Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 4, Issue. 1, January 2015, pg.460 – 469

RESEARCH ARTICLE

COIN RECOGNITION SYSTEM WITH ROTATION INVARIANT USING ARTIFICIAL NEURAL NETWORK

Sandeep Kaur[1], Mandeep Kaur[2]

[1]M.Tech, Computer Science Department & Guru Kashi University, India

[2]Assistant Professor, Computer Science Department & Guru Kashi University, India

[1] sipputakkipur12@gmail.com; [2] mandeepkaur.kaur49@gmail.com

***Abstract*— This paper presents a reliable coin recognition system that is based on Polar Harmonic Transform. Coins are widely used by humans at various places like in research organizations, banks, grocery stores, automated weighing machines, vending machines and currency detector. In these machines, there is important process is to recognize the coins accurately and fastly with the help of coin recognition system. In this project, the coin recognition system will be based on new algorithm of Polar complex exponential Transform i.e. the type of Polar Harmonic Transform.**

***Keywords*— Coin, Detection, Recognition, PHTs**

I. INTRODUCTION

Now a days, most of the work of human beings is replaced by machines due to advance technology. The coin classification of various denominations like '1', '2', '5' and '10' is very important process. There are various image based algorithms present in market for coin classification and identification. But still the recognition result and speed is not efficient and highly accurate. So, there is a basic need of highly accurate and efficient coin recognition system.

This paper presents the recognition system with rotation invariant using Polar Harmonic Transforms (PHTs). A class of rotation-invariant orthogonal moments is proposed using a complex exponential in the radial direction. Each member of this class, while sharing beneficial properties to image representation and recognition like orthogonality and Rotation-invariance has distinctive properties depending on the value of a parameter, making it more suitable for some particular applications. The computation of moments is simpler and more stable than existing methods. Experimental results show the effectiveness of this class of moments in term of Description performance and pattern recognition ability Invariant pattern recognition. The computations of Polar Harmonic Transforms are very fast for providing the rotation less properties to the images. In this system first image of both sides (head and tail) of coin is acquired by camera and then convert it into gray scale image. After then features of coin like radius and circumference are being extracted which are helpful in recognition. Now we apply PHTs and provide features to Artificial Neural Networks with inputs and targets. After that we select one image of coin for testing and again trained Artificial Neural Networks to give appropriate result according to the output of Neural Network i.e. matched or unmatched.

