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Detect Indian Currency from Image by using MATLAB

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ABSTRACT: The advancement of color printing technology has increased the rate of fake currency note printing and duplicating the notes on a very large scale. Few years back, the printing could be done in a print house, but now anyone can print a currency note with maximum accuracy using a simple laser printer. As a result the issue of fake notes instead of the genuine ones has been increased very largely. India has been unfortunately cursed with the problems like corruption and black money .And counterfeit of currency notes is also a big problem to it. This leads to design of a system that detects the fake currency note in a less time and in a more efficient manner. The proposed system gives an approach to verify the Indian currency notes. Verification of currency note is done by the concepts of image processing. This article describes extraction of various features of Indian currency notes. MATLAB software is used to extract the features of the note. The proposed system has got advantages like simplicity and high performance speed. The result will predict whether the currency note is fake or not.

KEYWORDS: counterfeit, extract features, currency detection

I. INTRODUCTION

Technology is growing very fast these days. Consequently the banking sector is also getting modern day by day. This brings a deep need of automatic fake currency detection in automatic teller machine and automatic goods seller machine. Many researchers have been encouraged to develop robust and efficient automatic currency detection machine . Automatic machine which can detect banknotes are now widely used in dispensers of modern products like candies, soft drinks bottle to bus or railway tickets. The technology of currency recognition basically aims for identifying and extracting visible and invisible features of currency notes. Until now, many techniques have been proposed to identify the currency note. But the best way is to use the visible features of the note . For example, color and size. But this way is not helpful if the note is dirty or torn. If a note is dirty, its color characteristic are changed widely. So it is important that how we extract the features of the image of the currency note and apply proper algorithm to improve accuracy to recognize the note.We apply here a simple algorithm which works properly. The image of the currency note is captured through a digital camera. The hidden features of the note are extracted using multiple feature extraction process. Now processing on the image is done on that acquired image using concepts like image segmentation, edge information of image and characteristics feature extraction.MATLAB is the perfect tool for computational work, and analysis. Feature extraction of images is challenging task in digital image processing. It involves extraction of invisible and visible features of Indian currency notes. This approach consists of different steps like image acquisition, edge detection, gray scale conversion, feature extraction, image segmentation and decision making [4-5]. Acquisition of image is process of creating digital images, from a physical scene. Here, the image is captured by a simple digital camera such that all the features are highlighted.

Manual testing of all notes in transactions is very time consuming, untidy process and also there is a chance of tearing while handing notes. No one can ever be 100 percent confident about the manual recognition. Fake or Counterfeit notes are one of the biggest problem occurring in cash transactions. For country like India, it is becoming big hurdle. Because of the advances in printing, scanning technologies it is easily possible for a person to print fake notes with the help of latest hardware tools. Detecting fake notes manually becomes time-consuming and untidy process hence there is need of automation techniques with which currency identification process can be efficiently done.

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II. LITERATURE REVIEW

The printing house has the ability to make counterfeit paper currency, but it is possible for any person to print counterfeit bank notes simply by using a computer and a laser printer at house. Therefore the issue of efficiently distinguishing counterfeit banknotes from genuine ones via automatic machines has become more and more important .The review [1] presented by Komal vora et al. [1] suggests a widespread review of study on paper currency recognition system. A number of techniques applied by a diversity of researchers are proposed briefly in organize to evaluate the condition of art. Here, the author focuses primarily on currency detection system including different steps like image acquisition, feature extraction and categorization system uses different algorithm. The classification result facilitates the recognition of fake currency mainly using serial number extraction by implementing optical character recognition (OCR). It is found that the proposed method gives superior results.

The paper [3], presented by Trupti Pathrabe and Swapnili Karmore introduced a new technique to improve the recognition ability and the transaction speed to classify the Japanese and U.S. paper currency. This compares two types of data sets, time series data and Fourier power spectra are used. In both cases, they are directly used as inputs to the neural network. They also refer a new evaluation method of recognition ability.

The paper [4], presented by Mirza and Nanda has a technique to extract paper currency denomination. The extracted region of interest (ROI) can be used with Pattern Recognition and Neural Networks matching technique. First they acquire the image by simple flat scanner on fix dpi with a particular size, the pixels level is set to obtain image. Few filters are applied to extract denomination value of note. They use different pixel levels in different denomination notes. The Pattern Recognition and Neural Networks matcher technique is used to match or find currency value/denomination of paper currency.

