# Coin Value Counter

Ms.Shreya G Shah
Electronics & Communication
C.U.Shah College of Engg. & Tech.
Wadhwan(363030), India
*Email:shahshru11@gmail.com*

Ms. Nehal J Dangi
Electronics & Communication
C.U.Shah College of Engg. & Tech.
Wadhwan(363030), India
*Email:danginehalj@gmail.com*

Ms. Viviksha H Bhoraniya
Electronics & Communication
C.U.Shah College of Engg. & Tech.
Wadhwan(363030), India
*Email:vhpatel.1008@gmail.com*

***Abstract***— The coins which are required to be counted manually, collected in huge amount, for example the coins collected at donation box in the temples is very hard. Counting of coins be made easy with the method which is given here for coin recognition, and here scanning of the coin from both the sides is considered. The main aim of this project is counting the value of coins as well as the total number of coins using image processing with MATLAB. Coin segmentation and cropping is done using codes in image processing. The Eigen value of coins is calculated using MATLAB .Eigen values and Eigen vectors are used to create the Eigen faces of the coins which will help in Coin Recognition. Real-time image is captured and identified and thus coin recognition is done.

***Keywords-*** *Coin counter, Coin recognition, Cropping, Eigen faces*

*****

## I. INTRODUCTION

Coin value counter is based on the principle of counting coins as well as the value of coins. The method which is proposed here takes the image of the coin to be recognised. The image of the coin, which is the input image is processed further for radius as well as area calculation and edge detection. Area and the Radius of the input mage is calculated and the database image is selected from the database having same radius.

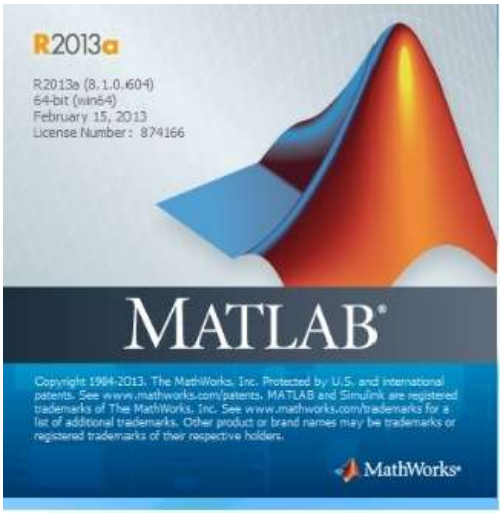
Firstly the database of all the coins is made and then the input image is compared with the database and in this manner the coin is recognised. The centroid and the area of the coin is calculated and thus auto cropping is done.

The coins which are needed to be counted manually, collected in huge amount, for example the coins collected at donation box in the temples is very hard. Counting of coins be made easy with the method which is given here for coin recognition, and here scanning of the coin from both the sides is considered.. This can be made easy with the proposed method of coin detection, where the Eigen value of coin is calculated and a database is created.

Image from database is then selected for comparison based on the Eigen value of coin. Next, matching of the coin with the database decides whether the match of the coin is found or not, by comparing the minimum value to the fixed threshold. The coin is verified by comparing coin from the back side or front side. Thus, the procedure described here is rotation invariant, and also, after comparing the coin with database, this process recognises the denomination accurately, though the database is having different coins with equal radius or area

## II. OVERVIEW OF SOFTWARE

### A. *MATLAB R2013a*




### B. *Basic Introduction*

MATLAB is a high-level language and interactiveenvironment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. MATLAB can be used for a range of applications, including signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology. [Mathworks.com]

While working with images in Matlab, there are many things to keep in mind such as loading an image, using the right format, saving the data as different data types, how to display an image, conversion between different image formats.