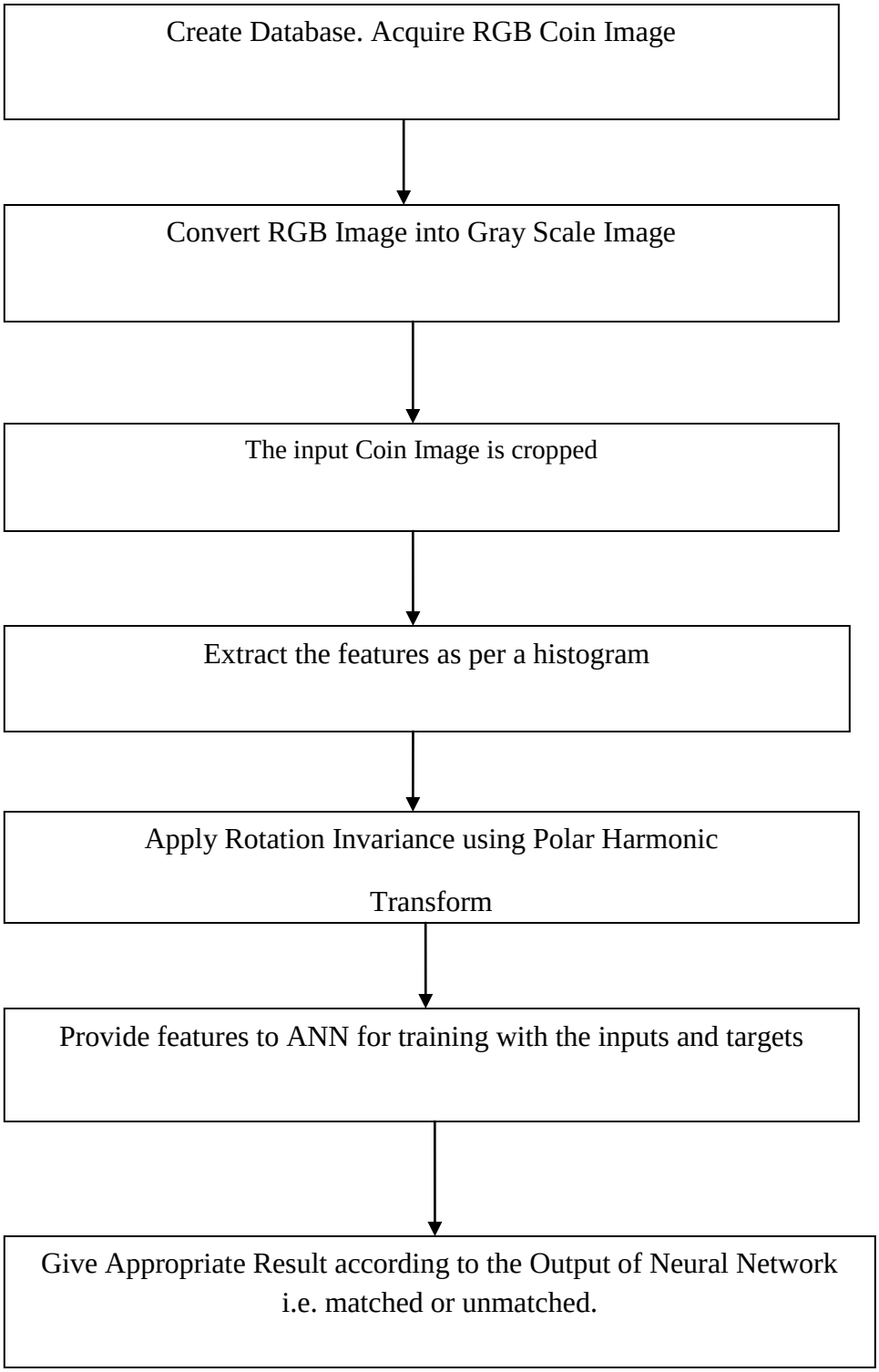

Fig. 1 Coin Recognition System

II. PROPOSED RECOGNITION SYSTEM

Step1: We take a query coin image from dataset of various coin images which includes both old and new Indian coins.
Step2: After then features are being extracted as per a histogram difference with the reference image.
Step3: Now here we apply polar harmonic transform for providing the rotation less properties to the images.
Step4: Then the features are being provided to ANN for training with inputs and targets.
Step5: After this again we have a Trained ANN.
Step6: Give Appropriate Result according to the Output of Neural Network i.e. matched or unmatched.

