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Identification of Rupees using Texture and Soft Computing Techniques

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ABSTRACT: In this article we have used the concept of texture analysis of the given currency denomination and also segmented the denomination for analysis purpose, the system with the different denomination patters like color, size and other parameters were used in processing of the images. In this system we have used trained the system with the best accuracy with 95.12% with the supervised learning, later we also tested with the new images that were not used in the training purpose, but the system showed with the accuracy of 98.57%.

KEYWORDS: Indian currency recognition, feature extraction, image processing, Feed-forward Artificial Neural Network

I. INTRODUCTION

The project completely lies on digital image processing its starts from capturing images that is image acquisition, segmentation, number of functions can be performed. The extracting information from the digital image and processing it further for the specific application we say it as extent of digital image processing. Main goal of the project is to obtain the identified denomination of Indian currency.
This section focuses on images in particular, and it deals with image manipulation using a digital computer.

We perform feature extraction of the images based on the supervised learning we are training the images by using feed forward neural network. On the basis of results obtained after training images with stabilized network for test and validation of samples then we convert into index this specifies that the record belongs to specified group. based on the group it gives the denomination of currency.

II. RELATED WORK

- **Data used for model:**

The currency images used in the work for finding the denomination of Indian currency by using the ideas of artificial neural network by training the images after the feature extraction process. By using the stabilized network. The images were captured through digital camera around 370 images were collected for processing.

Fig (1): Data samples

The images were obtained and resized with one value. They are converted to gray scale followed by edge detection. Followed by calculated the mean intensity of the RGB channels foe individual images.

Denomination ▾	Column1 ▾	input ▾	Mean ▾	Column2 ▾	Mean ▾	Column3 ▾	Mean4 ▾	Column5 ▾
value		image	intensity		intensity		intensity	
500			Red channel(R1)		Green channel(G1)		Blue channel(B1)	
		1	172.3011		171.0044		159.5671	
		2	155.9487		153.462		138.4132	
		3	117.2933		115.2753		103.9796	
		4	157.4815		155.048		140.1041	
		5	162.4725		158.5616		145.2112	
		6	120.8114		118.8829		109.4784	
		7	149.3993		145.3622		132.1757	
		8	109.3677		106.0878		93.3121	
		9	146.5352		143.9495		132.1299	
		10	139.8377		138.4085		124.0988	

Fig (2): Mean intensity value for 500 Rs.

In the above table R1 gives mean intensity of red channel, G1 gives the mean intensity of green channel and B1 gives the intensity of the blue channel.

