

Currency Identification Using CNN

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ABSTRACT

Fake currency is serious issue worldwide, affecting the economy of almost every country including India. The counterfeit currency is one of the major issues faced throughout the world nowadays. The counterfeiters are becoming harder to track because of their use of highly advanced technology. One of the most effective methods to stop counterfeiting is the use of counterfeit detection software that is easily available and is efficient. Our project will recognize Indian currency notes using a real-time image obtained from webcam. The background of our topic is image processing technology and apply it for the purpose of verifying valid currency notes. The software will detect the fake currency by extracting features of notes. The success rate of the software can be measured in terms of accuracy and speed. So our aim is to work on those parameters which will be impossible to implement on counterfeit notes so we started working on parameters which will be enough to differentiate between fake and original notes.

Keywords- Deep Learning, Convolution Neural Network, Automatic recognition, Currency, Image Processing

1. INTRODUCTION

This paper presents a deep learning-based bank notes denomination recognition framework which works on colour bank note images of a minimal resolution. The framework utilizes the concept of transfer learning where deep convolution neural network already trained upon a huge dataset of natural images is re-utilized for the problem of classification of banknote images. The real images of banknotes taken under variable lighting conditions are fed to a custom made neural network topped over the pre-trained convolution base to learn the new classes associated with problem. The obtained classifier trained upon a modestly sized dataset, achieves considerably accuracy of 96.6 % on a held out testing subset. The method requires pre-processing of images while feeding to the classifier and works well for recognition even in presence of background clutter.

1.1 Requirement

We will be building a convolutional neural network according to proposed algorithm which will be trained on given fake and original currency data set, and be able to predict whether the given currency image is fake or original. The way we are going to achieve it is by training an artificial neural network on image data set of currency and make the Neural Network to predict which class the image belongs, when it sees an image having fake note or original note the next time. Convolutional neural networks (CNN's) are nowadays widely used in image-recognition problems. They have advantages compared to other techniques. Convolution neural networks use approximately 5 to 25 distinct layers of pattern recognition. They take raw data, without the need for an separate pre-processing or feature extraction stage: in a CNN, the feature extraction and classification occur naturally within a single framework. This is a major advantage when compared to other image processing techniques as they need a lot of computations only for pre-processing step.

2. LITERATURE REVIEW

The methodology of image processing based extraction of the existing features of banknotes are depicted to demonstrate the feasibility of software-assisted fake currency detection system. For Bangladeshi bank notes following features were considered. For testing purpose BDT 1000 has taken parameters they used was:

1) Micro-printing 2) Watermark 3) Optically Variable Ink

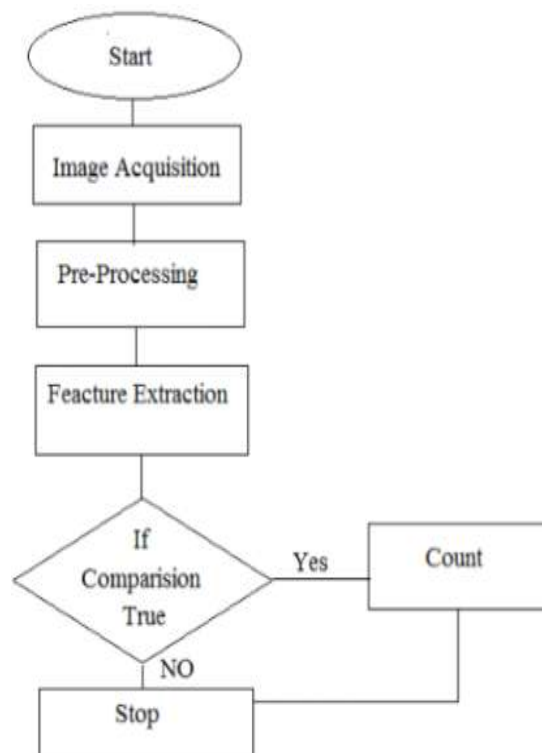
The proposed approach extracts the multiple features of Indian currency and uses them for fake currency detection. The image was acquired using image acquisition. The features were extracted using various image processing algorithms and then template matching was done to identify the fake currency. We will overcome this problem by using different parameters which will be sufficient to recognize the difference between fake notes and original currency notes, this will be implemented using image processing techniques.