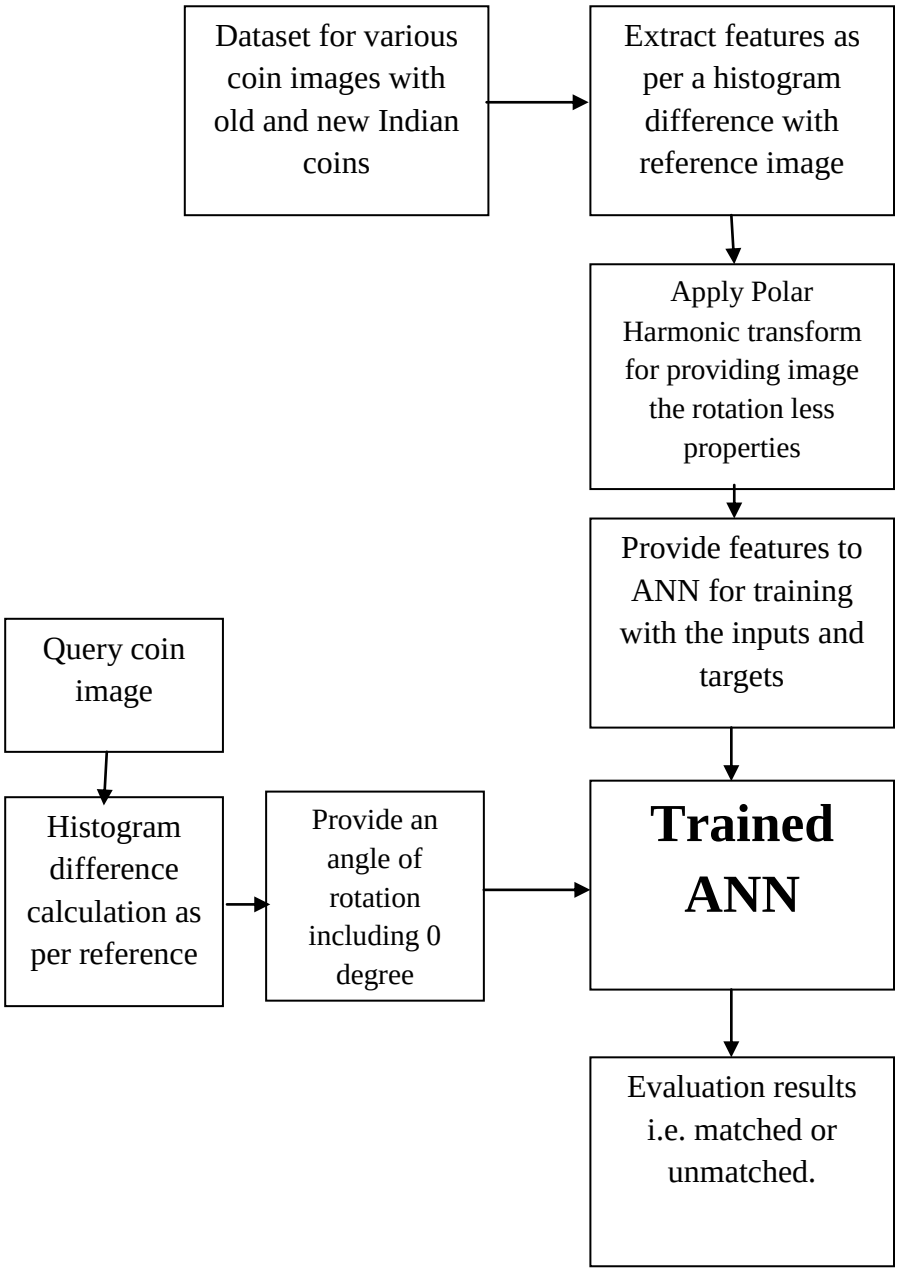

Fig. 2 Proposed Recognition system

1) ***Image Acquisition:*** By using good resolution camera click the images of both sides (head and tail) of coin from some distance without particular position.

2) ***Coin Detection:*** If the acquired input image is colored image first convert it into gray scale image than resize the input image to reduce pixels. After this we calculate the radius and circumference of input coin images. Than we cropped the input coin image in circular form. So that if the input coin image is rotated at some angle its features will not change. After then features are being extracted as per a histogram difference with the reference image. Now here we apply polar harmonic transforms for providing the rotation less properties to the images. Polar Harmonic Transforms consist of the Polar Complex Exponential transforms (PCET), Polar Cosine Transforms (PCT) and Polar Sine Transforms (PST). Here we apply Polar Complex Exponential Transforms (PCET) type of PHTs for providing the rotation less properties to the images.

3) ***Recognition:*** In machine learning and related fields, artificial neural networks (ANNs) are computational models inspired by an animal's central nervous systems (in particular the brain) which are capable of machine learning as well as pattern recognition. Artificial neural networks are generally presented as systems of interconnected "neurons" which can compute values from inputs. Neural network has three types of layers: input layer, output layers and hidden layers.

Following are the snapshots of the outcomes of the proposed coin recognition system using the neural network.

Fig. 3 the input coin image is loaded.

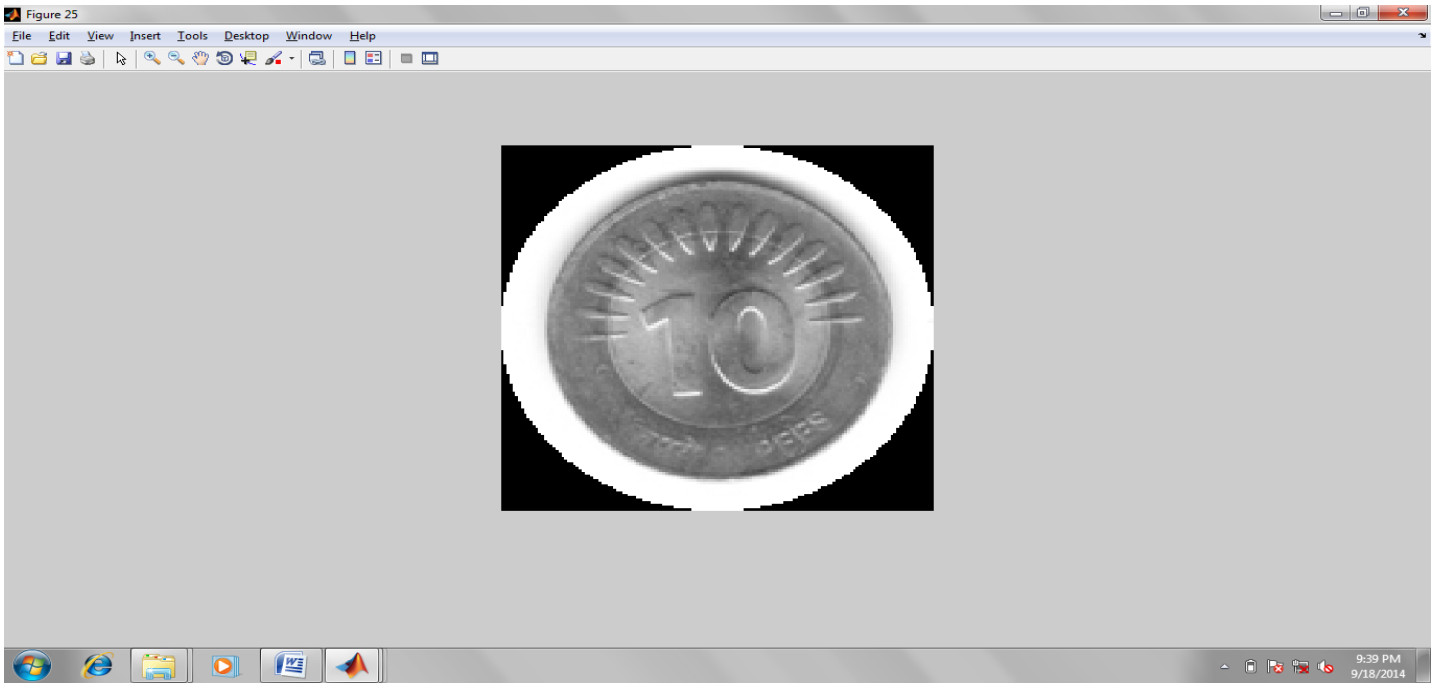

Fig. 4 the input image is cropped and further converted into gray scale image.