III. METHODOLOGY

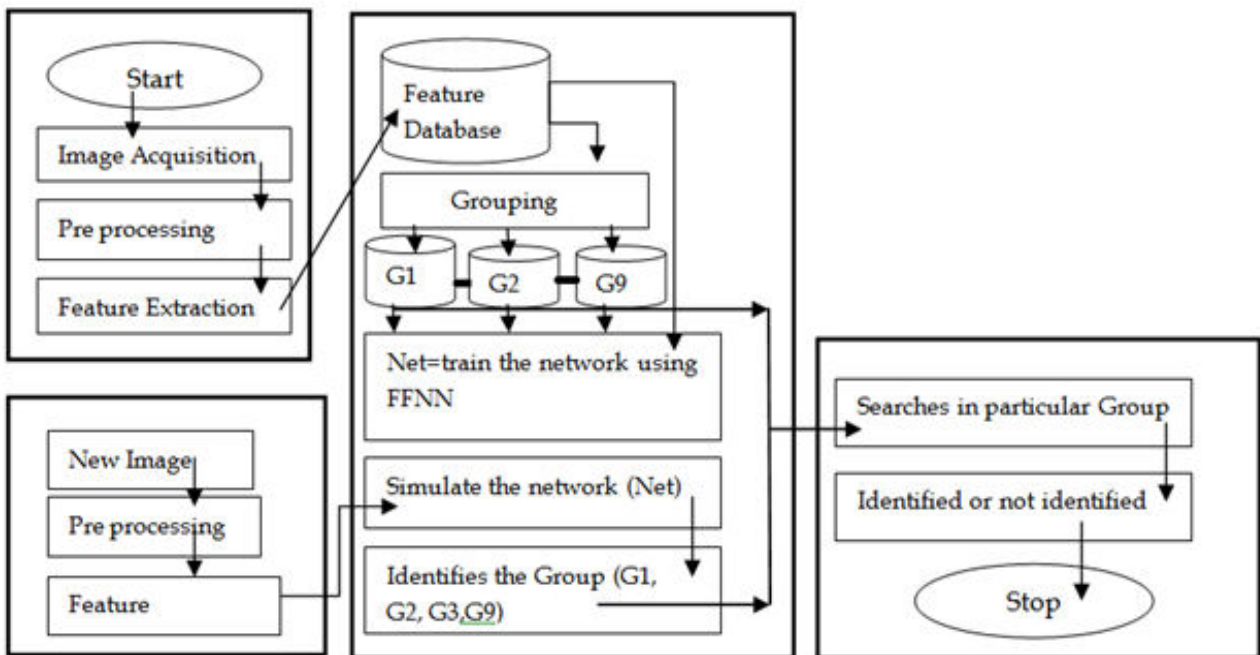The methodology in this project includes three steps:

Fig (3): Architecture

Step 1: The first and foremost thing is image acquisition that is collection of required images with fixed pixel value for good and efficient results.

Step 2: Pre-processing where we are removing noise from the image and unwanted images like oily note are removed from the gathered images

Step 3: Feature extraction is one of the important steps where we are extracting the features of currency.

Step 4: After feature image acquisition and feature extraction the data is stored into the database and start making group of individual currency

Step 5: once each currency is grouped next step is to train the data by using feed forward neural network.it is best way to get accurate results, by using stabilized network.

Step 6: Simulate the network

Step 7: After simulating network it identifies the group and search for the individual group and display. if it is identified it displays exact denomination of currency otherwise it displays misclassified denomination.

IV. MODULES

This project provides the access to many modules they are as follows:

1.Load image:
In this module we are loading the image from folder to check for denominations and display results.
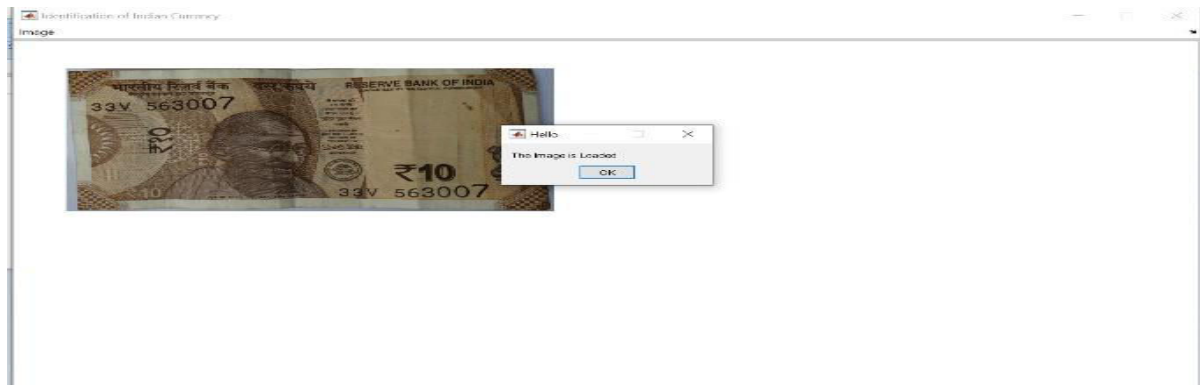

Fig (4): Module Load image

- Here the image is loaded and displayed on user interface.

