

Coin Separator and Counter

Mr. Raj Mayekar¹ Mr. Uddesh Patil² Mrs. Riddhi Wasurkar³

^{1,2,3}B.E. Students

^{1,2,3}Department of Electronics and Telecommunication Engineering

^{1,2,3}Finolex Academy of Management and Technology, Ratnagiri, Maharashtra, India

Abstract — A coin sorter is a device used to sort randomly collected coins from different containers for coins of different denominations. Coin sorters are currency specific to certain countries because different currencies often dispense similar-sized coins of different denominations. More human intervention is required to separate these parts, so they can be automated, increasing efficiency and reducing time consumption in the process.

Keywords: Coin Counting, Sensor, Servo Motor, Raspberry Pi, Coin Recognition.

I. INTRODUCTION

The coin sort sorts different collections of coins into different containers. The in-sorter is specific to the currencies of certain countries because these countries issue coins of the same size for different denominations. Most coin sorting is equipped with a display that can show either the number of coins sent through the machine or the value of the coins.

A "Coin counter" means a device simultaneously sorts and counts coins or only co-units of pre-sorted coins of the size. Greater human intervention is required to separate coins that fall into coin boxes (jars). It's not reliable in today's fast-paced world. Therefore, we need to take corrective action on this process. Some machines can be used to count bills, but they are not suitable. Some machines sort is a very time-consuming and tedious job.

The manual method of piece counting does not have a recording device for later use. This happens not only in temples but also in banks that deal with more coins and currency. Automation today in our country, every area needs automation. And this time-consuming process must also be automated. Automation with flexibility gives good results. This will provide a solution to the process.

There are machines that sort and count coins, but they have to be done by hand and won't fit in donation boxes. Temple people have to spend more time separating the coins, and now these traditional machines can't do it. They are tired of this constant work.

Automation offers efficiency and precision. It requires no human intervention. Reducing the time spent manually separating coins and change. The coins are then sorted according to their diameter. Counters are used for counting purposes. The count value is displayed on the screen for recording. An electronic controller acts as the brain of the system, controlling the sequence of operations. The excellent interface of mechanical components with electronics makes it an efficient mechatronic system. This reduces labor and improves accuracy.

II. OVERVIEW OF THE EXISTING SYSTEMS

Coin detection is an interesting research topic and experts have tried various coin detection methods. Some coin detection methods are referenced below:

1) A number of techniques are used to differentiate coins of this denomination. Parameters such as size, weight, and material are used as parameters to analyze and identify coin denominations. C, C++, C#, Java, Python, and other programming languages. is also used.

Some machines count coins individually. But they are not suitable for our application domain. These machines also require some labor to operate. In most places and temples, coins and change are separated and counted by hand. It is a three-step process that involves first collecting a mixture of coins and currency denominations, then separating them into coins and banknotes, and finally counting them and listing the denominations for use future.

The aim of the work of Velu et al. is a classification of recently issued Indian coins of different denominations and calculate the total value of Indian National Rupee (INR) coins. The system combines Robert's edge detection method (93% accuracy), Laplacian or Gaussian edge detection method (94% accuracy), Canny edge detection method (97.5% accuracy), and a multi-step counter propagation (ML-CPNN) based neural network (99.5% accuracy). Parameters such as shape, size, surface, weight, etc. were considered and Matlab was used as a support for simulation and obtaining results.

If the note is real, an artificial neural network is used to calculate the denomination of the currency. There is a DC gun for the sorting process.

Data on size, color, etc. coins were collected from the Indian government website. The approach used in this model is an embedded system consisting of a LabVIEW controller that controls the entire system. It is a vibrating grid system followed by a separation path. The separation pad has a digital camera that captures an image of each part and compares it to the template image and activates a servo mechanism for the separation process. It involves counting each denomination using an infrared sensor and a liquid crystal display as the display unit.

2) In the automatic coin sorting and counting machine, after inserting the coins, sorting is performed according to the size of the coins. The infrared sensor detects the coin, Maker NANO increments the coin amount, and uses the LCD screen to display the coin amount. This eliminates the manual work of sorting and counting parts. This project is used to sort and count Indian coins like 1 rupee, 2 rupees, and 5 rupees.