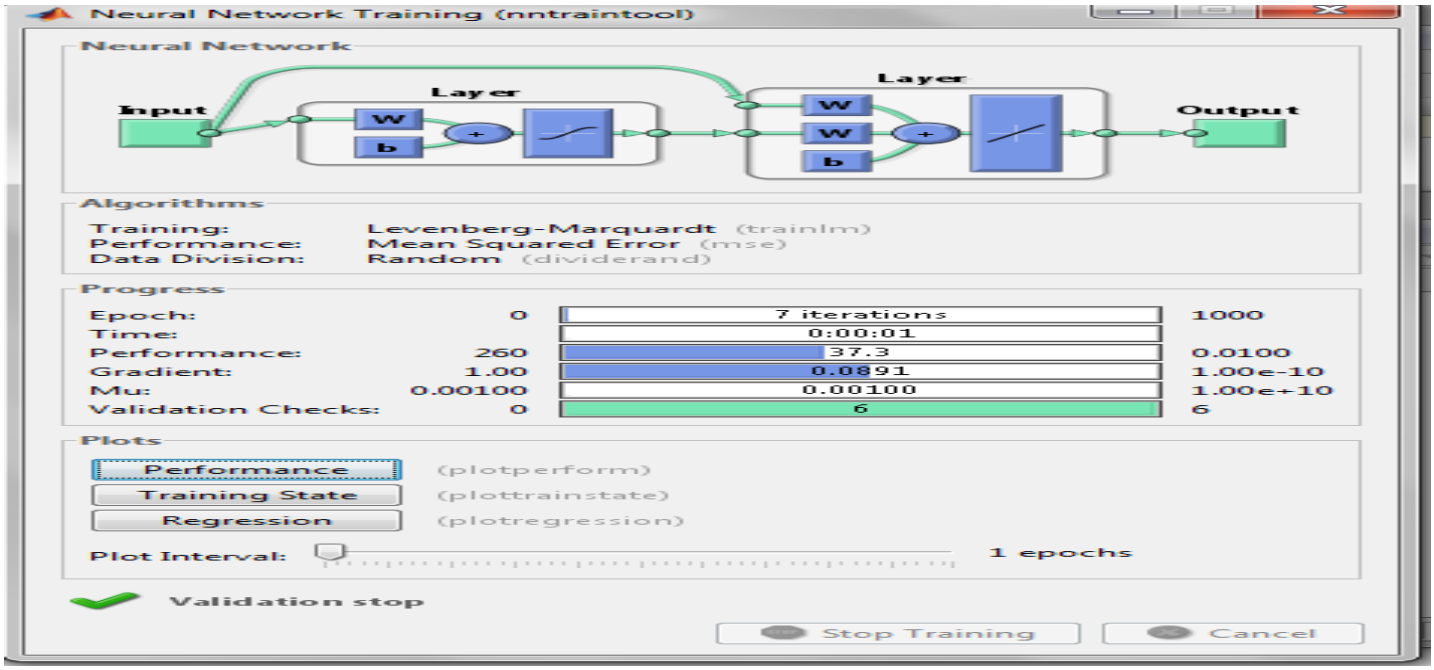

Fig. 5 the calculations carried out for the recognition of the coin by neural networks.