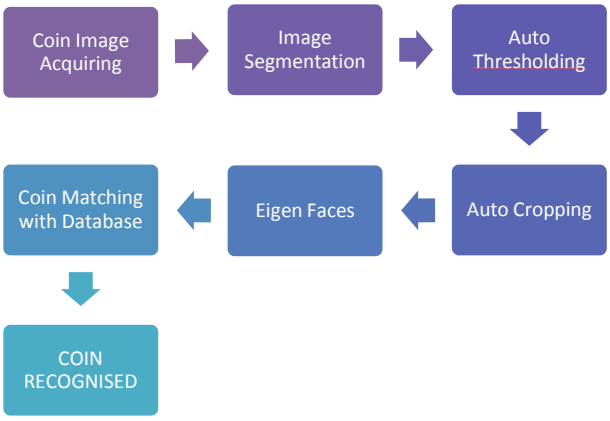
ISSN: 2321-8169
3461 - 3465

*C. Image format conversion*

| **Operation:** | **Matlab command:** |
|---|---|
| Convertbetween intensity/indexed/RGB format to binary format. | `dither()` |
| Convert between intensity format to indexed format. | `gray2ind()` |
| Convert between indexed format to intensity format. | `ind2gray()` |
| Convert between indexed format to RGB format. | `ind2rgb()` |
| Convert a regular matrix to intensity format by scaling. | `mat2gray()` |
| Convert between RGB format to intensity format. | `rgb2gray()` |
| Convert between RGB format to indexed format. | `rgb2ind()` |

## III. BASIC OPERATION ON COIN

*A. Block diagram*




*B. Description*

*1 . Coin Image Acquiring*

The very basic operation in the process of Coin Recognition is acquiring the real time image of coin. The real time image of coin is captured using a good resolution camera when the lighting is also good. Some processes are carried out on the acquired image to enhance the image and then the image is compared with the database and thus coin recognition can be done.

The image is acquired using a conveyor belt or keeping the image on black surface and in proper lighting atmosphere. The image needs to be of good quality and of good resolution to enable proper and correct recognition. Thus image acquiring is the very first step involved in this process of Coin Recognition.[Mathworks.com]

*2. Image Segmentation*

Segmentation is done to partition an image into many regions containing each pixels with same attributes. For meaningful and useful image analysis and interpretation, the regions should strongly relate to depicted objects or features of interest. Meaningful segmentation is the first step from low-level image processing transforming a grayscale or colour image into one or more other images to high-level image description in terms of features, objects, and scenes. The success of image analysis depends on reliability of segmentation, but an accurate partitioning of an image is generally a very challenging problem.

Segmentation techniques are either contextual or non-contextual. The latter take no account of spatial relationships between features in an image and group pixels together on the basis of some global attribute, e.g. grey level or colour. Contextual techniques additionally exploit these relationships, e.g. group together pixels with similar grey levels and close spatial locations.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to same characteristic(s). When applied to a stack of images, typical in medical imaging, the resulting contours after image segmentation can be used to create 3D reconstructions.

*3 Auto Thresholding*

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images.

The simplest thresholding methods replace each pixel in an image with a black pixel if the image intensity $I_{i,j}$ is less than some fixed constant T or a white pixel if the image intensity is greater than that constant. For a gray scale image, this results in the dark part becoming completely black, and the white or bright part becoming complete white.

**Object Attribute**-based thresholding is used for coin recognition which searches a measure of similarity between

 ISSN: 2321-8169
3461 - 3465

the gray-level and the binarized images, such as fuzzy shape similarity, edge coincidence, etc.

**Auto- thresholding** here means that the gray scale image of the coin to be recognized is converted to black & white image automatically by using auto thresholding function. Auto thresholding is done to find the centroid and radius of the coin which helps in coin recognition.

*4. Auto Cropping*

Cropping refers to the removal of the outer parts of an image to improve framing, accentuate subject matter or change aspect ratio. Depending on the application, this may be performed on a physical photograph, artwork or film footage, or achieved digitally using image editing software. The term is common to the film, broadcasting, photographic, graphic design and printing industries.

For the counter cropping of the acquired image is done in order to get better quality of image and enhance it. The cropping is done by finding the centroid of the thresholded image and with the help of centroid and area, the radius of the coin is found and with the help of radius auto-cropping is done.

*5. Eigen Faces*

In linear algebra, an **eigenvector** or **characteristic vector** of a square matrix is a vector that points in a direction which is invariant under the associated linear transformation. In other words, if **v** is a vector which is not zero, then it is an eigenvector of a square matrix *A* if *A***v** is a scalar multiple of **v**. This condition could be written as the equation

$$AV=\lambda V$$

where λ is a number (also called a scalar) known as the **eigenvalue** or **characteristic value** associated with the eigenvector **v**.

