

# Automatic Coin Sorter and Counter using the Combination of Labview and Matlab

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## Abstract

This paper proposes to sort coins from a large numbers. Coin separation is one of the major difficulties in major temples and in religious places. To overcome this problem, we have proposed model to process a large number of coins which were let one by one using a small drill. The drill is used to separate the coins then image of the separated coins are captured by a image capturing technique and compare the feed images and the captured image using the image matching technique. Number of captures let by the camera will be counted. Hence the number of coins will be counted. Then the sorted coins are collected in specified containers which would be allotted for the specific coin. The drive system is controlled by the mat lab. The image recognition is done in order to separate the images and for counting the image matching is done.

## 1. Introduction

In ancient period people will exchange their food and raw materials for their needs. After the invention of coins people would give the coins and took up their basic materials. Later these coins are plays major role. In the older days there are different types of coins. They are classified by the material which they are made. Later the invention of paper currency the importance coins will be reduced. So the former inventions are focused on the paper currencies. Till most probably our transfer will be in the coins. So back on consideration of coins there is lot invention to sort coins via considering its size, shape, dimension, color and the structure. But now a days coin are most probably in a same size and the same dimension and same shape. To make this possible via the color most of the countries have the coins in a same color and they made by the same alloys. In the temples like thirupathi and palani more number of coins has been collected from the people on consideration of their worship. The devasthanam has sorted the coin via size while which is not most efficient in the present days. Hence the tons of coins are collected in their hundial, and large number of people have required for counting these coins. To make it possible of simultaneous sorting and counting these coins I have proposed a process of image capturing and the image matching in the labview and control of drive using the matlab.

## 2. Pattern Recognition

There are two basic approaches in pattern recognition. They are statistical approach and structural approach. In the first approach, the pattern is represented as a vector in a feature space. Then a decision algorithm, which is mainly based on the statistical concept, is used to decide to which class the pattern belongs. In the structural method, the pattern is represented by its structure. For example, a string of symbols, a graph connecting the primary elements, etc. The statistical method can be broadly classified into classical and Artificial Neural Networks (ANN) approaches [10, 11]. No single technique or model is suited for all Pattern Recognition (PR)

problems. Hence, different types of PR approaches are to be adopted [7]. The coin classification technique is based on the following assumptions and computations.

- i) The coins should move on a conveyor belt.
- ii) Proper lighting is to be focused on the coin.
- iii) Each coin is separated and fed to the system for recognition.
- iv) Coins are weighed accurately.
- v) Both sides of the coin are to be collected.
- vi) The side view of the coin image can be captured.
- vii) The coin image can be rotated by any degree.
- viii) The Circular, Hexagon, Octagon, Polygon shape of coin's radius are measurable.
- ix) The coin Circumference/Perimeter and area are to be computed.
- x) The thickness of each coin can be computed by the system.
- xi) The coin images with 256 gray values are to be computed.
- xii) The coin average gray values are computable.

## 1. Coin Counting System

The coin baskets are mounted on the outside of the cabinet and are positioned at the most convenient height. They are fabricated from a durable plastic with the properties of flexibility and strength. Within the basket, is a flexible shock-absorbing back sheet, designed to dissipate energy and reduce the velocity of the coins as they are moved in. The system is modified for sorting Indian Coins. The standard features of coin recognition system are as follows:

- Electromagnetic sampling coin detection
- Rejection of unauthorized coins
- Automatic removal of other objects
- Extensive self-diagnostics
- Unique anti-jamming facility on coin pickup wheel
- Local and remote alarm indications
- Modular design for ease of maintenance and repair
- Surge protection filters

## 4. Pre Processing

The Zooming and de-zooming are the important processes by which a coin image is increased or decreased

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in size. The zooming helps us to make the size of the coin image bigger, by which recognition rate is increased. The Coin Recognition of Pre-Processing of various stages like cropping, scaling, resizing, rotation is performed.

### 5. Proposed System

In the previous systems authors have consider a large number of criteria such as color, shape, diameter, radius, thickness and negative imaging also shown for the dimensions of the outline of a coin. Now a days it is not possible and not necessary in latest technologies. In this paper just consider the images of the coin because every coin will differ in their picture by considering this criteria I would sort the coins using the lab view. The main task we have taken will be the image processing module. The coins are collected in an different containers which is allotted to the specified coins. The container could noticed the suitable coin by the signal which was sent using the lab view. The counting of coins is also the major criteria in the proposal. Number of captures will be counted by using the command word of  $i+1$ . Hence the sorted coins will be counted more quickly and accurately. The main advantages over the above system will be simplicity and usage of simple logics but advanced techniques.

