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Coin Sum Counter from an Image

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Abstract: The purpose of our paper is to recognize the coins which exist in the picture taken by the following user, which will be of Indian National Rupees. Almost every sacred place or some tourist place present in India has a charity/donation box. So the partition or segmentation of such coins requires a lot of people or manpower and therefore for that purpose the whole process must be automated so that it can be more efficient as well as reduce time consumption. We will organize and classify them based on the following classes specified by the user while making the model and then calculate the accumulated or total sum of the INR coins. Features of newer Indian coins are also considered. The proposed approach is to use the image classification model to classify the INR coins from the image and use Edge Detection, Gaussian Blur, and other techniques to correctly identify the edges of the coins as well as to find out the denominations of the coins. The implementation of this classification is written in Python and the dataset is taken from Kaggle.
Keywords: Classification, Calculate

I. INTRODUCTION

As arranging coins is a very long delayed process and the nonautomatic method is not very effective. In some places around the world, there are many charity/donation boxes that contain lots of coins, etc. So it's a very laborious process which is a very tedious task for a human being to do. In some banks also there are counting machines to count the money but if a customer wants to pay or submit a large amount of money then the employees working at the bank will definitely make mistakes in calculating the total amount of the money. And also it can be very difficult to distinguish between different coins using human eyes for a large number of coins. So this is a system that will automate this process of separating the coins and will count the sum from them. This will provide more accurate and efficient results. For having a high amount of accuracy the dataset used for training and building the model must contain a lot of images so that the model which is used in our project must be able to correctly identify the coins. For that purpose, it is necessary to have a lot of sharper and high definition images. Teachable machines allow us to easily create/train Machine learning-based models so that a user can use that model efficiently in their respective project. Users can set the epochs, batch size, and learning rate for making the model more efficient. It allows the programmer to import the code into their model easily.

A. Problem Statement

The project aims to recognize the coins from the Indian currency system and count the total value in terms of Indian National Rupees i.e. INR. The system will use various edge detection algorithms and methods. Various features of the newer Indian coins will be considered during the making of this project. There will also be a smoothing algorithm for the image to make processing easier. Our approach for this particular project, first we will build a neural network model (image model) and then train that particular model to classify the different types of coins. This model will be able to classify Rs. 1, Rs. 2, Rs. 5, Rs.10, and Rs. 20 coins.

B. Objective

1) From a given picture, recognise the total coins present inside the picture.
2) Classify the present coins into their respective categories.
3) Calculate the total sum of the coins present in the picture.

C. Project Scope

1) To recognize and match the Indian coins, finally count the total number of one rupee, two rupees, five rupees, ten rupees, and twenty rupees coins.
2) To decrease human labor by creating an automated system.
3) To count each coin and display the total sum of coins from an image.
4) Less time consumption.
5) To provide more accurate results.

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D. Purpose

The coin classification process done manually, is a very tedious process and is often time-consuming for a large quantity. There is also a high possibility of mistakes and errors which would result in a wrong calculation.

This program will make this process easier and very fast. It will also be more accurate and efficient.

1) The purpose of this project is to recognize the coins and to find the total sum of the coins within a shorter period.
2) This program will create an automated system to avoid the manual method of calculating the total sum of the coins.
3) To provide a user-friendly environment for calculating the overall sum of the coins.

II. LITERATURE SURVEY

There have been several approaches regarding the identification of coins of various denominations. A lot of criteria such as the diameter, appearance, leverage, coin dimensions, coin average gray value as well as depth are considered to recognize and analyze the coins from various denominations. Programming languages such as C++, Python, Java, C#, C, MATLAB, etc were also used.

Fukumi and others made a structure on the basis of rotation-invariant neural nets and it was made for Japanese coins [3]. Invariance was accomplished by an initialization step and serving of the results in a neural network. There was a flaw in this approach, the neural nets took too much time to train. Davidsson [2] also made several comparisons, mainly using decision trees and Bayesian categorization. He worked on an algorithm based on a decision tree to gain or deny the coins. But it was hard to enlarge the perspective of the image. An alternative approach based on Knowledge Discovery and ANN was proposed by Velu C and others. The characteristics of aged coins and current coins of dissimilar sizes are examined for sorting. Numerous boundaries were contemplated [6]. Adameck and others. bestowed a scheme on the acknowledgement process based on the depiction of the color [1]. A method that labels coin fragmentation hinged on gray values or RGB values is made by P. Thumwarin together with Petra Perner [4]. Neural networks have been recycled in the evolution of intuitive arrangements that profess ornamented identification and item identification. Coin recollection by tools reckons nowadays on the judgment of the physical parameters of a coin. An intuitive coin recollection scheme that uses coin ornaments for recognition aids precludes indecision in the middle of unalike coins of comparable bodily attributes. This decoration advances a rotation-balanced Intelligent Coin Identification System i.e ICIS that uses a neural net and sample containing gyrated coins by 15°. Adnan Khashman et al. [5] handed over ICIS in 2006 which used pattern averaging and neural networks for fetching coins. To determine the INR coins of unalike values and to add up the accumulated worth of INR coins [6]. The purpose of this work is to filter out recently issued INR coins. It is to filter out into denominations and calculate the accumulated (total) value. INR Coins concerning INR [1,2].

