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Advanced Image Processing for Authenticity Verification of Banknotes

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Abstract

This study delves into the intricate problem of counterfeit currency detection, leveraging the power of advanced image processing and machine learning techniques. Traditionally, identifying counterfeit banknotes relied on characteristics such as color, width, and serial numbers. However, in the era of cutting-edge computer science and high computational capabilities, this research explores a novel approach with machine learning algorithms, achieving a remarkable 99.9% accuracy in counterfeit currency identification. The methodology encompasses a multifaceted analysis, including parameters like color, shape, and paper width, enabled through image filtering. Specifically, this paper advocates the utilization of the K-Nearest Neighbors (KNN) algorithm in conjunction with image processing for counterfeit money identification. KNN, known for its exceptional accuracy, is a promising candidate for computer vision tasks, particularly well-suited for smaller data sets. The creation of a robust dataset for banknote authentication involved intricate computational and mathematical techniques, ensuring the reliability of the data related to currency attributes. Machine learning algorithms and image processing techniques synergize to process data and extract invaluable insights, ultimately delivering the desired level of precision and accuracy.

Keywords: Image processing, pattern recognition, fake currency detection, duplicate, counterfeit money notes

Introduction

Machine Learning techniques help in building applications that support in detection of currency, through automated system and algorithm. Machine Learning is going to use pattern recognition and image processing for analyzing the real characteristics. The aim of this work is to create a paradigm which can be supervised with the help of related set theory so that it can be further beneficial in with only a few categorization errors, recognising fake datasets. Therefore another name referred as categorizing model grouped as data, consisting of attributes and labels for the bills referring as fake or genuine. Moreover it identifies decision boundaries which seperate samples of two classes.

First, we extract data from photos that were taken from both an original and a copy of a banknote. In regard to digitization, we use camera for printing in terms of inspection. The size of all images have 300x

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300 pixels, this is because of the distance concerning lens and grayscale pictures having targeted some dots per inch to achieve. Properties and characteristics are explored and taken out from images in support of transformation concerning wavelet. Some methodologies that came from wavelet transformation are variance, skewness, kurtosis, entropy of pictures and class relevant to currency.

Among these some are continuous in showing the features of a banknote and some ie. the last one actually the real sign of the banknote, indicates 1 as original and 0 for duplicate. The set theory has 1100 samples, 600 samples for feigned notes, remaining 500 copies for original currency. This work basically aims at observing images taken as input that anonymously based on properties taken out after wavelet transformation and also on the problem based on machine learning. Therefore the processes are continuing with transformation of images. We check their feasibility by testing the data set in respect of set theory, which will be visible but not mentioned in the model, for achieving accuracy. Set of data is given, by using their properties we able to design supervised learning model and using that we classify whether the currency is fake or real. For the values that are not mentioned in the data set, we can search them by applying properties and methodologies.

As some of the properties are continuous in nature, normalization is applied to make the data set in the scope of 0 to 1. We cannot ignore or fabricate any attributes with outliers. In case of applying supervised learning, normalization helps in treating the properties equally and consistently. Other thing is, to establish a benchmark model. It functions as a crude classifier and aids with note recognition. Few metrics are introduced focusing on feasibility and overall classification

The development of colour printing technology has accelerated the production of counterfeit money notes and their mass duplication. A basic laser printer may now be used by anybody to print currency notes with the highest level of precision.In the past, print shops were the only places where printing could be done. As a result, the problem of phoney notes being used in place of real ones has greatly escalated. India has unluckily been plagued by issues like corruption and black money. Also a significant issue is money note counterfeiting.

This prompts the creation of a technology that more quickly and effectively detects fraudulent money notes. The suggested strategy offers a method for examining Indian currency notes. The principles of image processing are used to verify money notes. In this article, several properties of Indian currency notes are extracted. The features of the note are extracted using MATLAB software. The advantages of the suggested system include its simplicity and excellent performance speed. The outcome will indicate if the money note is genuine or not.

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