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### **REVIEW ARTICLE**

# REVIEW ON THE COIN RECOGNITION SYSTEM WITH ROTATION INVARIANT

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*Abstract-- This paper presents a reliable coin recognition system that is based on a polar harmonic transform. Coins are widely used in daily routine at various places like in banks, automated weighing machines, supermarkets, organizations for research purposes. So, there is a basic need to recognize the coin very accurately. There is problem that if coin is rotated at some angle then the system is unable to recognize it so we are going to introduce a new approach for rotation invariant for coin recognition that is if coin image is rotated at some angle it can be recognized and will prove rotation invariant. So, this paper focuses on removing the need of placing coin in particular position by using artificial neural network.*

*Keywords— Coin, Recognition, reduction technique, PHTs*

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## I. INTRODUCTION

Coins are widely used in daily routine by humans. Different countries have different currency like India have rupee, America have dollar etc. But some countries have same currency like India and Pakistan have rupee. Now a days, currency detector are used in many automated machines found in banks, gaming machines, transportation, parking machines and vending machines. In these automated machines, the main process is coin recognition process through which coin is detected i.e. coin is genuine or counterfeit. Ancient coins are difficult to recognize due to their irregular shape. But modern coins are available in circular shape which can easily detected by coin recognition system than ancient coins. The use of modern coins will minimize the complexity of coin recognition process.



Fig. 1 Head and Tail Images of some modern coins

Generally, In coin recognition system first color images of coin on both sides is acquired by high resolution camera or by scanning. The acquired image is converted into gray scale image, after which it is converted into binary image. Binary image is then undergone with edge detection process. After which we calculate radius, by traversing row wise we get horizontal axis than traversing column wise we get vertical axis. The intersection point between vertical axis and horizontal axis is the center point. The main parameter used in coin recognition process is radius as we know Indian coins have different radius. On calculating radius, we will select coin image from database by radius matching. It will give the accurate output image. Than we apply the rotation method on output image. When one side of coin is matched, than another side of coin image is compared with other side of coin image selected from database. If both the sides of coin image matches with coin images selected from database, then coin verification is done. We proposed a coin recognition system based on the polar harmonic transforms which will give high accuracy( close to 100 percent) and in less time

## II. LITERATURE SURVEY

Yamini Yadav ,Apoorvi Sood In this paper the aim of coin recognition system is to classify high volumes of coins with high accuracy within a short time span. This paper present a comparison between various coin recognition systems in terms of their accuracy which has been proposed by various researchers based on image recognition method. The accuracy rate achieved by R.Bremananth et al was 92.43%, Adnan Khashman et al was 96.3%, Hussein R.Al-Zoubi et al was 97%, Shatrughan Modi was 97.74%, Deepika Mehta et al was 40% to 50%.

Suchika Malik, Parveen Bajaj, Mukhwinder kaur this paper presents reliable coin recognition system based on polar Fast Fourier Transform .There is a basic need to automate the counting and sorting of coins. For this machines need to recognize the coins very fast and accurately as further processing depends on this recognition. However , currently available algorithm focus basically on recognition of modern coins. In this paper they have developed an ANN(Artificial Neural Network) based automated coin recognition system for the recognition of modern coins. Then, the extracted features are passed as input to trained neural network 98.798% recognition rate has been achieved during the experiments.

Sonali A Mahajan, Chitra M.Gaikwad this paper is to detect denominations of Indian coins. Counting the coins manually, collected in large amount such as coins collected at Indian temples is difficult. The methodology proposed in this used reduction technique that is the input image is reduced by database image repeatedly by rotating it with a fixed angle at each time. Denomination of coin is verified by comparing coin from both sides. Thus, the method proposed here is rotation invariance, also by using two way scanning and comparison of coin, method determine the denomination accurately even if the database is having different coins with same radius.

Chandan singh, Amandeep kaur this paper describe polar harmonic transforms (PHTs) are orthogonal rotation invariant transforms that provide many numerically stable features. The kernel functions of PHTs consist of sinusoidal functions that are inherently computation intensive. They develop a fast approach for their computation using recursion and 8-way symmetry/antisymmetry property of kernel functions.

### III. TECHNIQUES USED

Different techniques are used by various researchers for coin recognition system. The various techniques used are reduction technique, CHT(Circular Hough Transform)technique, Artificial Neural Network, Harris-Hessian Algorithm, Gabor filter, Statistical color threshold etc. For coin recognition system, first we take both sides of coin images using good resolution camera. One of the input image is then converted into gray scale image. After which we calculate the radius of input image by traversing row wise and column wise, we get the horizontal axis and vertical axis. The intersection point of horizontal and vertical axis is the center point. On calculating radius, we select the coin image from database by radius matching. Recently, we have two images test image and object image. Now we apply the reduction technique on these images.

**1) Reduction technique:** Rotate the test image with some angle say 30 degree. At each rotation the image is subtracted from object image. This subtraction will produce resultant image. By plotting the graph of sum of gray scale values of resultant image, minima of the graph can be seen at angle of overlap of two coins. By finding minima we will get exact value of overlap. If minima is greater than predefined threshold we say that coin does not match as there will not crossing overlap possibility between object image and test image. If minima is less than predefined threshold then coin is matched. When coin is matched then we consider the other side of coin image is compared with other side of coin image selected from database. If both sides of coin images matched then coin is verified.

**2) PHTs:** PHTs stands for Polar Harmonic Transforms. Polar Harmonic Transform based rotation invariant method for coin detection. PHTs are orthogonal rotation invariant transforms that provide many numerically stable features. Polar Harmonic Transforms consist of the Polar Complex Exponential Transform (PCET), Polar cosine transforms ( PCT) and Polar sine transforms (PST). These transforms collectively known as PHTs. They have identical mathematical representation with a difference in the radial part of the kernel function. We develop a fast approach for their computation using recursion and 8-way symmetry/anti-symmetry property of the kernel functions.

#### IV. CONCLUSION

This paper focused on coin recognition system based on a polar harmonic transforms which will very helpful to achieve 100% accuracy .There are so many methods has been proposed for recognition of coin but still very less work has been done.

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