Suchika Malik and others in 2014 proposed an Indian Coin Currency Reorganization model in which they utilized ANN. They incorporated grades of Indian coins as 1, 2, 5, 10. This mechanism can recall coins from one or the other face of the coin. Pattern Meaning, Hough Modification, and other formulae are made use of in order to draw out the qualities of several frames, which are then furnished as input to the directed Neural Network. They encouraged a proposal that brings about an edge map using Canny Edge before sensing the coins and establishing their radii using Hough Modification. The authors flourished a scheme for recalling Indian Coins based on a frame deduction strategy [7].

Rahele Allahverdi and others in 2012 progressed a Discrete Cosine Transform-grounded coins grouping innovation for Sasanian coins. There are primarily three steps that make up the entire process: Pre-processing, this step's requisite intent is to call attention to the currency from the crowded legacy frames. DCT is used to draw out competencies inside the second step. In the end, coins are stamped using a Vote Casting perspective at which point every Binary Classifier polls for one of the directives [8].

LJP van der Maaten et al. in 2006 presented a coin recollection system "Coin-O-Matic" [9], which was built to arrange varying coin collections. In order to recall coins, Coin-O-Matic makes use of a blend of coin frames and data with triggers.

Vaibhav Gupta and others formulated a clarification for recalling Indian coins based on the frame deduction technique in 2011 [10]. The process scrutinizes the inserted coin frames three times. Primarily, the radius is ascertained using the supplied frame. The radius is then used to adopt a check frame from the schema. Later, among the items and the trial snap, rough frame elimination is terminated. If the provoked image's minima are tinier than the set turning point, superb frame decrement is carried out in the middle of the trial snap, and the item is enforced; or else, a new trial snap is picked out. Eventually, popularity is acclaimed by means of outstanding frame deduction. Shatrughan Modi in 2011 put in a mechanized Coin acceptance gadget based wholly on an ANN [11] for the popularity of Indian coins with measures of 1, 2, 5, 10. Due to the certainty that snapshots were taken from both sides of the coin, this gadget was skilled at recalling coins from both sides. Hough Modification, Sample Meaning, and other schemes were taken advantage of in order to deduce traits from snapshots. The reclaimed purposes are then redirected into a Neural Community that has been tutored.

Prashanna R. R. worked on a Machine Vision based process, where he separated the coins and counted the coins [12]. The attributes of coins like the size of the color, coins, etc. were taken from the Government of India website. The course utilized in this model was an embedded system, made up of a LabVIEW regulator, used to control the whole system. It had entailed the system with a shaker grill followed by the distinguishing path. The distinguishing path had a digital camera utilized to snap the image of every coin and compare the snapshot with the test image and actuate a servomechanism for the distinguishing process. It involved the use of Infrared sensors to sum up the potency of each measure and had a LCD display in order to encase the result.
A. Salehittal, V. D. Shetti, M. M. Naik, and V. S. Sharanya developed a project where they used edge detection techniques to detect coins [13]. Pooja Jutur, etc also designed a system where they also took care of currency notes in their project using various techniques [14].

III. SYSTEM DESIGN

System Design is one of the most hypercritical factors affecting the quality of Software. By system design we can reduce inconsistencies and speed up our process. Once the design phase is completed and approved then the development team starts working on the maturing part. This phase helps in finding the solution to a problem by building an architecture or model. It is a means to find the result of the project. Basically, it will focus on the working of the project. The output of this phase includes UML diagrams, flow charts, prototypes, etc.

IV. PROPOSED APPROACH

This journal entry aims to recollect the Indian coins and enumerate the total number of Rs.1, Rs.2, Rs.5, Rs.10, and Rs.20 coins. There are a lot of techniques to recognize coins. We will use edge detection techniques to match the coins. And at last, we will compute the overall value of the coins present in the picture. The images before going through the neural network will be preprocessed separately. The result will be displayed in the program which reduces the need for manpower and at the same time, it also increases the accuracy.