3) Data on size, color, etc. coins are collected from the Indian government website. The approach used in this model is an embedded system consisting of a LabVIEW controller that controls the entire system. The output of this phase is the design document. Design activities are

usually divided into two distinct phases. These are system design and detailed design.

- 4) The purpose of the design phase is to plan a solution to the problem specified by the requirement document. The design of a system is perhaps the most critical factor affecting the quality of the software and has a major impact on the later phases, particularly testing, and maintenance. The output of this phase is the design document. The design activity is often divided into two separate phases. They are system design and detailed design.
- 5) This design uses low-cost hardware and open-source software to achieve the goal. Raspberry Pi 3 and PC are used as a control units. The proposed system comprises a conveyor belt driven by a stepper motor and an arrangement of pulleys. Items are fed from one side of the conveyor belt. The pulley that drives the belt is called the driving pulley and the end pulley is called the idler pulley. The USB camera is used for continuous monitoring and object recognition. The recognized objects are classified by an actuator, which can be a linear actuator or a servo motor.

This design uses low-cost hardware and open-source programming languages and image-processing libraries to achieve the purpose of object classification. The processor is used to process images from the webcam and a Raspberry Pi 3 with a Linux operating system is used as the control unit to drive various hardware devices. The CPU acts as a server and the Raspberry Pi acts as a client. When an object detects a specific object, the CPU will send a command to the Raspberry Pi. The Raspberry Pi client will receive the command to execute the corresponding script to drive the stepper motor according to the detected object. The server and client model separates software and hardware operations and will speed up the process in real-time.

- 6) Proposes a character recognition method and separates the value of recognized coins from the total value.

III. SYSTEM OVERVIEW

The coin separator is typically found in areas such as coin vending machines in public areas. The role of the coin selector is to determine the denomination of the coins and to prohibit any counterfeit or invalid coins. The operating time to locate each part is slow in the manual method. Consider the size, appearance, and other parameters of old and new coins of different denominations for classification.

The system has a hopper attached to the vibrator base plate. It consists of a blower unit that blows banknotes that can be mixed with coins. There is also a shaking grid to arrange the coins in a linear pattern and drop them one by one, which are collected below. There is a screw extruder and the parts are removed one by one. It then moves along a conveyor belt where cameras detect the physical parameters of each coin, such as size, color, denomination, etc.

The is then processed using digital image processing techniques. Various algorithms such as edge detection, pattern matching, object tracking, etc. Implement and identify parts. Place the recognized coins in the four holders (for 1, 2, 5, and 10 INR coins) as shown in the picture. This is done

using servo motors that turn the conveyor belt to the desired angle.

Sensors are attached to the end of the conveyor belt to count the pieces in each piece of denim. The counted coins are displayed on the LCD screen through which the value can be obtained.

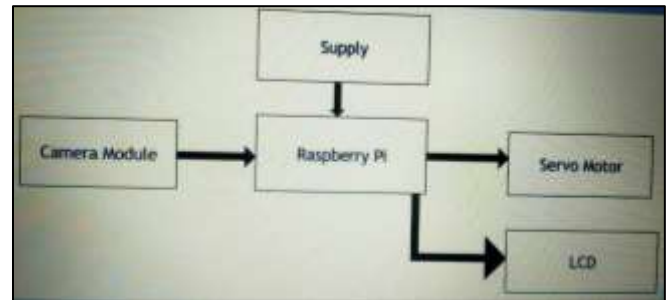


Fig. 1: Block Diagram

The system can be expanded and enhanced to function as a currency counter. The proposed model can separate and estimate parts. It can also be upgraded to a splitter for a currency stack in the future. The implementation of the money-counting mechanism can serve society effectively and efficiently.

The implementation is only done for parts. The integration of coins and banknotes can be done by implementing the principles of machine learning algorithms. A database can be created for each banknote and each coin. An automated system could be developed which would distinguish the coins and bills in and around the acrylic box, separate them, and place them in their respective slots. Piece sums are made separately at the end.

