

INDIAN CURRENCY DETECTION USING IMAGE RECOGNITION AND MACHINE LEARNING TECHNIQUE

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Abstract

There are more than 200 distinct currencies in use throughout various nations in the world. To cut labor costs, a currency recognition and conversion system has been used. Despite the rapidly growing use of Master cards and other electronic payment methods, cash is still widely utilized for everyday purchases because of its convenience. However, blind people could have trouble telling apart different denominations of money. Its high value raises the possibility that dishonest individuals will attempt to counterfeit it. In order to detect and authenticate new money issued by the Reserve Bank of India, this work's main objective is to explore a number of key characteristics of new real cash. Currency Recognition Systems their Use (CRS)

Keywords: Currencies, Automatic Recognition, Region of Interest (ROI)

I. INTRODUCTION

The majority of a country's economic development is every individual is reliant on its currency and a member of. However, some socially inept individuals hinder this process and disrupt the balance of the country's social harmony nation. For instance, during the days of demonetization, there were huge lines of ordinary people in front of banks and ATM machines. However, many unscrupulous individuals are issuing the money straight from malicious sources, directly impacting India's economic situation. We are aware that the RBI and the Ministry of Finance in India have the authority to print coins and currencies. On the other hand, dishonest people profit from advanced printing and scanning technologies.

Finding the phony notes while using the real ones is how fraudulent cash is detected. The primary users of money recognition systems are banks, companies, enterprises, shopping centers, railroad stations, the public sector, and other organizations. Normal people, however, lack access to any technologies for currency detection, making it impossible for them to recognize genuine original currency. Our service is designed to assist people who need to differentiate between various currencies and do business effectively. It is extremely challenging to add up multiple notes of various denominations. This research provides a method for classifying and converting paper money using image processing. Pattern recognition and neural network matching techniques can be employed with the retrieved region of interest (ROI). Image processing to enhance its graphic information for humans.

II. EXISTING SYSTEM

a) Texture Based Recognition Techniques

A highly helpful element for currency detection is texture. Textural characteristics that match to human vision are quite helpful for designing a texture analyzer and choosing the best features. For image retrieval, a certain collection of texture features has been applied rather frequently. Tamura's features. The average of the coarseness measurements taken at each pixel point inside a texture region is known as tamaura coarseness. Without any homogeneity restrictions, this kind of characteristics can be computed directly from the complete image. As a result, a better version of this feature that uses a histogram to describe the coarseness information should be taken into consideration.

b) Pattern Based Recognition Technique

Pattern recognition draws conclusions based on knowledge that has already been one method for doing this is to categories items using a collection of pictures. Other systems, such as Indian Currency Note Denomination Recognition in Color Images, use pattern identification to handle some of the more challenging problems. The primary focus of these techniques is vector quantization-based histogram modelling. After the RGB value was determined, these photos were processed using segmentation software. Following data collection is image segmentation and cropping. At this time, the images of the notes were modified to stand alone. The edges of the image were then determined using a cropping technique after segmentation. Convolution of each image with a texture template is then used to create features. Were extracted, along with edge detection.

c) Color Based Recognition Technique

The characteristics varied according on the four distinct currencies' textures, colors, and forms. In order to classify, they employ artificial neural networks. An accurate 93.84% was the average. A data set for Jordanian currency was used by Iyad et al. to construct a mobile currency recognition system.

They used the scale-invariant feature transform (SIFT) algorithm and the Jordanian dataset to implement this strategy on a smartphone. For paper cash (71% accuracy), the algorithm provided results, while for coin currency (25% accuracy). A mobile system for detecting paper money that is applicable to Saudi Arabian papers was suggested by the author. The technique for identifying paper money is based on some intriguing similarities and differences between two photographs. The classification is performed using a Radial Basis Function Network. The system can identify normal non-tilted images with an accuracy of 95.37%, noisy non-tilted images with 91.65%, and tilted images with 87.5%.