V. ARCHITECTURE DESIGN

A. Acquire Color (RGB- Red Green Blue) Image of the Indian Rupee Coin

We will obtain an RGB Image of the coin by using a camera and this RGB image will be taken input in the next phase.

B. Convert to Grayscale Image

In order to convert an image from one BGR image to an RGB image or vice versa. We use the cvtColor() method. Now, this RGB image will be converted into GrayScale by cvtColor() method. cvtColor() function is available in OpenCv.
Parameter: cv2.COLOR_BGR2RGB – BGR image is converted to RGB

C. Apply Gaussian Blur to the Image

In order to mute the noises from an image, we use Gaussian Blur. It is a non-uniform low-pass filter which conserves low spatial frequency and reduces the noise from the images and negligible details.
GaussianBlur() is a function given in OpenCV through which we have implemented this feature into the system.

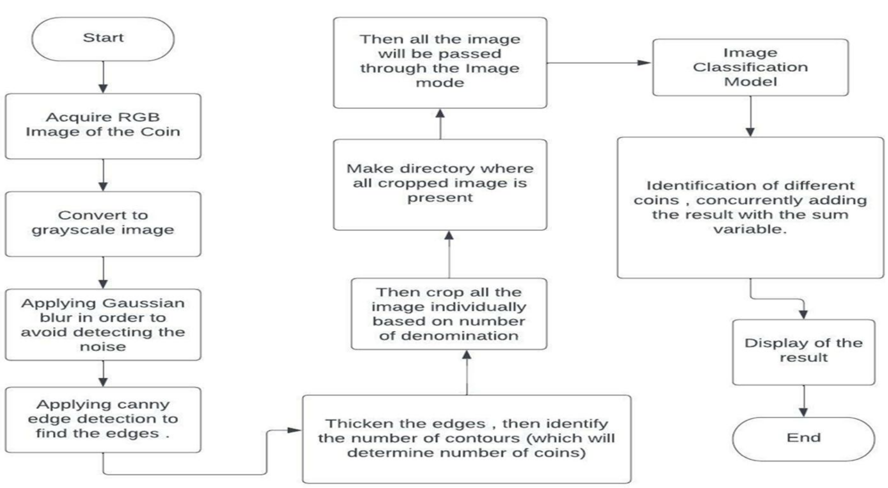

Fig 1.1 Architecture of Coin Sum Counter From An Image

D. Apply Canny Edge Detection

After Gaussian Blur we use Canny Edge detection technique to find out wide ranges of edges in the image .
We use this detection technique to extract useful information and reduce the amount of data to be processed.
canny() is a function in OpenCV through which we implement these features into the system.

E. Edge Thickening and Identifying Contours

After Canny edge detection gives the result highlighting the edges, the edges are thickened in order to better work with the image.
OpenCv has a findContour() function that helps in extracting contours from the image.
After identifying the contour we use the length function to determine the number of contours.

F. Crop the Image

In order to make all the images equal in resolution, all the images are cropped into a particular resolution such that it works properly with the system.

G. Make Directories

After cropping, the images are sent into the directory which will later be passed through the model.

H. Image Classification Model

The image classification model assigns classes for images of coins which helps in classifying images of coins of Rs.1, Rs.2, Rs.5, Rs.10, and Rs.20. It helps in recognizing the coins based on some features. This model only extracts top-side features and classifies the images using a neural network. This model makes class 0 for five rupee coins, class 1 for one rupee coin, class 2 for ten rupee coins, class 3 for twenty rupee coins, and class 4 for two rupee coins.

VI. RESULTS

The ultimate goal of our project is to determine the total sum of coins. Firstly, we determine the number of coins and then determine the total sum.
We have prepared a project where we can recognize all the coins of the INR present in a picture and provide an overall sum as an output.

VII. FUTURE SCOPE

1) To make the model more practical, different varieties of currencies can be introduced including foreign currencies .
2) Paper currencies can also be used.
3) A much larger dataset will help in getting a more accurate result.
4) Can be used in vending machines, banks, cash counters, etc.
5) Could be used by visually impaired people using some kind of device.
6) A mobile application could be developed to make the user experience easier.
7) The system can also be ameliorated to work for a stack of coins.
8) It can also be upgraded to work if the coins are scattered.