A. Components required:

- 1) Raspberry pi3b: Raspberry Pi 3 Model B is the earliest model of the third-generation Raspberry Pi. It replaced Raspberry Pi 2 Model B in February 2016. See also Raspberry Pi 3 Model B+, the latest product in the Raspberry Pi 3 range.
- 2) Servo Motor: A servomotor (or servomotor) is a rotary or linear actuator that provides precise control of angular or linear position, speed, and acceleration. It consists of a suitable motor connected to a position feedback sensor. It also requires a relatively complex controller, usually a dedicated module designed specifically for use with servo motors. Servo motors are not a specific class of motors, although the term servo motor is often used to refer to motors that can be used in closed-loop control systems. Servo motors are used in applications such as robotics, CNC machines, and automated manufacturing.
- 3) Raspberry pi camera module: This 5-megapixel sensor with the OV5647 camera module is capable of capturing 1080p video and still images and connects directly to your Raspberry Pi. This is the latest plug-and-compatible version. -play of Raspbian operating system, ideal for time-lapse photography, video recording, motion detection, and security applications. Connect the included ribbon cable to the CSI (Camera Serial Interface) port of the Raspberry Pi and you're good to go!

The card itself is small at around 25mm x 23mm x 9mm and weighs just over 3g, making it ideal for mobile or other applications where size and weight are

important. The sensor has a native resolution of 5 megapixels and has an integrated fixed focal length lens. In terms of stills, the camera is capable of capturing stills at 2592 x 1944 pixels and also supports 1080p30, 720p60, and 640x480p90 videos.

- 4) LCD Display: A liquid crystal display (LCD) is a flat panel display or another electronically modulated optical device that uses the light-modulating properties of liquid crystals in combination with polarizers. Liquid crystals do not emit light directly, but use backgrounds or reflectors to produce color or monochrome images. LCD screens can be used to display arbitrary images (like on a normal computer screen) or still images with low information content, which can be displayed or hidden. For example words, numbers, and predefined seven-segment displays, such as digital watches, are good examples of devices with these displays. They use the same basic technology, except that arbitrary images are built from an array of small pixels, whereas other screens have much larger elements. Depending on the layout of the polarizers, the LCD screen can be always on (positive) or always off (negative).

For example, a positive character LCD with a background will display characters on a black background, while a negative character LCD will display characters on a black background of the same color as the background. A filter has been added to the white on the blue LCDs to give them a unique look.

IV. SOFTWARE/ TOOLS USED

- 1) Raspberry Pi OS (formerly known as Raspbian) is a Unix-like operating system based on the Debian Linux distribution for the Raspberry Pi series of compact single-board computers. It was first independently developed in 2012 and has been in production since 2013 as the primary operating system for these boards, distributed by the Raspberry Pi Foundation.

Raspberry Pi OS is highly optimized for Raspberry Pi with an ARM processor. It works with all Raspberry Pi microcontrollers except Pico. Raspberry Pi OS uses a modified LXDE desktop environment with an Open Box stackable window manager and a unique theme.

The default distribution comes with the Wolfram Mathematica computer algebra system, a copy of VLC, and a lite version of the Chromium web browser.

- 2) Python 3.10: Python is commonly used for developing websites and software, task automation, data analysis, and data visualization. Since it's relatively easy to learn, Python has been adopted by many non-programmers such as accountants and scientists, for a variety of everyday tasks, like organizing finances. Writing programs is a very creative and rewarding activity, says the University of Michigan and Coursera instructor Charles R Severance in his book Python for Everybody. "You can write programs for many reasons, ranging from making your living to solving a difficult data analysis problem to having fun to helping someone else solve a problem.
- 3) Object_Recognition: Recognize and manipulate faces from Python or the command line with the world's

simplest face recognition library. Built using dlib's state-of-the-art face recognition built with deep learning. The model has an accuracy of 99.38% on the Labeled Faces in the Wild benchmark. This also provides a simple face recognition command line tool that lets you do face recognition on a folder of images from the command line.