Based on size information and correlation matching of several templates, Sungwook et al. proposed an effective and quick algorithm. This information was considered to be crucial as different banknotes come in a variety of sizes. The 55 currencies from five countries—EUR, KRW, RUB, CNY, and USD—representing 30 different classes were used in this method's testing. For normal banknotes and defiled banknotes, this approach produced classification

accuracy results of 100% and 99.8%, respectively. For identifying paper money, a nonparametric technique is suggested. The suggested approach is founded on the creation of a nonparametric model for each class of paper money. By averaging all accessible samples of one banknote, the model is created. Based on these data, the nonparametric models, and matching. For obtaining the money,

To get a satisfactory outcome, the camera and money should be horizontally aligned. This method has been tested on a variety of currencies and applied to three different types of Saudi Arabian banknotes. The accuracy of identification is 100%.Nouraetal. Employed basic currency, CRSF. This technique compares the suggested method to the dataset that was used by the proposed approach. The suggested system uses fundamental techniques such image segmentation, equalization, region of interests (ROI) extraction, and template matching based on correlations between the captured picture and database dataset. The findings demonstrated that this technique can identify Egyptian paper currency with a modest level of accuracy that approaches 89%.

III. REQUIREMENT SPECIFICATIONS

a) Software Requirements

1. Tensor flow

Tensor Flow is a versatile technology that excels in deep neural network inference and training but can be applied to many different tasks. Computing can be done on a wide range of platforms (CPUs, TPUs), including desktop computers, server clusters, mobile devices, and edge devices. Tensor Flow computations are represented by stateful dataflow graphs. Tensor Flow gets its name from the operations that these neural networks perform on tensors, which are multidimensional data arrays. According to Jeff Dean at the Google I/O Conference in June 2016, just 5 of the 1,500 GitHub projects that employed Tensor Flow were from Google. The process of using a computer to apply an algorithm to digital photos is known as digital image processing.

2. PyCharm

PyCharm is a committed Python Integrated Development Environment (IDE) imparting a wide variety of important equipment for Python developers, tightly included to create a convenient surroundings for effective Python, web, and data technology development. PyCharm is a cross-platform IDE that works on Windows, macOS, and Linux. Check the gadget necessities everything we do in PyCharm, we do in the context of a project. It serves as a foundation for coding assistance, bulk refactoring, coding fashion consistency, and so on. That is the purpose for deciding on this iDE.

3. Deep Learning Techniques

The pooling layer minimizes the number of parameters required to process the image, speeding up the process while also lowering memory usage and computational expense. CNNs can be used for different data analysis and classification issues, while image analysis has historically

been their most common application. They can therefore be used in a variety of industries to provide accurate results, covering crucial areas including face identification, video classification, and street/traffic sign recognition, categorization of galaxies, and interpretation and diagnosis/analysis of medical images, among others.

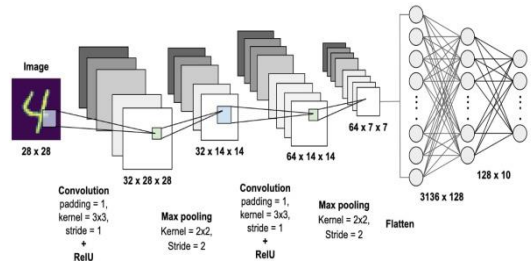


Fig.1: Represents the layers

IV. DESIGN

Features like Identity Marks and optical variable ink are employed in currency recognition. Each feature's pixel value is determined. A histogram is drawn using those pixel values as a base. For currency recognition, Id marks and optical variable links will be used. For money verification, elements including watermarks, security threads, fluorescence, and latent images will be utilised. Character is retrieved from each split component in currency verification. The extracted portion's pixel value can be determined.

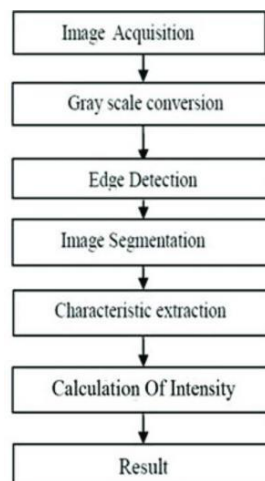


Fig.2: Design

a) Image Acquisition

Processing cannot be done without an image the first stage in the workflow sequence following the acquisition of the image a variety of processing techniques can be used to carry out the numerous vision tasks there are several methods for acquiring images including using a camera or scanner all the features from the acquired image should remain.

b) Preprocessing

The primary objectives of pre-processing are to improve data set handling and the visual appeal of photographs. The correction of distortion, deterioration, and noise introduced during the imaging process is what is referred to as image preprocessing, or picture restoration. In order to zoom, rotate, shrink, and make geometric repairs, interpolation is the technique most frequently utilised. The process of processing must include the removal of noise. But noise interferes with pattern matching and segmentation.