There is a correspondence between *n* by *n* square matrices and linear transformation from an *n*-dimensional vector space to itself. For this reason, it is equivalent to define eigen values and eigenvectors using either the language of matrices or the language of linear transformations. Eigen Faces of coins are created and stored in database. Thus Eigen Faces of the coins help in coin recognition .

*6. Coin Matching with Database*

The real-time image of the coin is allowed to be compared with the database after passing the image of coin through all above operations. After performing above operations on the acquired image of coin, the desired quality and desired part of coin is obtained.

The coin image is then compared with the database of coins and if the match is found the result is displayed .If a perfect match is not found, there may be some error in the image of coin or may be that coin is not in the database. Thus, this step is most important step in the process of coin recognition.

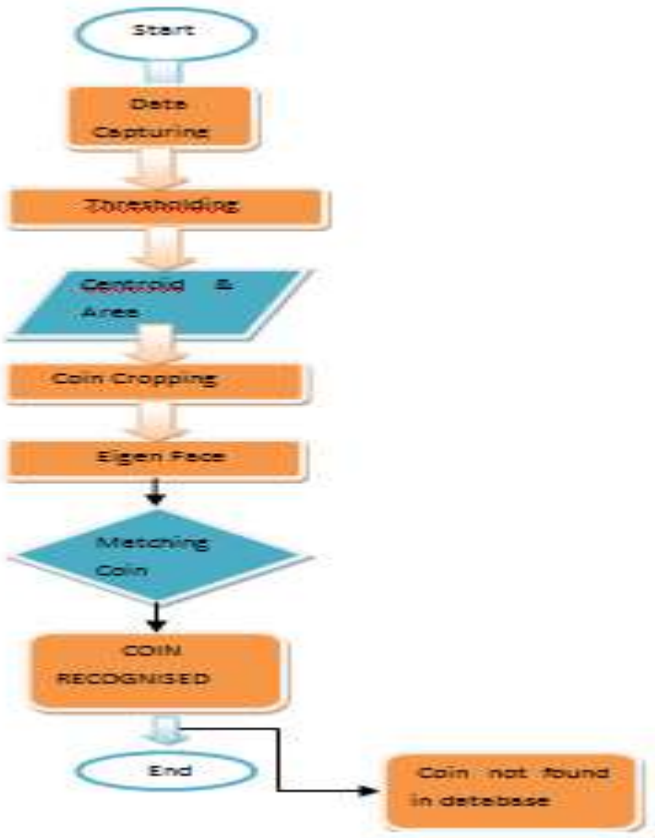
*7. Coin Recognition*

This is the final step in the entire process of coin recognition.After passing through all above steps, the final output is displayed with the value of coin and total umber of coins at last is also displayed.

## IV. WORK FLOW

The various processes on coin are explained in the flow-chart which is explained below. After performing all the processes, the coin is detected and recognized.

*A. Flow-chart*




B.*Description*

1. Data capturing here means the image to be recognized is captured using a camera or the images of coin passing on the conveyor belt is taken by the camera.

ISSN: 2321-8169
3461 - 3465

2. Here the image is auto thresholded.
3. After thresholding the image, the centroid and area of the coin in the image is found with the help of MATLAB.
4. The radius of the coin is found from the area of the coin.
5. Based on this, the cropping of the image is done.
6. The image is cropped for getting better results and for better coin recognition process.
7. After cropping the image, Eigen values and Eigen vectors of the image is found.
8. Thus, Eigen face of the image is created.
9. This image is then matched with the images of coin taken in database, and the image is matched and output is displayed.

If the image is not valid or not matched he output shows that the image is in database

## V. DATA BASE & RESULT

### A. *DATABASE*

First we load database in which the different images of coin are stored and taken as database. The acquired image is matched with these database images and thus the image is recognized.