The paper [5], proposed by Pathrabe and Bawane gives the algorithm with low computational complexity, which can meet the high speed requirement in practical applications. It needs to be noted that the proposed technique may not be able to distinguish counterfeit notes from genuine notes. Indeed, techniques use infrared or ultraviolet spectra may be used for discriminating between genuine and counterfeits notes.

The paper [6], presented by Sai Prasanthi and Rajesh Setty describes an approach for verification of Indian currency banknotes. The currency will be verified by image processing techniques. In this article, six characteristic features are extracted. The approach consists of a number of components including image processing, edge detection, image segmentation, characteristic extraction, comparing images. The characteristics extraction is performed on the image of the currency and it is compared with the characteristics of the genuine currency. The Sobel operator with gradient magnitude is used for characteristic extraction. Paper currency recognition with good accuracy and high processing speed has great importance for banking system. [Sobel operator or Sobel filter is used in image processing and computer vision, particularly within edge detection algorithms where it creates an image emphasising edges].

III. PROPOSED METHOD

Image Acquisition: The image acquisition is to acquire a digital image. It requires an image sensor and the capability to digitize the signal produced by the sensor.
Preprocessing: Pre-processing is a common name for operations with images at the lowest level of abstraction -- both input and output are intensity images.
The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing.
Segmentation: Segmentation is the process of partitioning a digital image into multiple segments. It is typically used to distinguish objects from backgrounds. Here edge based segmentation is performed on the image. Based on the binary images processed by the morphological transformations, we need to segment the small objects, the digits on the serial numbers, from the large banknote images. To implement this, first used the Sobel operator to the large binary banknote images in order to distinguish the regions of interest (ROIs) from the background, then extract the ROIs in order to obtain the small digits (objects for forming the templates of the digits and for recognition.
Image segmentation sub divides the image into its constituent regions or objects. The level to which sub division is carried depends on the problem being solved. Segmentation algorithm for monochrome images generally are based on one of the two basic properties of image intensity values- Discontinuity, Similarity. In the first category, the approach

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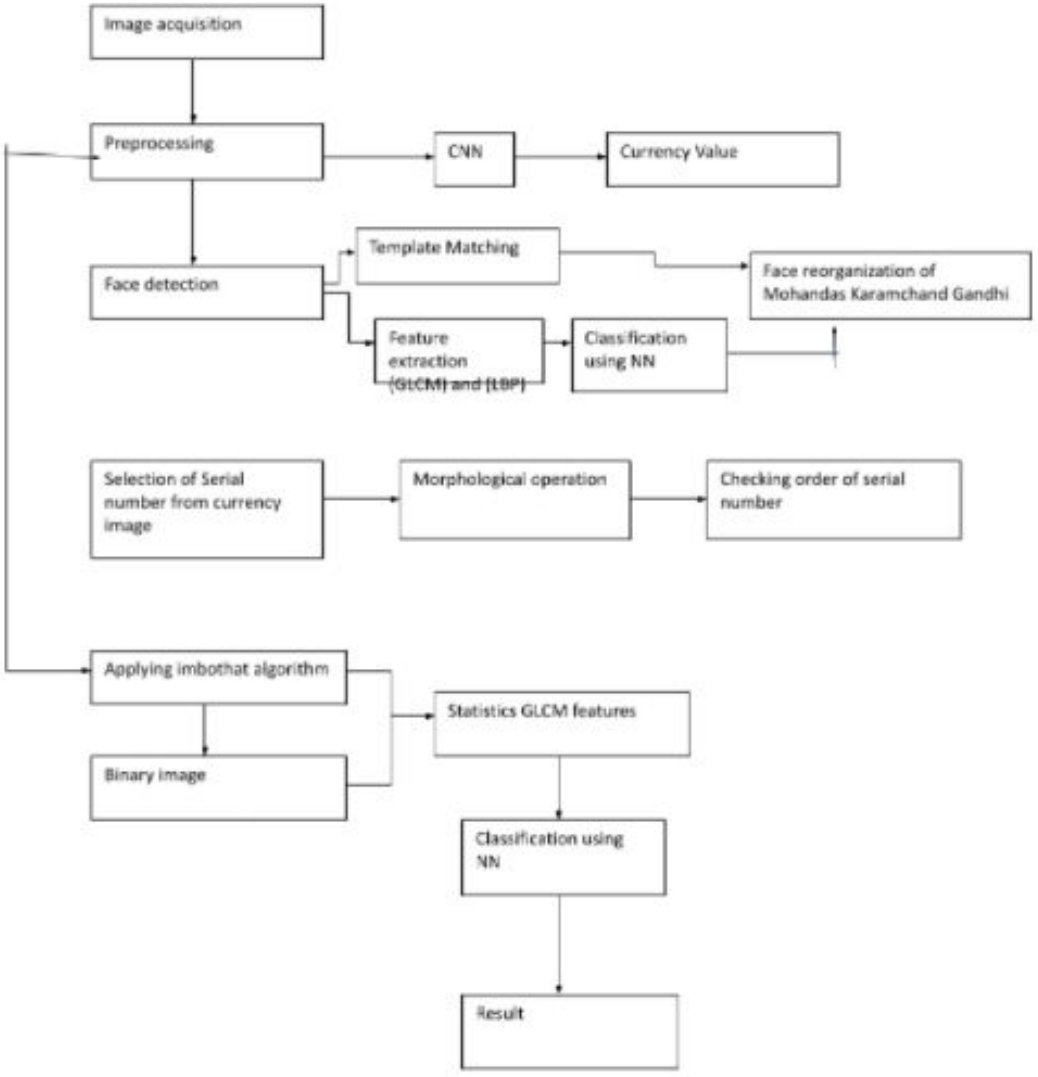
is to partition an image based on abrupt changes in intensity such as edges in an image. The approach in the second category is based on partitioning an image into regions that are similar according to a set of predefined criteria.

