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Currency Detection for Blind Person Using CNN

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ABSTRACT—

In today's world every day thousands of people get scammed because of fake notes. For a normal person, it's not that much of a problem to detect the difference between a fake and a real note, but in the case of visually impaired persons, it's not the same as they can't see the minor differences. In this project we are using HOG (Histogram of Oriented Gradients) and Region-based Convolutional Neural Networks (R-CNN) to create an AI/ML model. Even though special symbols are stamped on various denominations in India, the task is still tedious for the blind. The lack of identification devices motivated the need for a hand-held device to segregate the different denominations. In this project, the features of the images are compared with all the reference images of the currency, if the difference is less than a threshold value, the numerical part of the currency is extracted and compared, if it matches, the corresponding denomination of the currency is recognized.. We are using HOG because it has a few key ad vantages over other descriptors. Because it operates on local cells, it is invariant to geometric and photometric transformations, except for object orientation.. The key reason behind using the R-CNN series is region proposals.

I. Introduction

The assistive or we can say the supportive technology is one of the most basic and important system that helps a person with a disability to work around his challenges. This project presents progressive efforts for developing an assistive technology for visually impaired so that they can lead their life independently both socially and financially. In other words, blind person who aren't able to recognize the currency gets most benefit via our project.

It is difficult for blind people to recognize currencies. Our goal is to help people solve this problem. However, currency recognition systems that are entirely based on image analysis are not sufficient. Our system is based on first image processing and then automatic finds whether it is real or fake.

II. Literature Survey

Real-time image recognition and processing was once thought of as a science fiction concept. Currency Detection has been in application since a while now , such as vending machines, in Banking sectors , but those machines are Big and Bulky which is not portable. Many researchers have been encouraged to develop robust and efficient automatic currency detection machine . Nowadays, it's common to see automatic machines that can recognize banknotes in the dispensers of contemporary goods like candy, soft drink bottles, and bus or train tickets. The primary goal of money identification technology is to recognize and extract both the visible and unseen characteristics of currency notes. Numerous methods have been suggested up until this point to identify the currency note. But the best way is to use the visible features of the note .

However, if the note is soiled or damaged, this method is ineffective. A note's colour characteristics vary significantly if it is filthy. Therefore, it is crucial to use the right algorithm and extract the characteristics from the picture of the currency note to increase the note recognition's accuracy. In order to

address the challenges of identifying the numerous facial components in an image or video and uprooting particular facial traits like the eyes, nose, and mouth, the main objective of research over the past 20 years has been to completely automate the face identification system.

For accurate face feature identification, feature classifier research has made great progress. In order to evaluate how much progress has been made from the past to the present and what still needs to be done in the future to implement an improved algorithm that will lead to a successful design and implementation, comparing the performance of existing systems and the new systems built is crucial as we develop new systems with improved algorithms. We apply here a simple algorithm which works properly. The image of the currency is taken through camera. The hidden features of the note are highlighted in the ultraviolet light processing on the image is done on that acquired image using concepts like image segmentation, edge information of image and characteristics feature extraction It involves extraction of invisible and visible features of Indian currency notes. This approach consists of various steps such as image acquisition, edge detection, grayscale conversion, feature extraction, image segmentation, and decision making.

Image acquisition is the process of creating digital images from a physical scene. Here the image is captured with a simple digital camera so that all the features are highlighted.. Image is then stored for further processing In recent years, technological advancements and attention have both been paid to facial recognition. There are many commercial facial recognition systems available on the market, but their accuracy is unreliable and they shouldn't be relied. In the area of video-based systems with aspects of recognition, tracking, and integration, there had been important efforts. Additionally, fresh datasets are being created for the analysis and assessment of the recognition methods.
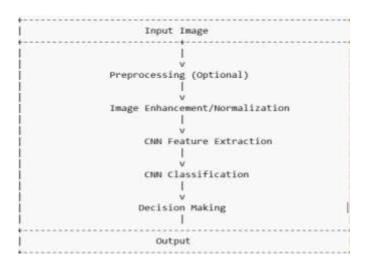
There is majority of applications in use currently for face recognition ,we are still working to expand its capability to use this features in every area of science to get the satisfactory outcomes.