2.Feature Extraction:
once loading is finished the feature extraction takes for each individual images.
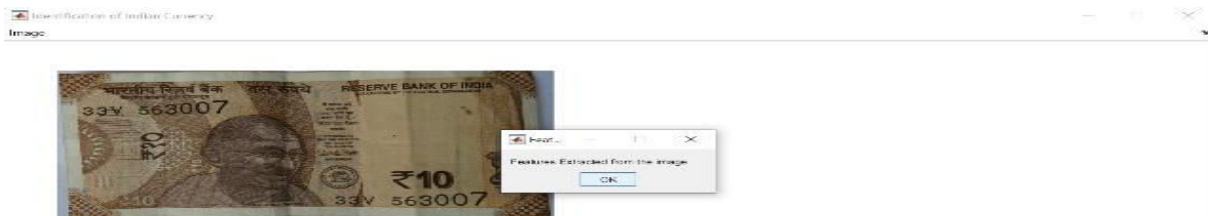

Fig (5): Module Feature Extraction

- Here features of image is extracted.

3.Identify:

- once the currency finishes the extracting of feature next, we are training the image by passing it to stabilized net by using feed forward neural network.
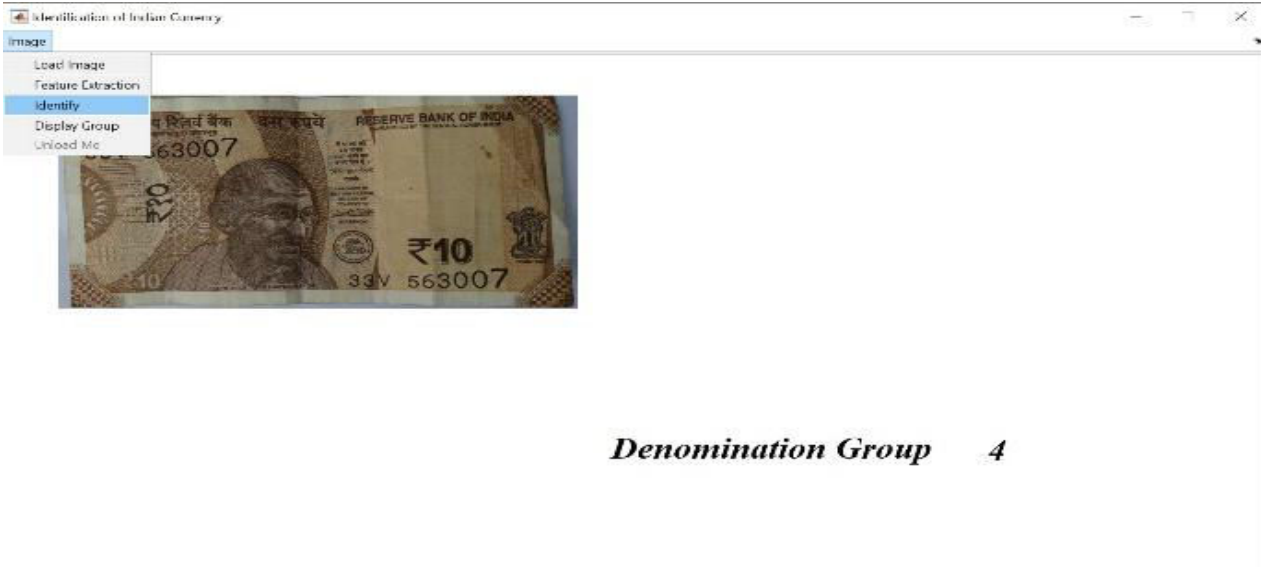

Fig (6): Module Identity

- Here it displays denomination group number by identifying the groups of input images.

4.Display Group:

- Once all operation is finished based on group numbers corresponding denomination of currency is displayed.