BLOCK DIGRAM



A convolutional neural network (CNN, or ConvNet) is one of the most popular algorithms for deep learning with images and video.

Like other neural networks, a CNN is composed of an input layer, an output layer, and many hidden layers in between.

Feature Detection Layers

These layers perform one of three types of operations on the data: convolution, pooling, or rectified linear unit (ReLU).

Convolution puts the input images through a set of convolutional filters, each of which activates certain features from the images.

Pooling simplifies the output by performing nonlinear downsampling, reducing the number of parameters that the network needs to learn about.

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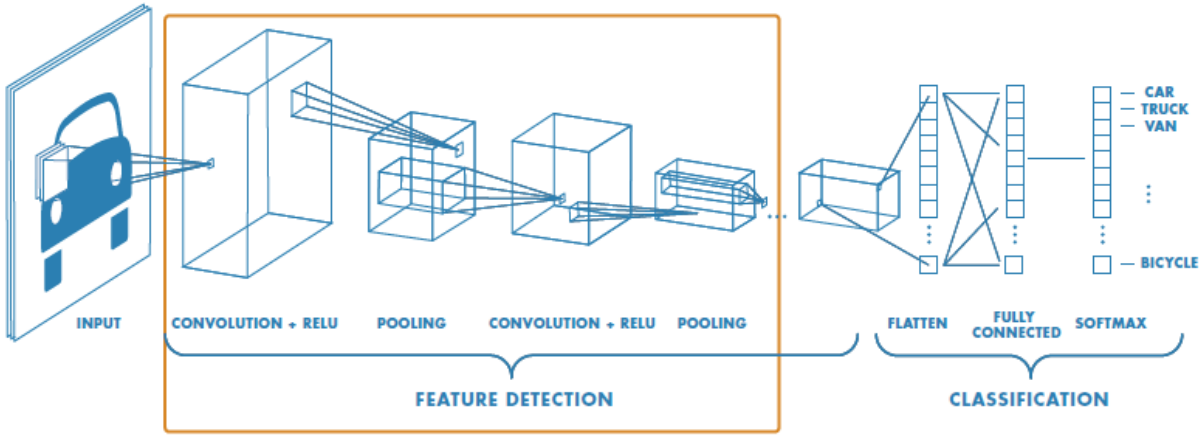
Rectified linear unit (ReLU) allows for faster and more effective training by mapping negative values to zero and maintaining positive values.

These three operations are repeated over tens or hundreds of layers, with each layer learning to detect different features.



Classification Layers

After feature detection, the architecture of a CNN shifts to classification.

The next-to-last layer is a **fully connected layer** (FC) that outputs a vector of K dimensions where K is the number of classes that the network will be able to predict. This vector contains the probabilities for each class of any image being classified. The final layer of the CNN architecture uses a **softmax** function to provide the classification output.

SOFTWARE AND HARDWARE REQUIREMENTS

64-Bit MATLAB, Simulink, and Polyspace Product Families				
Operating Systems	**Processors**	**Disk**	**RAM**	**Graphics**
Windows 10 Windows 7 Service Pack 1	**Minimum** Any Intel or AMD x86-64 processor	**Minimum** 2.6 GB of HDD space for MATLAB only, 4-6 GB for a typical installation	**Minimum** 4 GB **Recommended** 8 GB For Polyspace, 4 GB per core is recommended	No specific graphics card is required. Hardware accelerated graphics card supporting OpenGL 3.3 with 1GB GPU memory is recommended.