c) Binarization

The picture received is in RGB color. It is transformed into grey scale as it consists of best the depth information which is straightforward to technique in place of processing three additives R (Red), G (Green), B (Blue). To take the RGB values for every pixel and make as output a unmarried value reflecting the brightness of that pixel.

d) Edge Detection

Edge detection is the call for a hard and fast of mathematical techniques which goal at figuring out factors in a virtual picture at which the picture brightness adjustments sharply or, more formally, has those continuities. The factors at which picture brightness adjustments sharply are commonly prepared into a hard and fast of curved line segments termed edges. Edge detection is a picture processing method for locating the limits of items inside images. It works via way of means of detecting discontinuities in brightness. Edge detection is used for picture segmentation and facts extraction in regions including picture processing, pc vision, and device vision.

e) Image Segmentation

Image segmentation is the system of partitioning a digital photograph into multiple. The purpose of segmentation is to simplify and/or alternate the illustration of a photograph into something this is extra significant and less difficult to analyze. Image segmentation is usually used to find items and boundaries (lines, curves, etc.) in photos Segmentation set of rules for photos commonly are primarily based totally on one of the two primary houses of photograph depth values 1) Discontinuity: Based on abrupt adjustments in depth consisting of edges in a photograph. 2) Similarity: Based on partitioning a photograph into areas which might be comparable in line with a fixed of predefined criteria.

f) Feature Extraction

Dimensional discount in a selected manner is referred to as function extraction. When the quantity of enter statistics for a set of rules is just too extensive to manner and it seems to be exceptionally redundant, A condensed illustration set of capabilities might be made from the supplied statistics. The manner of extracting capabilities from the enter statistics is referred to as function extraction. If the capabilities extracted are correctly selected, its miles assumed that the capabilities set will extract the essential statistics from the enter to perform the meant project using this smaller illustration in preference to the total length enter.

V. IMPLEMENTATION

Image Acquisition is the primary level of any imaginative and prescient system is the enter photo level. After the photo has been obtained, diverse techniques of processing may be implemented to the photo to carry out the numerous exceptional tasks. Performing enter photographs in photo processing is usually step one in the workflow collection because, without a photo, no processing is possible. There are diverse strategies to collect photographs which includes with the assist of a digital digicam or scanner. Input photo need to maintain all of the features.

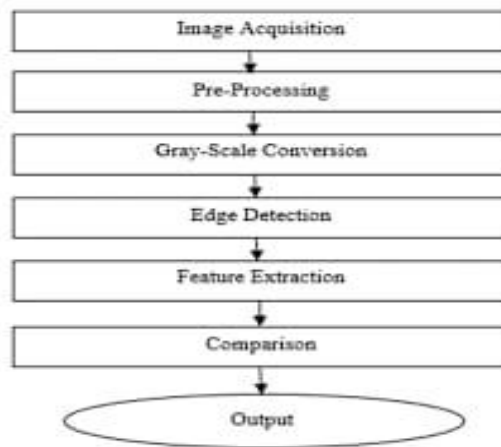


Fig.3: Implementation

a) Image preprocessing

The foremost a part of this step is to preprocessing the photo to decorate the visible look of snap shots and enhance the manipulation of datasets. Preprocessing of photo are those operations which are generally required to the primary data evaluation and extraction of information. Image preprocessing, additionally known as photo restoration, entails the correction of distortion, degradation, and noise delivered all through the imaging process. It can substantially boom the reliability of an optical inspection. Several clear out out operations are used, which accentuate or lessen positive photo information to allow a simpler or quicker evaluation. Image Adjusting is a part of preprocessing with the assist of photo interpolation. Interpolation is the approach often relevant for obligations such as zooming, rotating, shrinking, and for geometric corrections. Then getting rid of the noise is a crucial step while photo processing is being performed. However noise might also additionally have an effect on the photo segmentation and sample matching. When acting the smoothing process, it's far higher than the unique pixel of the photo.

b) Image segmentation

Image segmentation is the method used to partition a virtual picture into more than one segmentation (units of pixels, threshold saturation and cost). It specifically used to threshold the saturation and cost of the images. The utility of segmentation is to simplify and/or ex trade

the representation of a picture into something this is greater than meaningful\ and less complicated to analyze. It is normally used to discover objects and boundaries (lines, curves, etc.) of the given images.

c) Feature Extraction

In the extraction, especially a few functions are utilized in safety to discover the factitious forex. We used watermarking, latent photo, safety thread, strips, and an identification mark. In the characteristic extraction ROI is used with inside the photo. It is a unique shape of dimensional reduction. If the enter data to a set of rules is just too massive to be processed, the enter data can be converted into a discounted illustration of functions. In the characteristic extraction set the database to the one folder the supply to enter photo to evaluate the database and discover the forex actual or bogus.