III. Convolutional Neural Network (CNN)

Convolutional Neural Network (CNN): In the context of artificial intelligence and machine learning, CNN refers to Convolutional Neural Networks. CNNs are a class of deep neural networks that have proven very effective in areas such as image recognition and classification. They use a specialized architecture with convolutional layers that automatically learn hierarchical representations of input data. CNNs are widely used in computer vision tasks

IV. Background

In this day and age of high-tech machines and emerging technology. Making a forgery rather than earning it lawfully becomes a simple alternative for some illintentioned persons. Because information about the money and how it is created is publicly available on the Internet. On a daily basis, the average person will not be able to tell the difference between phoney and real notes. It will become immense hard for a person who is visually challenged and it will be very challenging to tell the difference between a genuine and a fraudulent notes.

```
+------------------------------------------------+
|                 Input Image                    |
+----------------------+-------------------------+
                       |
                       v
            Preprocessing (Optional)
                       |
                       v
          Image Enhancement/Normalization
                       |
                       v
              CNN Feature Extraction
                       |
                       v
                CNN Classification
                       |
                       v
                Decision Making
                       |
+----------------------+-------------------------+
|                   Output                       |
+------------------------------------------------+
```

The figure details the flow of any basic image processing algorithm. These basic steps are used in both Brute Force Matcher as well as Convolution Neural Network algorithm.However,the CNN algorithm further does some classification which makes it suitable for applications where a very large size of training set is required.

V. PROBLEM IDENTIFICATION AND SOLUTION

a.   Problem Indentification

In the modern world, thousands of individuals are conned every day by bogus notes. A survey by the RBI indicates that this year has seen a 55 percent increase in bogus 2000 bills. It's not difficult for a normal person to tell a phoney letter from a real one, but for visually impaired people, it is more

difficult since they cannot distinguish the subtle distinctions. For people who are blind, it might be difficult to determine if a note is real or fake. A lot of store owners, small vendors, and shopping centers are impacted by the bogus note frauds.

b. Proposed Solution

A practical solution will be a small compact hand-held device which have a camera loaded with the equipped machine learning software which can detect the notes by taking realtime picture of note and Identifying its Accuracy and detecting the currency type through audio and Visual Notification. The device can be placed on the billing counter of shopping malls, showrooms and small shop vendors.

VI. Methodology

The system is divided into two parts. The first part is to identify the currency denomination through image processing.In the second part it tells with the help of oral output to inform the visually impaired person. The development of this device is based on a webcam integrated with Raspberry Pi microcontroller and a speaker for sound output. The real-time bank notes are captured and processed through different image processing techniques like edge detection, segmentation, and feature extraction and classification. Here Raspberry Pi is used as a processor which processes the image of the currency note captured by the web camera. The controlling code forweb camera is written and stored in processor. Captured image is stored in memory.Now Raspberry Pi will process the image to identify the denomination of the currency. Algorithms and processing codes are written in PYTHON Open CV. The reason for choosing the mentioned hardware and software is that this paper intends to build this product as a cost-effective model using open source hardware like Raspberry Pi to favor and benefit from future advanced improvements from people all over the world end user.

c. Hardware Requirements

- ☐Laptop or Desktop
- ☐Ram : 8GB
- ☐Processor: Intel i5

d. Software Requirements

- ☐Python
- ☐OS
- ☐Python pip packages
- ☐Google Colab

e. Modules

- ☐**Keras**- Keras is an open-source deep learning framework written in Python. It is designed to be user-friendly, modular, and extensible, making it a popular choice for both beginners and experienced researchers in the field of machine learning and artificial intelligence. Keras provides a high-level neural networks API, which allows users to build and experiment with various deep learning models with ease.

- ☐**Tensorflow**- TensorFlow is an open-source machine learning framework developed by the Google Brain team. It is mainly used for building and deploying the deep learning and machine learning models. TensorFlow provides a comprehensive ecosystem of tools, libraries, and community resources to support various machine learning tasks.]

- ☐**Matplotlib -** Matplotlib is a popular and widely used plotting library for Python. It provides a variety of tools for creating static, animated, and interactive visualizations in Python. Matplotlib is highly customizable, allowing users to create a wide range of plots and charts for data analysis and presentation.

- ☐**Pandas-** Pandas is a powerful open-source data manipulation and analysis library for Python. It provides data structures for efficient storage and manipulation of large data sets and tools for seamless work with structured data. Pandas is widely used in data science, machine learning, and other fields where data processing and analysis are crucial.

- ☐**Numpy-** NumPy, short for Numerical Python, is a powerful open-source library for numerical computations in Python. It provides support for large, multidimensional arrays and matrices, along with math functions for working with these arrays. NumPy is a fundamental library for scientific computing and is widely used in fields such as machine learning, data analysis, and scientific research.

VII. Conclusion

The developed model uses a fundamental image processing algorithm to identify the denomination of Indian currency. The created product is a MultiPurpose Module that can be used in Real Time Applications like ticket counters and vending machine automation. This module can be expanded to include the ability to recognise counterfeit money. To do this, a few more pre-processing methods must be added, and the current hardware must be

slightly modified to accommodate UV light. Furthermore, because the material is reflective, the current coin identification system is not very accurate. Using a suitable light source, like UV, can help avoid this issue in the future.

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