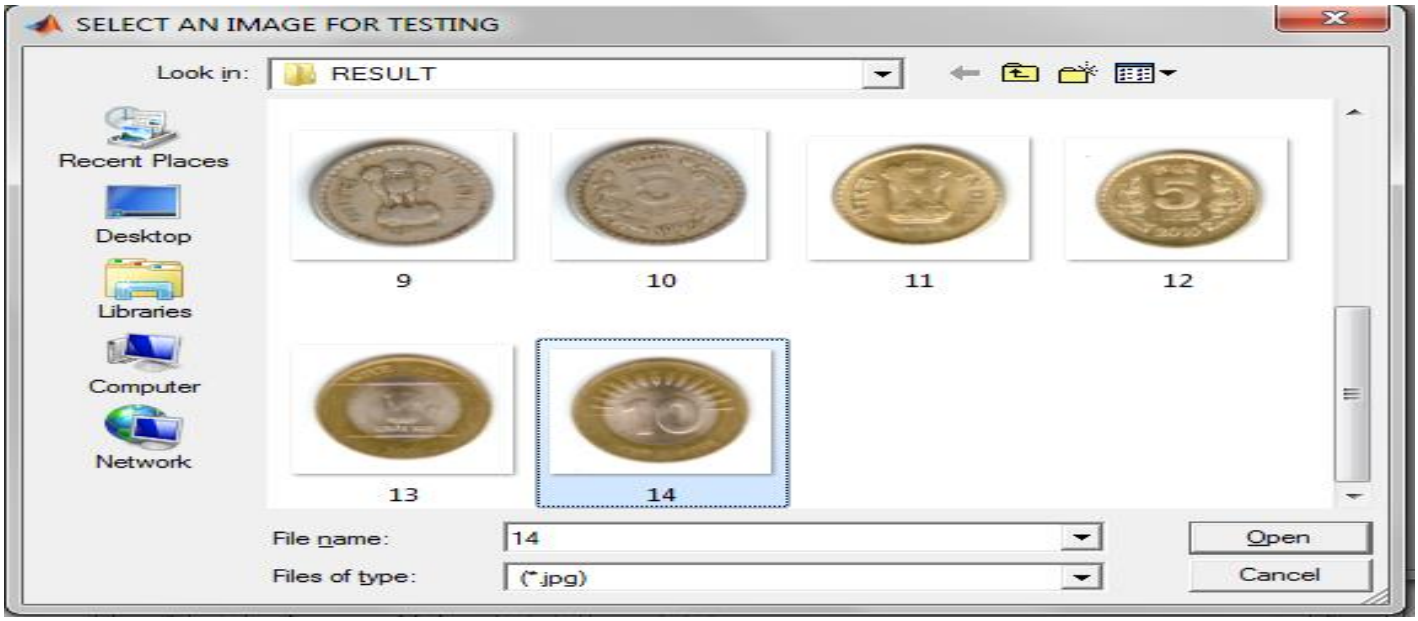

Fig. 6 Select an image for testing.

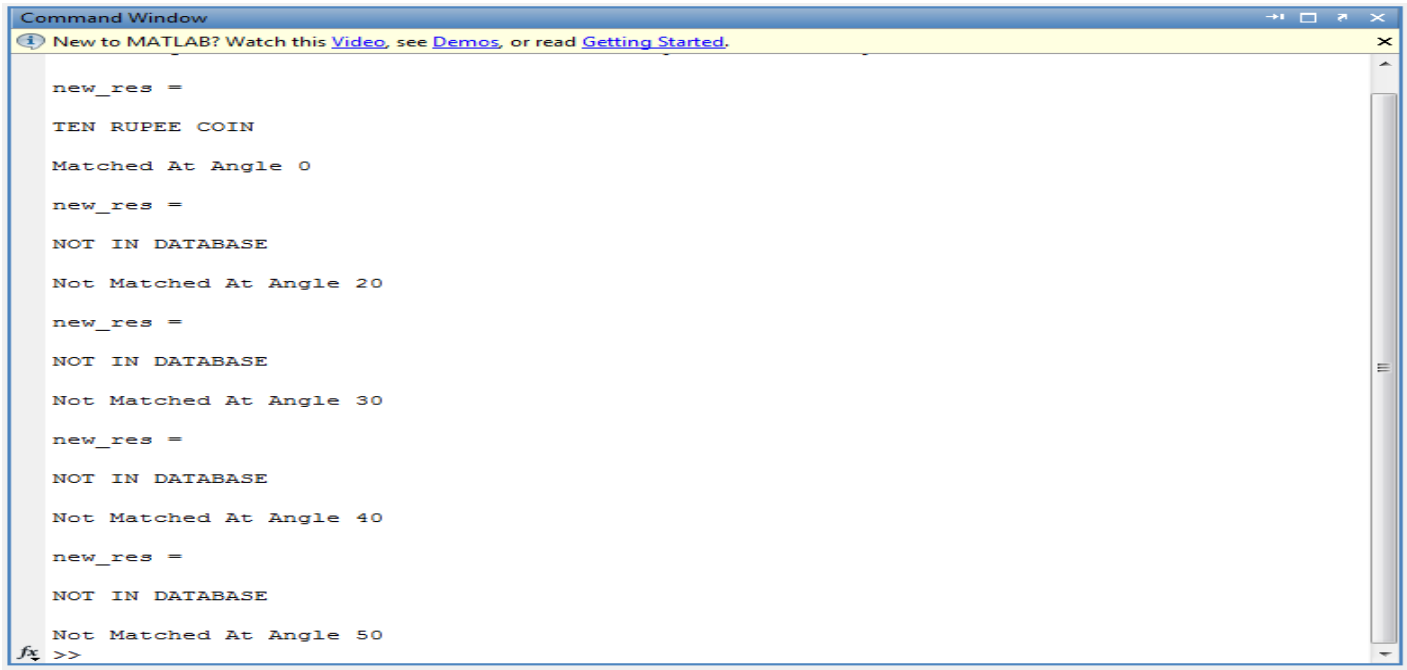

Fig. 7 Final outcome of previous coin recognition system.

