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**NMAM INSTITUTE
OF TECHNOLOGY**

A MINI PROJECT REPORT

ON

Coin Detection

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ABSTRACT

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it.

In this project we implement few image filters using MATLAB and some other steps of image processing like Hough transformation.

We have developed this project using MATLAB, MATLAB is used for a range of applications, in industry and academia, including deep learning and machine learning, signal processing and communications, image and video processing, control systems, test and measurement, computational finance, and computational biology.

MATLAB is a programming platform designed specifically for engineers and scientists to analyze and design systems and products that transform our world. The heart of MATLAB is the MATLAB language, a matrix-based language allowing the most natural expression of computational mathematics.

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DECLARATION

I hereby declare that the entire work embodied in this report titled, “Image Filtering” submitted to the Visvesvaraya Technological University, Belagavi has been carried out by me at the **NMAM Institute of Technology, Nitte** under the supervision of **Dr. Ashwini B**, Assistant Professor, Department of ISE, NMAM Institute of Technology, Nitte. This thesis has not been submitted in part or full for the award of any diploma or degree of this or any other University.

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Introduction

Using digital image processing it's possible to obtain the most accurate method by reading the details of an obtained photo to compare it with the properties of another standard photo.

Image processing is a precursor to Computer Vision – making a computer understand and interpret what's in an image or video.

In this project implementation of Coin Detection using Sobel filter, canny filter and also Hough transform is used to detect the coin.

Objectives

The main purpose of this project is to apply edge detection techniques to develop a program which should recognize coins in an image.

We have used Hough Transform for coin detection.

The following steps are taken in the proposed coin recognition system:

- Step 1: Develop RGB code for loading database of coin image in MATLAB.
- Step 2: Convert this RGB image to grayscale Image using MATLAB.
- Step 3: Applied Image Thresholding on Gray Image in MATLAB.
- Step 4: Crop the coin image automatically in MATLAB.
- Step 5: Detection of the Edge of Image in MATLAB.
- Step 6: Recognize the coin using its centroid and radius.

Convert RGB Coin Image to Grayscale :

From the first step the image we got the 24-bit RGB coin image. The figure below shows the grayscale converted image in given RGB image of the coin.

Convert RGB Coin Image to Grayscale Edge enhancement :

In order to improve the accuracy of Hough Transform, the clear edges of the coins were required. In other words, edge enhancement was required.

Convert RGB Coin Image to Grayscale Edge enhancement :

Edge detection We can use either Sobel or Canny filter to detect the edges but Canny is preferred as it reduces the noise in the image more than Sobel.

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Centroid Measurement :

Next, we use The Hough Transform to calculate the radius of the image and detect its centroid.

Coin Recognition :

Finally, we can use the computed radius to compare with given data and recognize the coin.

Need For Coin Detection

There is a basic need to automate the counting and sorting of the coins. For this machine need to recognize the coins very fast and accurately as further processing depends on this recognition.

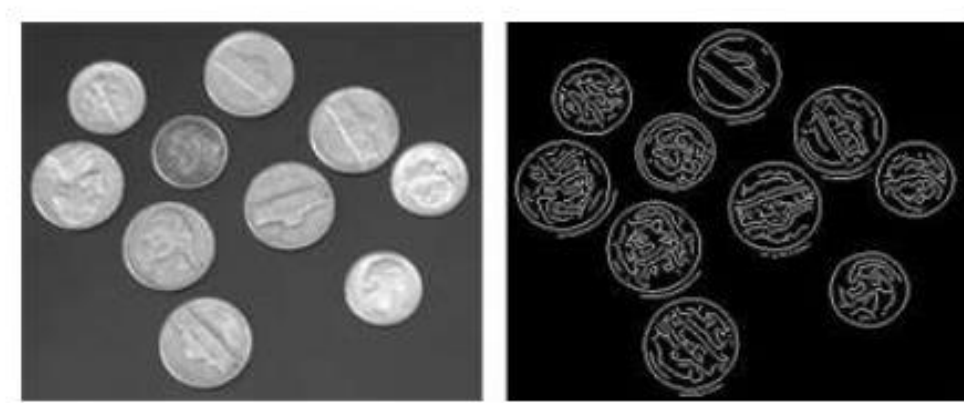
The main purpose of this project is to apply computer vision techniques to develop a program which should recognize coins in an image, and enumerate their value. That is to have a computer read the image.