IV. CONCLUSION

In this project, detection of fake Indian currency note is done by using image processing principle. This is the low cost system. The system works for denomination of 100, 500 and 2000 for Indian currency. The system also provides accurate and valid results. The process of detection of fake note is quick and easy. In this system input is taken by digital camera and output is displayed on PC.

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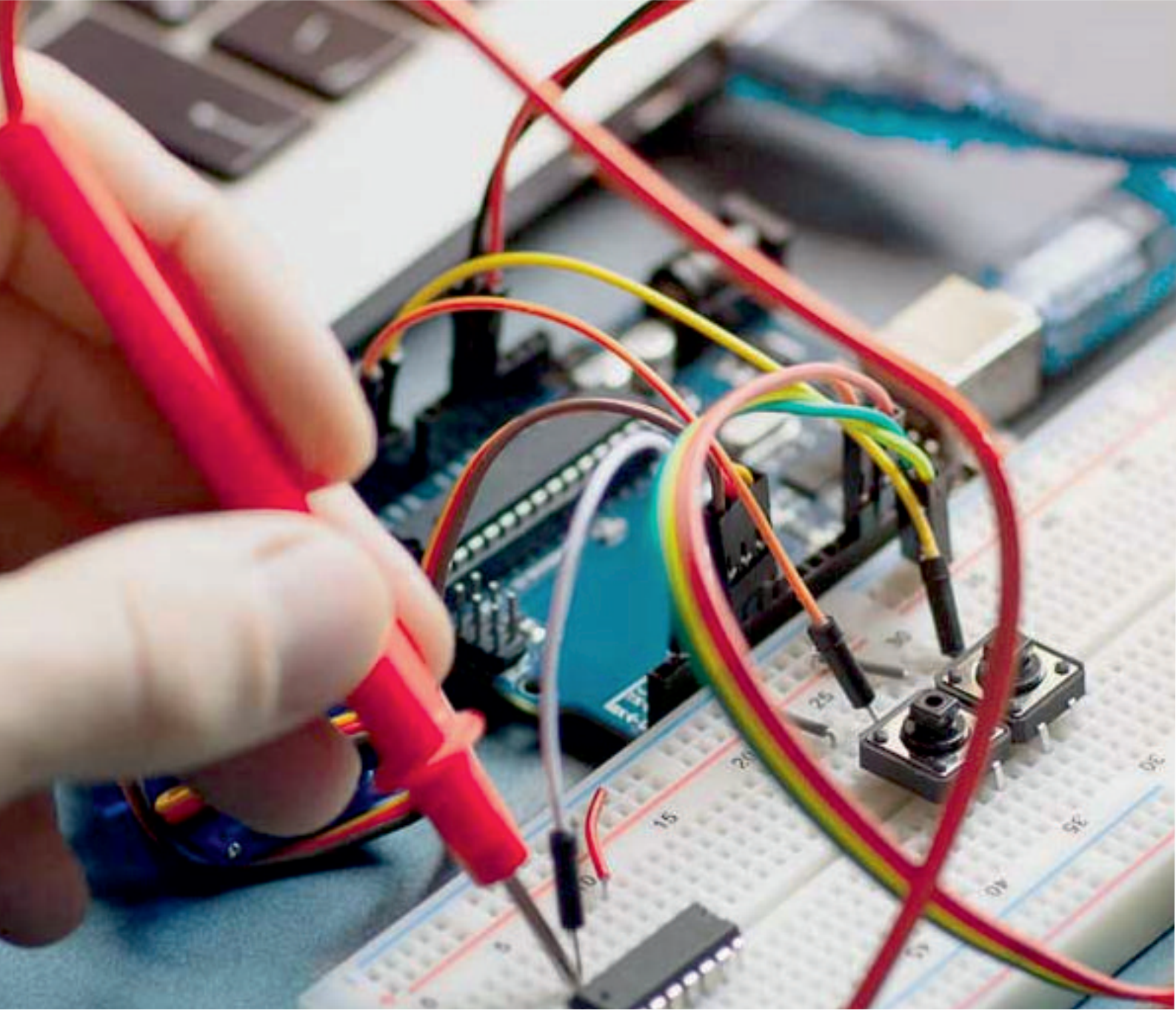

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