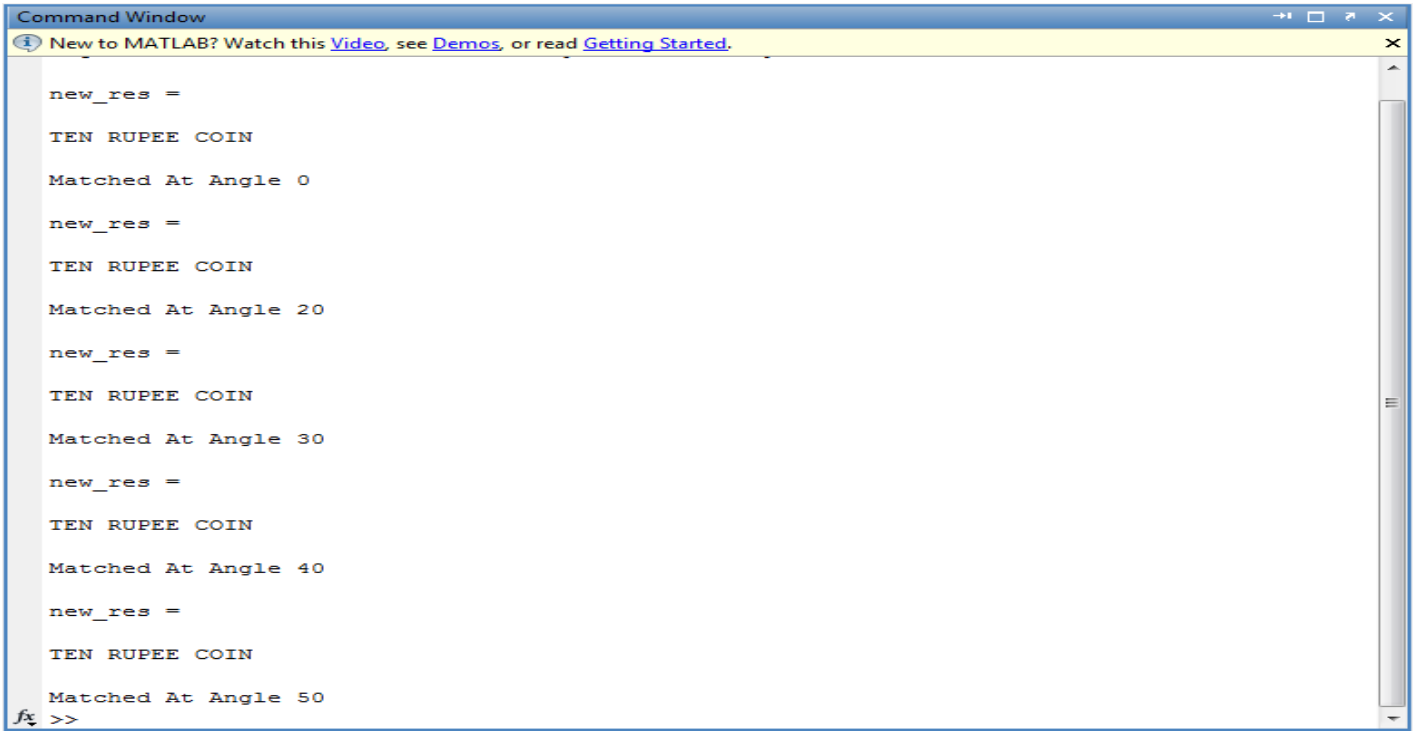

Fig. 8 Final outcome of the proposed coin recognition system.

