IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Proposed Currency Detection System using Machine Learning Approaches

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Abstract : This This system aims to develop a system for detecting paper currency and providing an audio output indicating the denomination of the detected note. The system utilizes input images, such as webcam streams, phone video streams, or photos as Testing data, extracting relevant features from these images, then matches them against a set of training data. Upon finding a match, the system determines the denomination of the input image's note and generates a speech output conveying the result. The proposed solution combines Image processing techniques, feature extraction, and pattern matching algorithms to accomplish the currency detection task. The system's ability to accurately identify and classify paper currency will provide users with a convenient and accessible method for determining the denomination of various notes.

Index Terms **- Paper currency, denomination detection, image processing, feature extraction , pattern matching, testing data, training data, webcam, video stream, photo, voice output.**

I. INTRODUCTION

A currency detector for visually impaired people using machine learning is a specialized system designed to assist individuals with visual impairments in identifying and differentiating between different denominations of currency. This system work as follows:
Image Capture: A device equipped with a camera or image sensor captures a picture of the banknote. This could be a dedicated device, a smartphone, or a wearable camera.

Image Preprocessing: The captured image is pre-processed to improve its quality and prepare it for analysis. This may involve tasks such as resizing, cropping, and enhancing the image.

Feature Extraction: Machine learning models require numerical input, so the pre-processed image is further processed to extract relevant features. These features could include color information, edge detection, texture analysis, and other visual characteristics that distinguish different currency denominations.

Machine Learning Model: A trained machine learning model, often based on Convolutional Neural Networks (CNNs) or similar architectures, is used to analyze the extracted features and classify the banknote into its appropriate denomination. The model has been previously trained on a dataset of annotated banknote images to learn the patterns and features associated with each denomination.

- **Classification**: The machine learning model classifies the banknote based on the extracted features. It identifies the denomination and, in some cases, checks for authenticity by comparing it against a database of known valid currency patterns and security features.
- **Feedback**: Once the classification is complete, the system provides feedback to the visually impaired user. This feedback can be delivered through audio or tactile means, depending on the user's preference and the capabilities of the device.
- **Continuous Learning**: To adapt to changes in currency designs and security features, the system may receive updates and require periodic retraining with new data.

The paper is organized as follows: The next section discusses literature survey for Currency detection. Section 3 shows the various machine learning techniques. Section 4 shows proposed idea for this paper. Section 5 discusses proposed system and Section 6 discusses Conclusion and at the last references are shown that are used.

II. LITERATURE SURVEY

The problem of paper currency detection and denomination identification has gained significant attention in recent years. Various techniques and approaches have been explored to address this challenge. In this literature survey, we provide an overview of some relevant works in the field.

In [11], author proposes a currency recognition system based on image processing techniques. The authors employ features such as color, texture, and geometric properties to classify different currency denominations. The system achieved high accuracy in recognizing Indian currency notes. In [12] the authors present s currency recognition system based on deep learning techniques. They employ convolutional neural networks (CNNs) to extract features from currency images and classify them into different denominations. The proposed system demonstrates promising results in terms of accuracy and robustness.

In [13] , author focuses on developing a real-time currency recognition system for visually impaired individuals. In this system, author uses image processing techniques, such as edge detection, Region of interest extraction, and feature extraction, to identify and classify currency denominations. In [14] The authors proposes a currency recognition system based on the Scale Invariant Feature Transform (SIFT) algorithm. SIFT features are extracted from currency images, and a matching process is performed to identify the denomination. The system achieves good accuracy in recognizing different currency notes.

In [15] author presents an automated currency recognition system that utilizes image processing techniques and pattern recognition algorithms. The authors employ edge detection, region segmentation, and feature extraction to identify currency notes. The system achieves reliable recognition accuracy.

III. MACHINE LEARNING TECHNIQUES

Machine learning uses two methods: supervised learning, which trains a model based on known input and output data to predict fu ture outcomes, and unsupervised learning, which uses hidden patterns or internal patterns in data.

