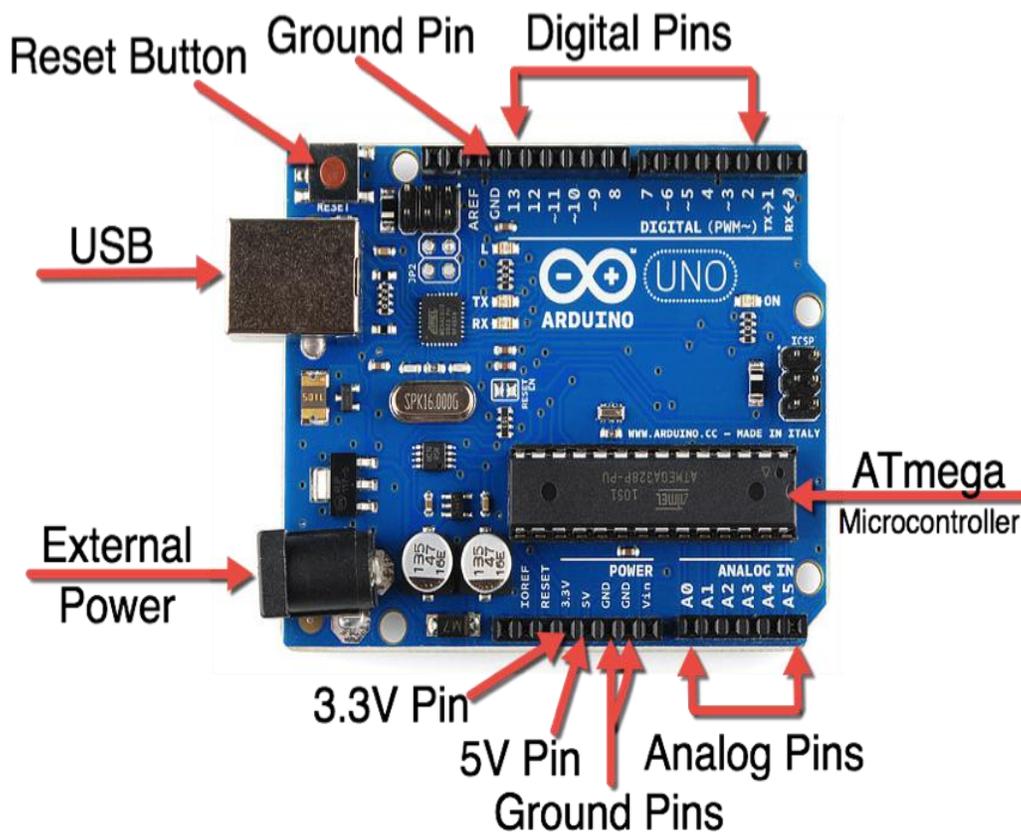   i.   Matlab R2013a.
   ii. Audrino.

Figure 5 Description of Arduino UNO

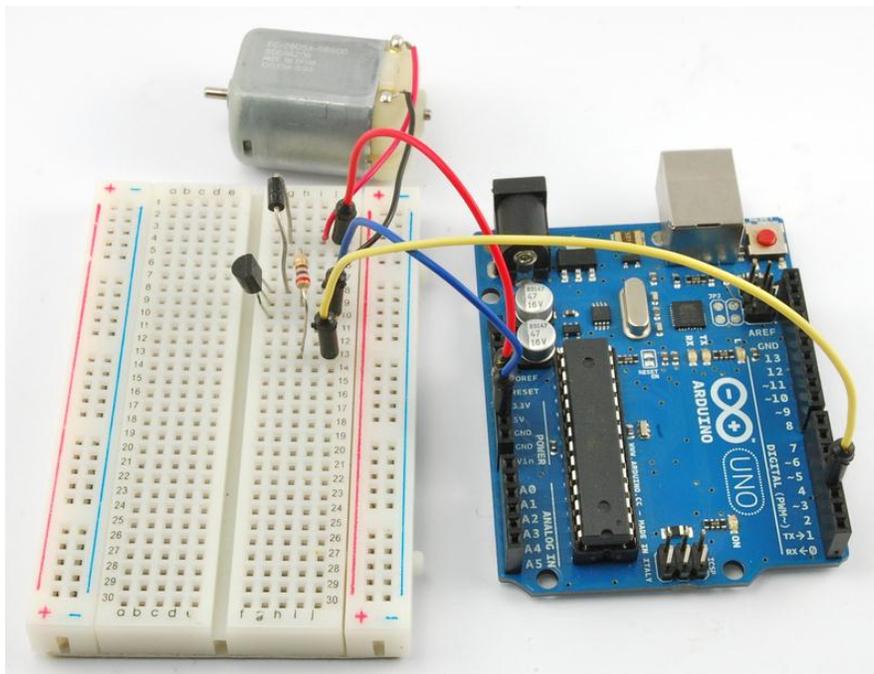*Figure 6 Connection between Matlab and Arduino.*

Figure7 Arduino connected with dc motors

➢ **LINKING ARDUINO:**

1.The arduino consist of the ATMEL 1548(ATMEGA 328P-PU) microcontroller.
2.This microcontroller is coded using the arduino IDE.
3.The arduino is connected to the laptop using USB I/O cable.
4.The motor is connected to DIGITAL(PWM) I/O pins on arduino board.
5.The reset button is also available on the arduino board incase of any failure.
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V. CONCLUSION

The machine meant for detection of fake notes as prime function invariably should be capable of not allowing a fake note to pass as genuine. The kind of machine Indian Banks at cash counter needed are the machine which can verify not only the images but also can check the chemical and physical properties of papers, inks, resins and other materials used in production of note.For detecting the kind of note color based recognition [7], pattern based or checking by the watermarking techniques [9] can be preferable. The result is given to the controller which will manipulate coin container through relay and motors. Hence in the output we get coins as per users' requirement.

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