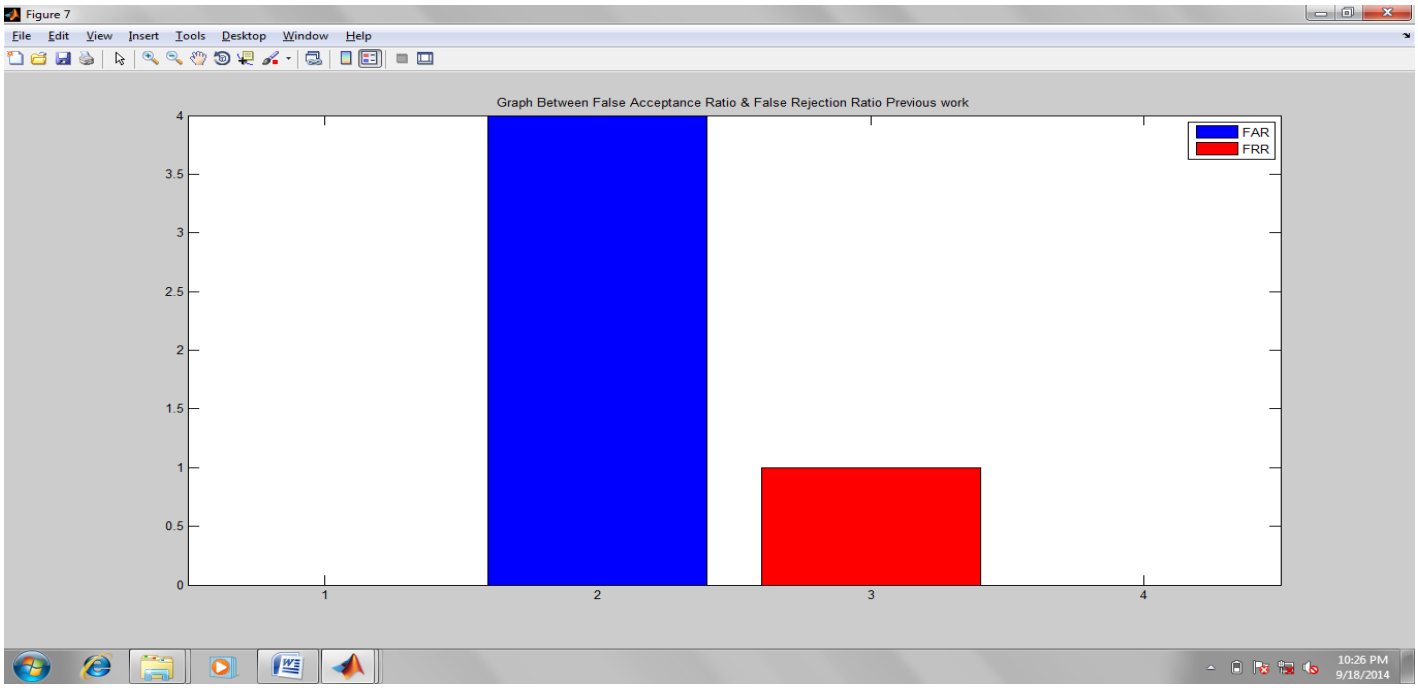

Fig. 9 Graph between False Acceptance ratio and False Rejection ratio for previous work.