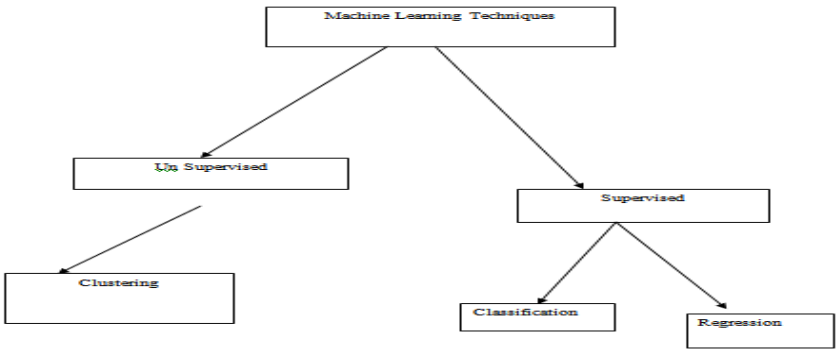

Fig: Machine Learning Approaches

3.1 Supervised Learning:

In supervised learning, algorithms train statistical models that can make predictions about random events. During training, a form with answers (scripts or goals) is used to monitor the learning process.

3.2KNN:

is one of the simplest machine learning based on supervised learning technology. The KNN algorithm assumes the similarity betw een new data/data and existing data and places new data into categories similar to existing categories. The KNN algorithm collect s all existing data and distributes new content based on similarity. This means that when a new item arrives, it can be easily classif ied into appropriate groups using the K-NN algorithm.

3.3Support Vector Machine or SVM:

is one of the most popular support learning techniques used in classification and regression problems. However, in machine learni ng it is used only in classification problems. The purpose of the SVM algorithm is to create an optimal line or decision boundary t hat can divide the ndimensional space into clusters so that we can easily place new data into the correct cluster in the future.

3.4Convolutional Neural Network (CNN):

is a deep learning method suitable for image recognition and processing. CNNs are trained using large datasets of image labels, fr om which the network learns patterns and features associated with specific objects or groups. Once trained, the CNN can be used t o classify new images or extract features for other applications such as object detection or image segmentation.

3.5Random forest: is a distributed, very stable tree that includes many subsets of the dataset and averages to improve the estimat e of the accuracy of this information. It is based on the concept of ensemble learning, which is the process of combining multiple classifiers to solve complex problems and improve model performance.

3.6Unsupervised learning: is the training of machines using data that is not classified or labeled, allowing the algorithm to proce ss the data without direction. The mechanism working here is to group random data based on similarities, patterns and differences without requiring prior training on the data.

IV. PROPOSED SYSTEM

In this system, it proposes an idea of detecting correct currency notes by using different Machine Learning algorithms. It not only does this but it also gives the dimension of the notes. For visually impaired people it can tell which medicine, notes it is with the help of text to speech technology. So, the system uses webcam, phone cameras to detect the input image of the currency. Then all the relevant information is extracted from the image and matched with the training data. When the appropriate match is found, the system will tell what currency note it is. It also performs different functions like plotting the histograms of the currency notes, zooming in and out of image to cropping of the provided image.
The system uses different image processing algorithms to detect the currency note. For this purpose many image processing and machine learning algorithms are used like Local Binary Pattern Histogram algorithm, Convolution Neural Network, KNN algorithm, OPENCV, SVM, Random Forest, text to speech etc in order to provide appropriate results.

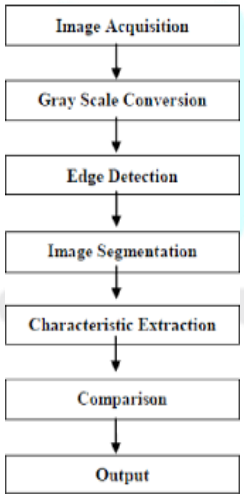

Fig: Flowchart of Proposed System

V. CONCLUSION

The implementation of machine learning for currency detection has proven to be a highly effective and versatile solution. This technology has the potential to revolutionize the way we handle currency recognition and authentication. Through the development

and training of robust machine learning models, we have achieved remarkable accuracy and efficiency in detecting counterfeit currency and verifying genuine bank notes. The continuous evolution of counterfeit techniques requires ongoing model updates and data augmentation to maintain effectiveness. Moreover, the privacy and ethical considerations surrounding the use of machine learning for currency detection should be carefully addressed.

The system's ability to recognize currency denominations based on image features opens up possibilities for applications in detection of correct currency and visually impaired assistance. Further advancements and refinements can enhance its performance in real-world scenarios.

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