Results Obtained

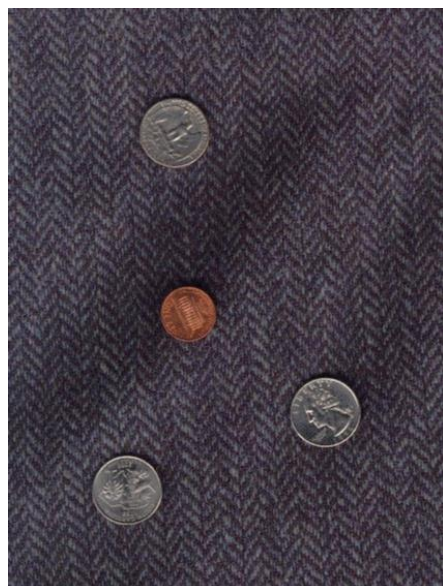
Edge Detection :

There are many algorithms to process a photo, edge detection is one of simplest methods which depend on significant changes like colour or some physical aspects.

The simple meaning of edge detection is to transform a photo into set of curves; the curves are the boundaries which split the significant changes so some properties of the photo could be treated.



Original Image



Coin Detection

Sobel Filter :

If Sobel filter is used to a coin image, large number of edge points are obtained. The texture of the coin can be regarded as noise, which will induce a huge overhead in the execution time of the Hough transform and most importantly will produce measurement errors.

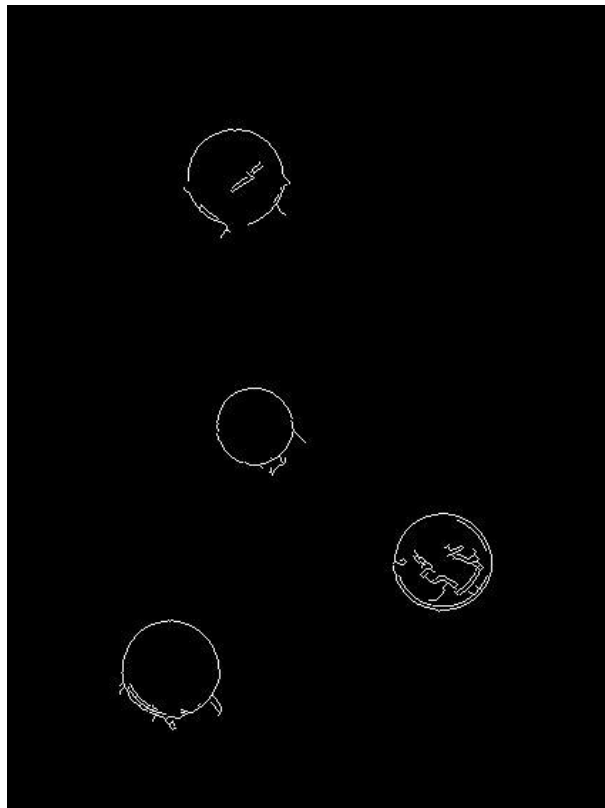
Therefore, the technique to reduce the unwanted edge is sought.

Canny Filter :

The canny edge detector is a very powerful tool for detecting edges in a noisy environment. Canny edge detector can remove most of the edge points. Canny gives thin edges compared to the Sobel. Hence, canny edge detector has been used for eliminating the unwanted edges that can result from Sobel.

The result of this edge detector is a binary image in which the white pixels closely approximate the true edges of the original image.