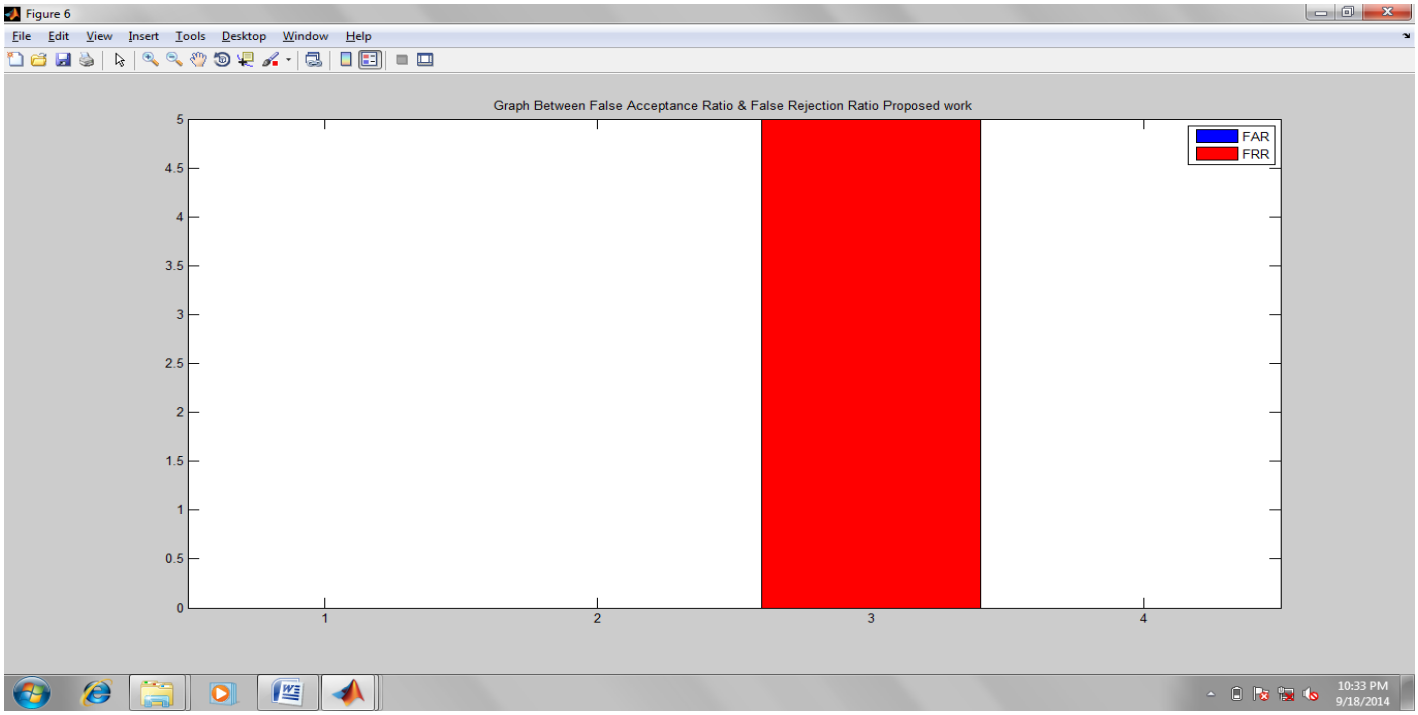

Fig. 10 Graph between False Acceptance ratio and False Rejection ratio for proposed work.

III. CONCLUSION

Coin Recognition system using Polar Harmonic Transforms is the easy and faster way for the detection of coin. This method also provides the high accuracy for the recognition of coin. This can be used in real time for coin detection without placing the coin in particular position. Further research will include method modification by adding the more features like weight of coin, surface design etc. for recognition of coin more accurately.

REFERENCES

[1] Chandan Singh, Amandeep kaur, *"Fast Computation of Polar Harmonic Transforms"*, Springer-Verlag, Punjab, India.2012

[2] Chen H., *"Chinese Coin Recognition Based on Unwrapped Image and Rotation Invariant Template Matching",* Third International Conference on Intelligent Networks and Intelligent Systems, 2010.

[3] Davidsson.P, *"Coin classification using a novel technique for learning characteristic decision trees by controlling the degree of generalization*", Ninth International Conference on Industrial and Engineering Applications of Artificial Intelligence & Expert Systems, Gordan and Breach Science Publishers, pp. 403-412,1996.

[4] Deepika Mehta and Anil Sagar, *"A Survey on various Techniques of coin detection and Recognition",* International Journal of Computer Applications, Vol. 69,5, pp. 29-32, 2013.

[5] Fukumi. M, Mitsukura. Y, Norio Akamatsu, *"Design and evaluation of neural networks for coin recognition by using GA and SA",* IEEE, pp. 178-183,2000.

[6] Gupta V., Puri R., Verma M, *"Prompt Indian Coin Recognition with Rotation Invariance using Image Subtraction Technique",* International Conference on Devices and Communications, 2011.

[7] Gonzalez.R.C. and Richard E. Woods, *"Digital Image Processing",* Addison-Wesley Publishing Company,2000.

[8] Hoang, T.V., Tabbone, S., *"Generic Polar Harmonic Transforms for invariant image description",* IEEE International Conference on Image Processing-ICIP, pp. 845-848, 2011.

[9] Li, L., Li, S., Wang, G., Abraham, A., *"An evaluation on circularly orthogonal moments for image representation",* International Conference of International Science and Technology, pp. 394-397, 2011.

[10] M.Nolle, P.Harald, R.Michael, K.Mayer,I. Hollander and R.Granec., *"Dagobert- a new coin recognition and sorting system",* in Proc.DICTA Digital image computing techniques and applications, Vol.1, pp. 329-338,2003.

[11] M.Fukumi, S.Omatu, *"Rotation-Invariant Neural Pattern Recognition System Estimating a Rotation angle",* IEEE Trans. Neural Network ,Vol.8(3),568-581,1997.

[12] Milan Sonka, Vaclav Hlavac, Roger Boyle, *"Image Processing Analysis and Machine Vision",* PWS Publishing Company.

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

[14] R.Bremananth, B.Balaji, M.Sankari,, *"A New approach to Coin Recognition using Neural Pattern Analysis",* IEEE Indicom Conference, pp. 366-370,2005.

[15] Sonali A Mahajan, Chitra M. Gaikwad**,** *"Rotation Invariable Method for Currency Coin Detection"*, International Journal of Computer Science and Information Technologies, Vol.5,1, pp. 1117-1119, 2014.

[16] Suchika Malik, Parveen Bajaj, Mukhwinder kaur, *"Sample Coin Recognition System using Artificial Neural Network on Static Image Dataset",* International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 4,1, pp. 762-770 , 2014.

[17] Sivanandam, S.N., Sumathi, S. and Deepa S.N., *"Introduction to Neural Networks using MATLAB 6.0",* Mc-Graw Hill, Computer Engineering Series,1999.

[18] Yamini Yadav, Apoorvi Sood, *"A Comparative Survey on various Coin Recognition System based on Image Processing***",** International Journal of Engineering and Computer Science, Vol. 2,11, pp. 3272-3277, 2013.

[19] Yang, Z., Kamata, S., *"Fast Polar Harmonic Transforms",* 11th International Conference Control, Automation, Robotics and Vision, pp. 673-676, 2010.