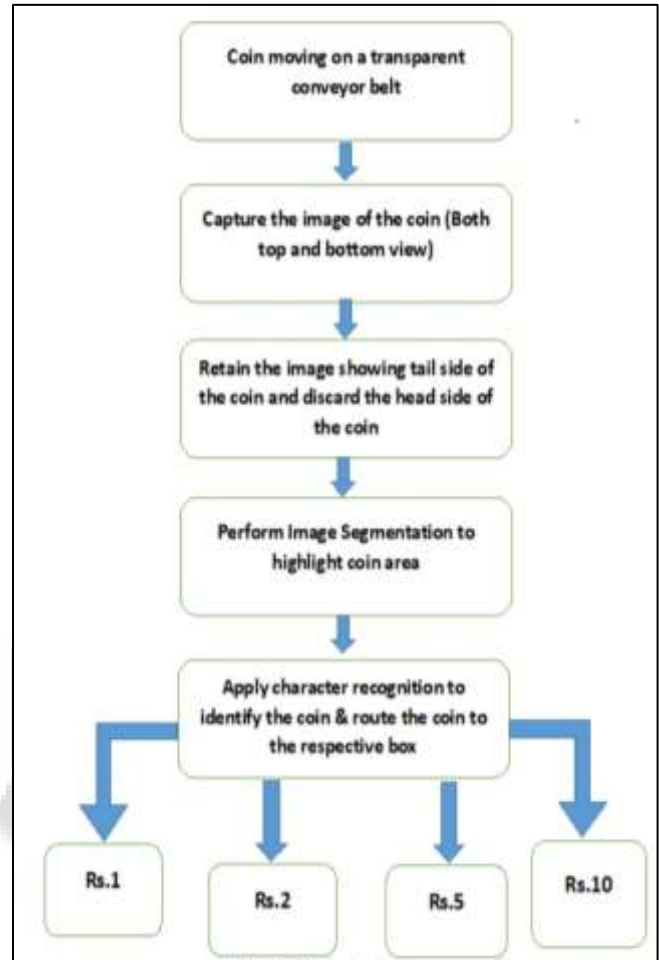


Fig. 2: FLOWCHART

- 4) Open CV: It is the huge open-source library for computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even the handwriting of a human. When it is integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify an image pattern and its various features we use vector space and perform mathematical operations on these features.
- 5) NumPy: In Python, we have lists that serve the purpose of arrays, but they are slow to process. NumPy aims to provide an array object that is up to 50x faster than traditional Python lists. To identify facial features, all you need to do is load the image into a NumPy array again using load_image_file () and then pass the array to object_landmarks(). This will return a Python list containing the dictionary of facial features and their coordinates.

- 6) Teachable Machine: Teachable Machine is a web tool that makes it fast and easy to create machine learning models for our projects, with no complex coding required. Train a computer to recognize our images and poses of coins, then export our model for our sites and more.

V. CONCLUSION

In this research paper we have discussed on the Manual method can be completely replaced by this proposed method. Time consumption in counting the coins is much reduced. The proposed model can be used widely in donation boxes and other places like charities, where we have to separate and estimate the coins and currency. It can be specifically used in temples, where segregation and counting of coins play a major role and are a vital and mandatory process to carry out. An Automatic coin sorting and counting machine enables the sorting of coins on the basis of dimensions and displays the count automatically. The coin count and an LCD display are used to show the coin count. This project eliminates the manual work required to sort and count the coins. It also saves time and manpower to sort and count the coins. This project can be used in banks, cash counters, etc.

REFERENCES

- [1] Mr. Prashanna Rangan, "Machine Vision Based Coin Separator and Counter", Recent Trends in Sensor Research and Technology, May 2018.
- [2] Dr. A.N. Jayanthi, "Automatic Coin Sorting and Counting System", International Research Journal of Engineering and Technology (IRJE), Mar 2021.
- [3] Mr. Prashant Vige, "Coin Counting and Sorting Machine", International Journal of Engineering and Creative Science, July 2021.
- [4] Mr. Amith Salehittal, "Indian Coin Separator and Counting Machine Using EDGE Detection Technique", International Research Journal of Engineering and Technology (IRJE), Apr 2020
- [5] Mr. Rahul Soans, "Object Sorting Using Image Processing", IEEE, May 2018
- [6] Mr. Naveen Kumar, "Automate Coin Recognition and Counting by Image Processing Technology", International Journal of Engineering Research and Technology, Mar 2018.