Fig.4: Feature Extraction

VI. EXPECTED OUTPUT

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46900/46900 [-----] - 3s - loss: 0.0773 - acc: 0.9765
Epoch 9/20 [-----] - 3s - loss: 0.0711 - acc: 0.9786
Epoch 10/20 [-----] - 3s - loss: 0.0654 - acc: 0.9797
Epoch 11/20 [-----] - 3s - loss: 0.0605 - acc: 0.9819
Epoch 12/20 [-----] - 3s - loss: 0.0568 - acc: 0.9830
Epoch 13/20 [-----] - 3s - loss: 0.0535 - acc: 0.9839
Epoch 14/20 [-----] - 3s - loss: 0.0508 - acc: 0.9844
Epoch 15/20 [-----] - 3s - loss: 0.0481 - acc: 0.9857
Epoch 16/20 [-----] - 3s - loss: 0.0449 - acc: 0.9864
Epoch 17/20 [-----] - 3s - loss: 0.0424 - acc: 0.9875
Epoch 18/20 [-----] - 3s - loss: 0.0400 - acc: 0.9878
Epoch 19/20 [-----] - 3s - loss: 0.0386 - acc: 0.9887
Epoch 20/20 [-----] - 3s - loss: 0.0369 - acc: 0.9890
[INFO] evaluating...
21300/21300 [-----] - 0s
[INFO] accuracy: 98.49%
[INFO] dumping weights to file...
[INFO] Predicted: 6, Actual: 6
[INFO] Predicted: 2, Actual: 2
[INFO] Predicted: 6, Actual: 6
[INFO] Predicted: 1, Actual: 1
    
```

Fig.5: OUTPUT

1. Epoch: Shows that how much number of images are passed.
2. 3s: This means the time taken .
3. loss: Represents the failures.
4. acc: Represents the Accuracy.

CNN (Conventional Neural Network) can be in 2 methods one in sound and another is image. In this paper Image processes used. Image are considered as pixels that represented as dots.

These dots are the RGB color when every pixel is joined, the RGB color is formed. The images have been trained and data has been collected.

More than five layers the feature has extracted and trained..When the pixels are reduced the clarity is reduced and when pixels are increased clarity is introduced. Conventional Neural Layer detects the amount of the currency.

This is done by math pooling. There are data that has been already stored in Validation .This use to check the correction. Weights in Conventional Neural Network is tuned.

VII. CONCLUSION

In this Paper, an Indian coins reputation framework has been proposed. The proposed framework starts with shooting nonetheless pix. Basic photo dealing with techniques like thresholding, noise evacuation, histogram equalization and department are applied to extricate the ROI and inspire the format coordinating method. Correlation primarily based totally format coordinating is applied after that to find out the ROI within the dataset pix. This gadget has been evolved in Mat lab, deep studying CNN and OpenCV library below the degree as well. The Mat lab framework considers offline captured pix while the Android one become deliberate to coordinate visible disabled customers. Live video shooting is taken into consideration for the Android application. This paper furnished an evidence of the usage of the concept switch attending to know for Banknote reputation. Indian foreign money papers have been used for education and checking out to song the community models, particularly Alex net, Google net version, Vgg16 showed a tremendous overall performance in comparison to Alex net and Google net. While Vgg16 carried out the 100% accuracy at the same time as it's far ninety 5 percentage carried out through Alex net and Google net attains 88% of accuracy. In future, after making the very last version which is already skilled with datasets, an app can be made and embed the model offline just so a blind individual utilizing this app profits an interface to the internet on every event they need to understand the notes they`re carrying. This framework will be progressed to apply the classification approach to have a look at the true or overseas cash notes on a low stop flexible cellphone for visually disabled people and tell customers via voice word in local language. In future it is able to be extended to understand overseas cash.

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