VIII. CONCLUSION

1) This system completely replaces the laboring method of finding the overall sum of the coins.
2) It will take very less time to recognize the coins and find their total sum.
3) It can be used in donation boxes, temples, etc where counting the coins is a rugged task.

IX. CONTRIBUTIONS

A. Tarang Kushwaha

Managing Project
Building the model
Architecture

B. Ujjwal Verma

Literature Survey
Result analysis

C. Tanya Chaubey

Dataset
Model
Methods

D. Tanmay Tibrewal

Future Scope
Conclusion
Proposed Approach

X. ACKNOWLEDGEMENT

This is to certify that the research, design, development as well as implementation has been made by all the group members of IMS Engineering College, Ghaziabad.

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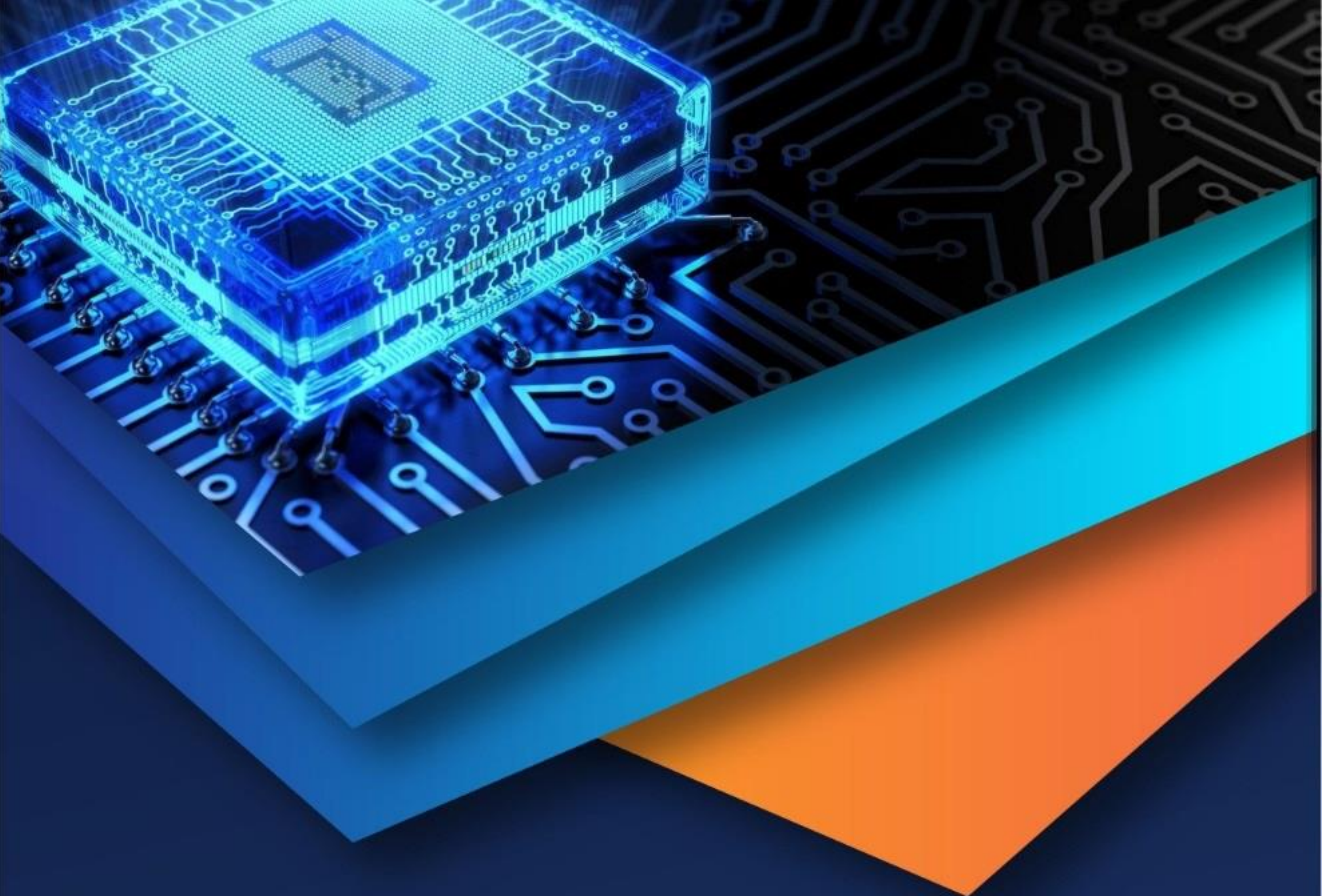

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