The another paper we studied was having the title Neural Networks for Image Analysis and Processing. We noticed here basic neural network algorithms applied to the imaging process as well as their applications in areas of technology. One of the important points was Artificial neural networks have been used as a tool for image segmentation in the field of echocardiography, it showed that segmented images preserved better than heart structure at the cost of high fragmentation of the image. They showed that segmented images had sufficient details of anatomy of heart to allow medical diagnosis which is amazing, So to overcome the problem of counterfeit notes and to deal with the problem, we will be overcoming this problem by using different parameters like deep learning algorithm which will be sufficient to recognize the difference between fake and original currency notes. This will be implemented using image processing techniques like CNN, pattern recognition and some algorithms.

3. METHODOLOGY

We will be building convolution neural network according to algorithm which will be trained on the given fake and original currency data set, and later can predict whether the given currency image is fake or original. In this we will be solving an image classification problem, which will give the class of input image. We are going to achieve it by training an artificial neural network on image data set of currency and make the NN (Neural Network) to predict which class the image belongs. Convolution neural networks (CNN's) are widely used in pattern-recognition and image-recognition problems. We generated data-set of paper currency. This data-set has been created for specific purpose. The image have been collected from various Google sources. The data-set is segregated into two types, original note and fake note (Figure 1). In this we have used 75% of the images in the data set for training and the rest 25% of the images for purpose of testing. We give the training images as input to our model and train the model. We compare the input with the dataset that is already available.

3.1 Main Methodology:



In the coding part, we are going to use Tensor flow as library in python to build our Convolutional Neural Network. We should install the Tensor-Flow. Tensor-Flow is an open source software library for data flow programming across range of tasks. Tensor flow is a symbolic math library and is also used for machine learning applications such as neural networks. After installing the required libraries, we train our model. After training and testing the model, we set an value which increases the accuracy of the R-CNN upon increasing the value. The features extracted may be categorized as general features. The general features are basically features such as texture, colour ,contrast and shape. Fake currency detection system varies depending on features of notes of a country.

For Indian notes features considered are:

- Latent Image of note
- Identification Mark on notes

Feature extraction refers to the retrieval of information about the image by applying image processing algorithms. The images of a currency note were acquired using a digital camera. After image acquisition, pre-processing and then feature extraction is done to extract features.

a. Pre-Processing: In pre-processing the operation is the extraction of information. In this method unwanted distortions are suppressed and enhances some image features that are important for further processing. It includes image smoothing and also image adjusting.

b. Feature Extraction: Feature extraction does the selection and extraction of some of the effective and important features, among the largest data set of the features which are important for the recognition of fake currency. Some features of an image are latent image and identification marks. We first create a database of Indian notes and then extract the features. The extracted features are used for detection of the fake currency.

c. Training the CNN: This speeds the training process, since there are few layers to actually train. To train the neural network, it is actually better to start with a bad performing neural network and bring up the neural network with high accuracy. We want our loss function to be much lower in the end of training. This indicates our neural network has high learning rate and accuracy. The problem of training the network is equivalent to generating the loss function with minimum error rate. It is important and efficient to minimize the loss because it gives us a neural network with high accuracy.

4. CONCLUSION

In this paper, we proposed a model which demonstrates the usage of CNN architecture. Although the generated data set was small and did not represent the real world scenario of fake currency, it was helpful throughout the experiment. The detection of fake currency is quick and easy under the trained model. By this we can also assure that under the large data set, the model R-CNN can be well-trained and provides accurate results, which can help the people in recognizing the currency note whether it is fake or original.

5. REFERENCES

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