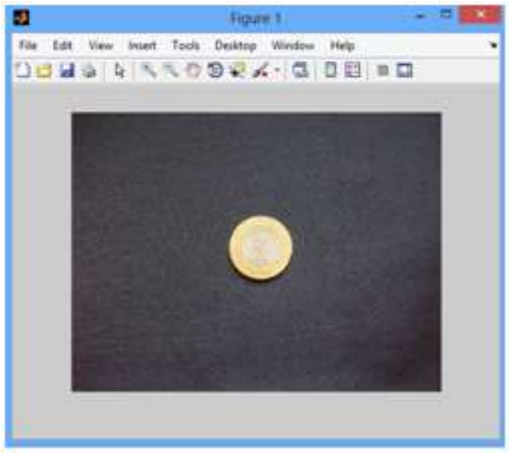
The images taken in the database are of following coins:

1 Rupee coin;
2 Rupee coin;
5 Rupee coin;
10 Rupee coin;

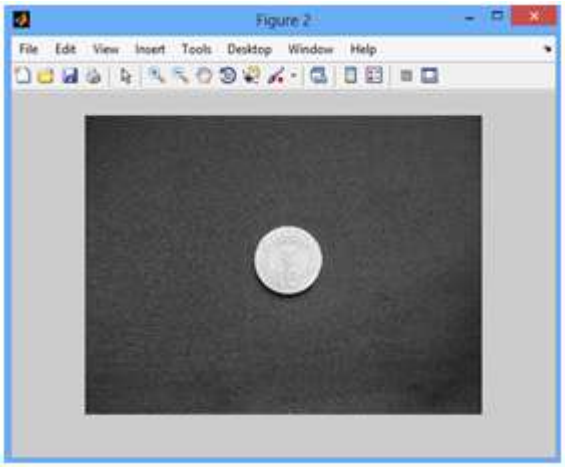
In database the following images of coin are taken:

