PERFORMANCE ANALYSIS OF SMART SYSTEM FORCOIN SORTING AND COUNTING

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Abstract: A coin sorter and counter is used to sort random collection of coins into separate bins for various denominations of coins like 1,2,5 rupee coins. More human intervention is required to separate such coins and hence it could be automated and as a result it improves efficiency and reduces the time consumption in the process. The subject of this paper is a survey on coin sorting and coin counting using different controllers by comparing the performance andlimitations based on the mechanism involved.

Keywords: Arduino UNO, Maker NANO, Raspberry PI.

I. INTRODUCTION

More human intervention is required to separate the currency coins. This is not reliable for today's fast world. So, we have to take corrective actions against this process. Sorting of coins is a very time consuming and boring job. There are some machines available to count the currency notes, but they are not suitable for this purpose.

The manual method of counting the coins does not have any recording device for future usage. This may make mistakes to calculate the total value and number of one rupee, two rupee, five rupee, and ten rupee coins used. Some coins look similar so sometimes it is difficult to distinguish them by using human eyes, especially for large amount of coins [1]. This time taking process will also need automation. Automation with flexibility provides efficiency and accuracy. It does not need any human intervention.

Coins are sorted according to the diameter. Counters are used for counting. The counted values are displayed on the digital display for recording purpose. This reduces the man power and increases the level of accuracy. Sorting and counting coins is an activity that demands accuracy, security and reproducibility.

II METHODOLOGY

Operation using Arduino UNO

The function of the coin selector is to determine the denomination of coin as well as to forbid any fake or invalid coin.The parameters like dimensions and outlook of old and new coins of different denominations are considered for classification. It is further processed using digital image processing technology. Various algorithms like edge detection, template matching, object tracking etc. are implemented and the coins are identified.

There are sensors attached to the end terminal of the conveyor to count the coins in each denomination. The counted coins are displayed on a LCD display, by which the value can be acquired. All the operation performed by microcontroller and their special purpose firmware which is written in embedded 'C' code by using Arduino IDE[2].

But when the customer wants to pay a large number of cash into the bank, bank staffs may make mistakes to calculate the total value and number of one rupee, two rupee, five rupee, and ten rupee coins used. Some coins from different foreign currency look similar. So sometimes it is difficult to distinguish them by using human eyes, especially for large amount of coins. Moreover, because of the globalization, the banks often receive foreign currency that the staff may not recognize. The charities face the same situation as the bank, because the donators come from all over the world. So it is necessary to develop a system that can help them to recognize and calculate the money that they receive. As well as this time taking process will also need automation. Automation with flexibility provides a good result. Automation provides efficiency and accuracy [3]. It does not need any human intervention. Coins and currencies are separated at the time of insertion of donation itself

Operation using Arduino NANO

The Marker NANO is an Arduino Based Microcontroller. Maker Nanoboardhas 12 x LEDs, 1 x programmable push button, and 1 x piezo buzzer. Infrared sensor modules which are placed inside the slots are used to detect the coins. Eachtime a coin falls in the slot, the respective infrared sensor detects the coin. The Maker Nano board is programmed such that it increases the count for each coin falling in the corresponding slot. The infrared sensor detects the coin, Maker NANO increases the coin count and an LCD display is used to show the coin count[4].

The permanent magnet is normally placed on the side of the coin path and thelocation of the magnetic sensor is directly opposite to the permanent magnet [5]. Aconstant magnetic flux and magnetic field strength is generating across the coin path. When the coin passes and go through the path, the coin will vary the magneticflux density, so that the initial form of the magnetic flux density in the space has been changed, and this resulting specified change of the magnetic sensor will instantly induce the electromotive force (emf) [6].

Operation using Raspberry PI

The operation consists of the following 7 steps as followsStep 1: Read input image

Step 2: Convert input image into grey scale image

Step 3: Extract Features such as histogram, color feature and shape of the coinStep 4:

Perform normalization

Step 5: Apply machine learning algorithmStep 6: Perform class detection

Step 7: Update count in server

This system utilizes the digital image processing template matching algorithm, by which the value of the coin is identified. It also makes use of the edgedetectionalgorithm to detect the edges of the coins and counts them if the coin is turned up-side down and displays it on a digital monitor. It also matches color of the coin to segregate coins, as the new 1 rupee and 5 rupee coins are more or less similar in size [7]. Coins are sorted according to their diameter. Counters are used for the counting purpose [4].

III. RESULTS

Parameters	Arduino UNO	Arduino NANO	Raspberry PI
Speed and Accuracy	Speed and Accuracy cannotmeet the currentrequirements.	Speed and Accuracy ishigh.	Speed and Accuracy is veryhigh when compared with other.
Design complexity	The design is more complex asit requires more hardware components	It does not require more components thanUNO.	The design is not complex as it contains all inbuilt in it.
Cost	It is less expensive whencompared with others.	The cost is higher than UNO but lesserthan RaspberryPI	As it contains advanced component s it is more expensive .
External Interfacing	This design requires moreexternal interfacing	This design requires less external interfacing	This design doesnot require any external interfacing.
SD card	It does not haveany SD card facility.	It does not have any SD card facility	It contains inbuilt SD card.
Cloud Computing	This design doesnot contain any cloud computingfacility.	It does not contain any cloud computingfacility	This design contain cloudcomputing facility
Programming Language	It uses EmbeddedC code using Arduino IDE.	It uses Arduino coding using C.	It uses Machine Learning Algorithm.
Sensors	It uses IR sensorsfor detecting the coins.	It uses IR sensors for detecting the coins.	It uses metalsensors for detecting the coins.

IV. CONCLUSION

An automatic coin sorting and counting machine is more efficient with high performance by using Raspberry PI Controller and it uses many advanced technologies and advanced programming. It is more expensive and the coin sorting and counting machine does not require this much advancement. The Arduino NANO is the controller which meets all requirements and it is more suitable in present generation and it is less expensive when compared with Raspberry PI.

The intent of this paper is to identify and matches the Indian coins, finally count the number of one rupee, two rupees, five rupees, and ten rupee coins are used. There are various techniques are there to matches the coins. In this system Edge Detection technique was used. That is to have computer read the image and matches the coins. Finally count the total value of the coins. Techniques involved are image color segmentation, edge enhancement, edge detection, blob measurements, Hough transform. The proposed system utilizes the digital image processing template matching algorithm, by which the value ofthe coin is identified. It also makes use of the edge detection algorithm to detect the edgesof the coins and counts them if the coin is turned up- side down and displays it on a digital monitor. It also matches color of the coin to segregate coins, as the new 1 rupee and 5 rupee coins are more or less similar in size. Coins are sorted according to their diameter. Counters are used for the counting purpose.

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