Edge Detection using Canny Filter

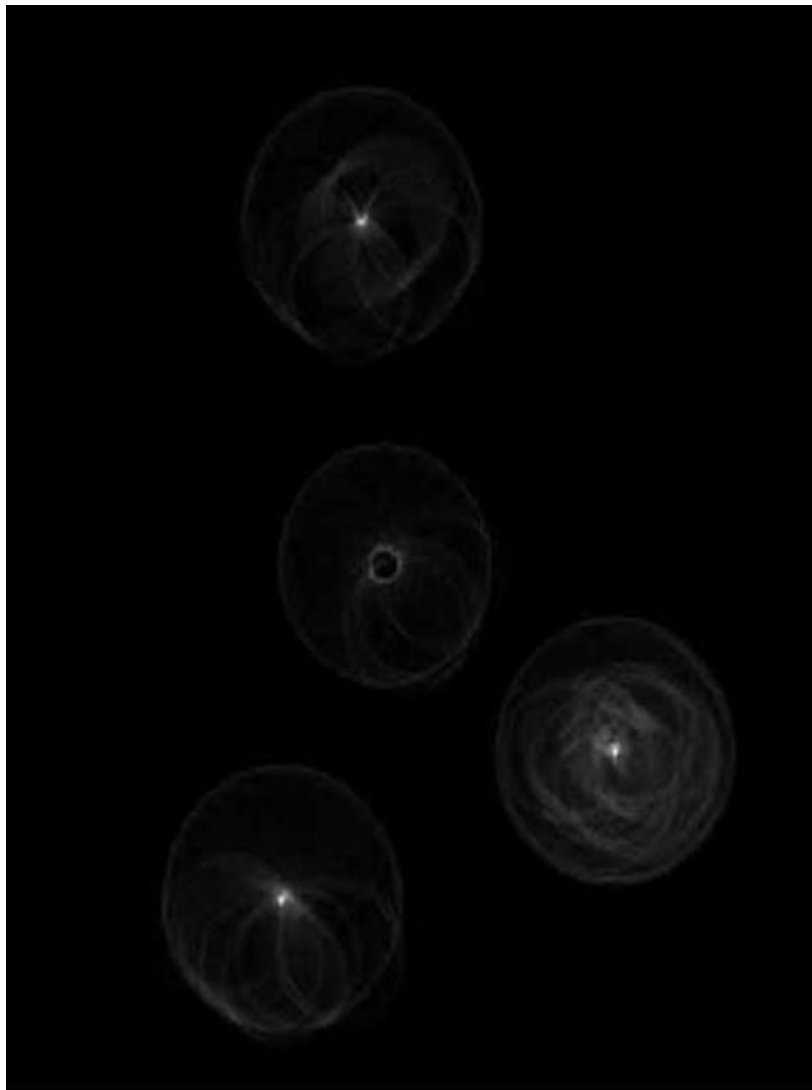


Hough Transform :

It is an elegant method for direct object recognition as the edges need not be connected and the complete object need not be visible.

It works on disconnected edges and can effectively detect lines, circle, and simple shapes

Finding Circle using Hough Transform

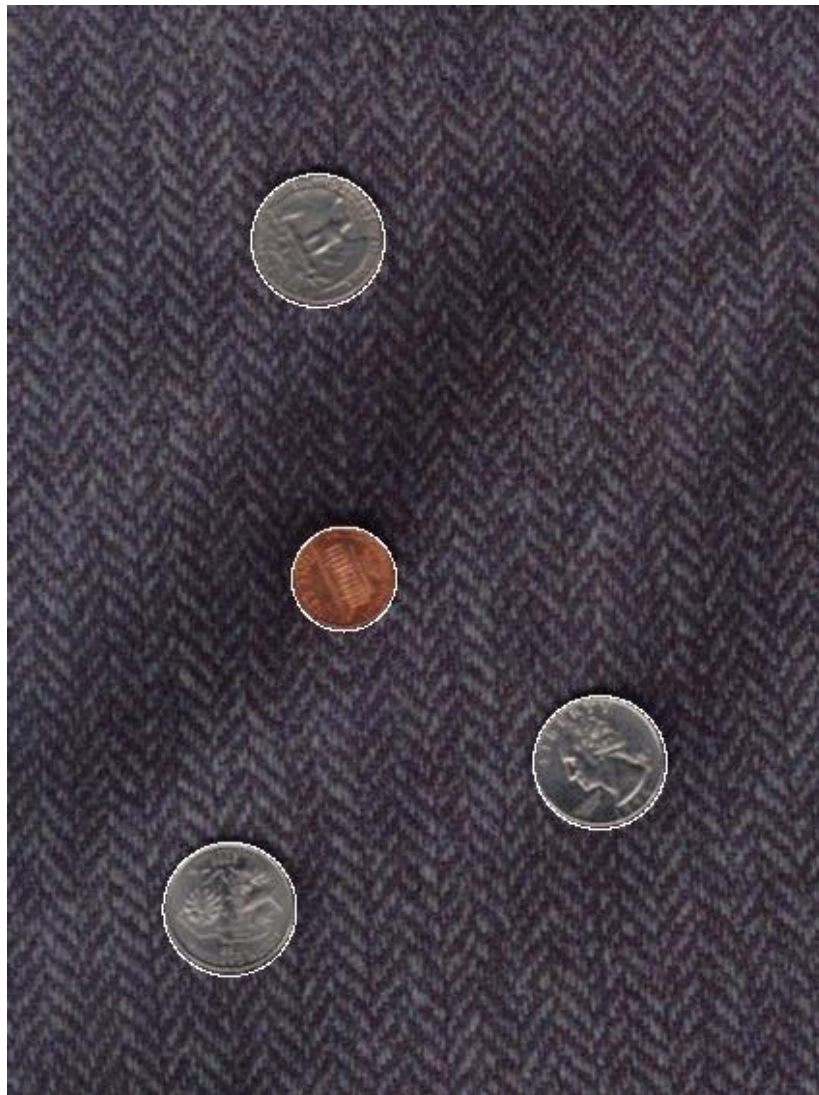


Detecting Circles :

Once the Hough transform image for a particular radius is computed to leave only those points with high probability of being the centers. The centroids of each region are considered as centers of the detected coins.

The output image is computed by drawing circles with these points as centers and the matched radius as the radius, and adding this to the input image.

Recognized Coins



Conclusion

The proposed system can be used in coin operated payphones, vending machines, weighing machines and in many other machines that are based on coin recognition.

The problem arises if the coin image is captured from a distance and the image tends to be small. Besides that, some of the coins are overlapped. These restrictions make the detection process difficult.

References

1. Above source code is referred from a GitHub repository ,
<https://github.com/himanshusharma89/Coin-Detection-using-MATLAB>