### B. *RESULT*

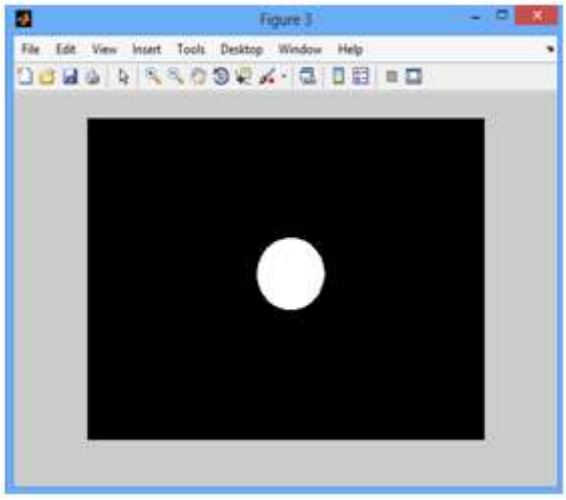
1.ORIGINAL IMAGE




2. RGB to Gray Converted Image

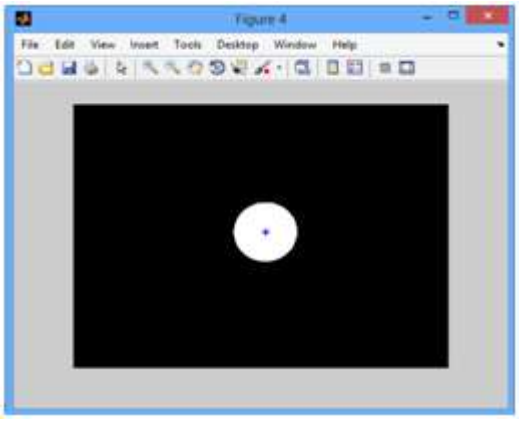



3. Thresholded Image

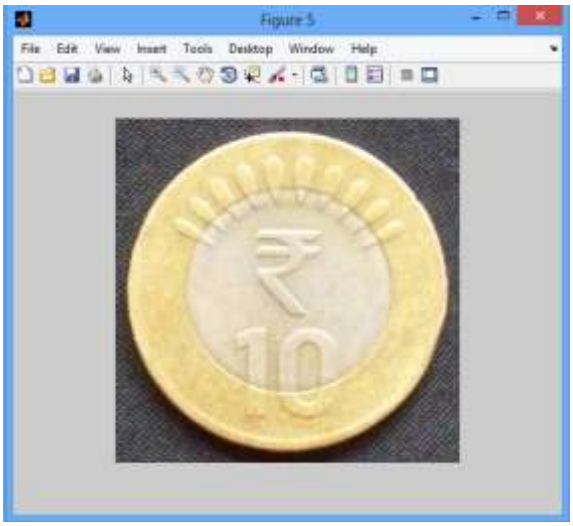


 ISSN: 2321-8169
3461 - 3465

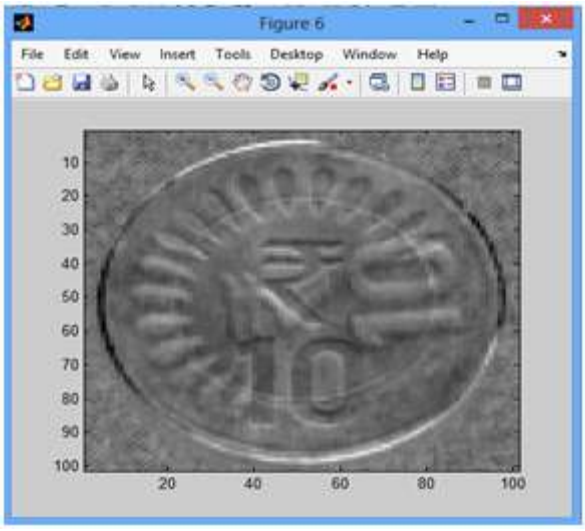
4. Centroid of Coin




5.Cropped Image




6.Eigen Face Image




After creating the Eigen face of the image, the image is compared with the database images and thus the coin is recognized.
The method proposed here is rotation invariant as it is based on creating the Eigen faces of coin and auto-cropping by finding the centroid and radius of coin.

## ACKNOWLEDGMENT

A debt of gratitude to Prof. R.J. Acharya, our internal guide for their guidance and support at all stages of our project, right from the selection of project to its completion, for their constant encouragement.

To Prof. Y.J. Parmar, for their guidance and support in programming and basic knowledge of image processing.

To Mr. D.N. Khandhar, for being helpful and kind to us at every stage of final year project.

To Mr. K.H.Wandra, Principal of C.U.Shah College for giving us chance to work on this innovative and demanding project.

## REFERENCES

[1] Rafael C Gonzalez, Richard E Woods,"Digital Image Processing".,2nd edition.

[2] R. . Bremananth, B. Balaji, M. Sankari, A. Chitra. pp. 2005 annual IEEE, Indicom 366-370. A New Approach to Coin Recognition using Neural Pattern Analysis.

[3] P. Harrop. pp.339-342, 1989. New Electronics for payment, IEE review.

[4] P.Thumwarin, S. Malila, P. Janthawong, W. Pibulwej, T. Matsuura. International Conference on Communications, Circuits and System Proceedings,2006. A Robust Coin Recognition with Rotation Invariance.

[5] E. Ashbridge, D.I. Perrett, M.W. Oram and T. Jellema. Vol. 17: 1/2/3, pp. 13–34, 2000. Effect of Image Orientation and Size on Object Recognition. Responses of Single Units in the Macaque Monkey Temporal Cortex. Cognitive Neuropsychology.

[6] D.Zhang and L. Guojun. vol. 17, no. 10.pp.825.848,2002.Shape-based image retrieval using generic fourier descriptor,. Signal Processing:Image Commun.

[7] Linlin Shen, Sen Jia, Zhen Ji. 2009. IST '09, pp.295-298. Statictics of Gabor Features for Coin Recognition. IEEE International Workshop on Imaging Systems and Techniques.

[8] M.Fukumi, S.Omatu. IEEE Trans. Neural Networks,Vol.8, No. 3,pp.568-581,May,1997. Rotation-lnvariant Neural Pattem Recognition System Estimating a Rotation angle.

[9] M. N¨olle, P. Harald, R. Michael, K. Mayer, I. Holl¨ander, and R. Granec. 2003, vol. 1, pp. 329.338. Dagobert - a new coin recognition and sorting system,. in Proc. DICTA Digital image computing techniques and applications.

[10] P. Harrop, pp.339-342.1989. New Electronics for payment, IEE review.