Fig (7): Display Group

- Here displays denomination of Indian currency

V. BENEFITS

1.improvement of pictorial information for human interpretation that is whether the information we get from a certain image that is addressed into this point we always want the pictorial information improved for our interpretation.
2.Processing of image data for storage, transmission and representation for autonomous machine perception. Here the task of storage of that particular information to reproduce it takes on or to transmit that information from one place to another place and representation onto the display of the modern computer or machines.
3.There are fields like computer vision which use computer to emulate human vision including learning and being able to make inference and take action based on visual inputs. thus is a branch of whose objective being to emulate human intelligence. Hence the area of image analysis is in between image processing and computer vision.

VI. RESULTS

The results obtained are denomination of Indian currency with 95.12% of accuracy after training the images and remaining are misclassified.

Fig (9): percentage of identified from known data set

According to the training image results, we used approximately 369 samples for training, 351 of which were correctly identified, and we achieved 95.12 percent accuracy in the training state.
The statistical way for examining the results by using GLCM feature extraction, there are many GLCM features where we used four glcmfeatures for this approach they are:

1.Contrast:
- it measures the spatial frequency of an image and difference moment of GLCM.
- It is difference between the highest and lowest values of a contagious set of pixels.

2.corellation:
- Over the entire image, this function returns a measure of how correlated a pixel is to its neighbor.

3.Energy:
- It is also called as uniformity.
- This measures the textual uniformity that is pixel pair repetitions.
- It detects the disorder in texture and measures the local variation present in image.

4.Homogenity:
- Homogeneity is also called as inverse difference movement.it measures image homogeneity as it assumes larger values for smaller grey tone difference in pair elements.

- It is more sensitive to the presence of near diagonal elements in the GLCM.
- It has maximum value when all elements in the image are same.

GLCM Feature Extraction

1RS Note(front and back views)

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9
	1RS							
Images	72A	73A	74A	75A	76A	77A	DSC02105	DSC02106
Features								
Contrast	1.016635901	1.02565957	1.06815486	1.03437875	0.7924937	1.00914419	0.31469922	0.24970661
Correlation	0.805371122	0.80358876	0.76114936	0.79926275	0.67987431	0.78629235	0.8327114	0.7860834
Energy	0.127349054	0.1096848	0.07983683	0.10271447	0.18189927	0.07790468	0.18796998	0.23664731
Homogenity	0.759263294	0.75097003	0.72434905	0.74846619	0.77877831	0.73727372	0.87136886	0.88331293

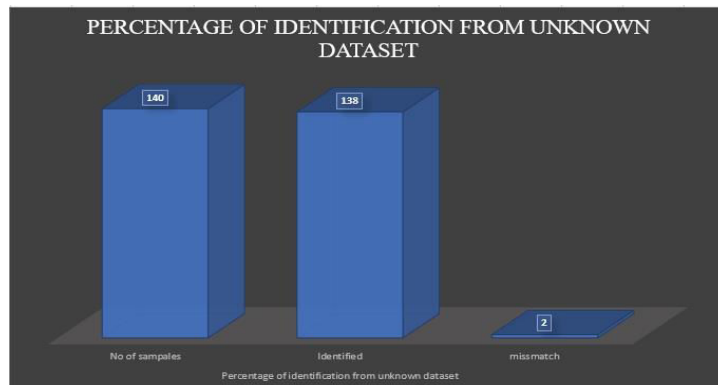**Fig (10): Example to show features extraction**

Fig (11): Example to show features extraction

The figure 11 shows the result of the samples that were used to the system for testing purpose, the system performed well.

VII. CONCLUSION

Thearticle presented for denomination of Indian currency identification. The system showed the better and stabled result, the Gary level Co-occurrence features revealed the best result obtained, using artificial neural network, we arrived with the 95.12 percent of accuracy from the known dataset that are being used for identification of the Indian currency and later we used the stabilised network to test the network to perform for our surprise the system performed with 98.57precent accuracy from an unknown data sets.

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