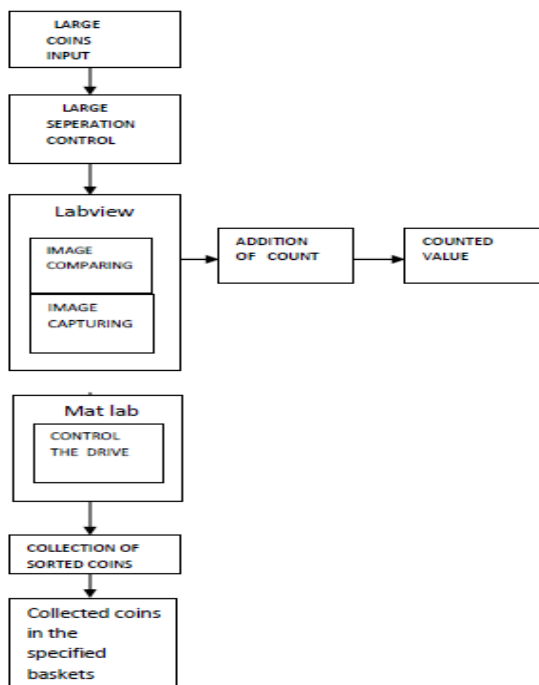


Fig. 1. Block Diagram of the Proposed System

### 6. Block Diagram Description

Block diagram of the proposed system is shown in the figure 1. From this block diagram the operation of the system can be described step by step.

- 6.1 **Large input of coins:** This system mainly proposed for the place which deals with the large number of coins. This system takes variety of coins as an input which has to be sorted.
- 6.2 **Large separation control:** The largely collected coins are let one by into the tray and in to the transparent belt for a better image capturing.

- 6.3 **Image capturing:** This is the most important section of this system. The cameras were fixed back and froth of the fiber belt. Hence in this block the image of the coins are captured and send to comparison process.
- 6.4 **Addition of count:** It is the counting section of the proposed system. It will be done by the programming. The number of captures in the camera over a specific coin will be noted.
- 6.5 **Counted value:** The counted value could be noted later which is stored in the processor.
- 6.6 **Image comparison:** This block denotes the concept of the proposed system. Only the images of the specific coins are taken in the consideration. Some of the hot views are present in the each coin these are in the comparison with the excited samples.
- 6.7 **Control the drive:** The image comparisons done in the lab view exist in a signal to the matlab while the control operation of a motor drive will be easy in the proposal.
- 6.8 **Collection of coins:** When the signal is given to the drive the suitable container faced over the specified coin. Hence in this block the coins are collected in the containers.

### 7. Image Processing using LabView

Lab VIEW ties the creation of user interfaces into the development cycle. Lab VIEW programs/subroutines are called virtual instruments (Vis). Each VI has three components: a block diagram of other, calling Vis. Controls and indicators on the front panel allow an operator to input data into or extract data from a running virtual instrument. However, the front panel can also serve as a programmatic interface. Thus a virtual instrument can either be run as a program, with the front panel serving as a user interface, or, when dropped as a node onto the block diagram, the front panel defines the inputs and outputs for the given node through the connector pane. This implies each VI can be easily tested before being embedded as a subroutine into a larger program. The graphical approach also allows non-programmers to build programs simply by dragging and dropping virtual representations of lab equipment with which they are already familiar. The Lab VIEW programming environment, with the included examples and the documentation, makes it simple to create small applications.

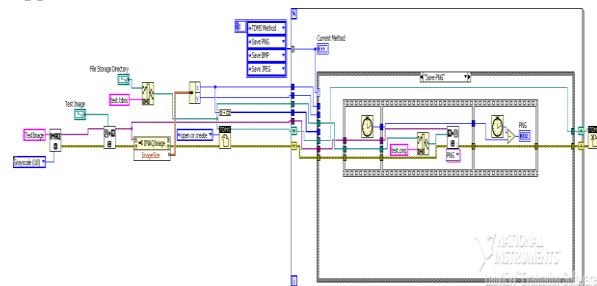


Fig. 2. Lab View Model for Comparison

This is a benefit on one side, but there is also a certain danger of underestimating the expertise needed for good quality “G” programming. For complex algorithms or large-scale code, it is important that the programmer possess an extensive knowledge of special Lab VIEW syntax and the

programmer possess an extensive knowledge of the special Lab VIEW syntax and the topology of its memory management.

In this coin the highlighted segment will be its shape of the number without considering its size, diameter or any things my proposal has focused only on this feature of the image. Then the coin will be identified and sends the command to the matlab. The comparing of two images in the running on system is faster in labview.



Fig. 3. Focus Point of the coin

### 8. Counting System

In this proposal the other most important criteria will be the counting the coins. By the basic programming languages there was a hope to count the coins via the number of images matching to the given image and add a count for the specified image. Hence for different coins different count will be noted.

### 9. Stepper Motor and its Control using LabView

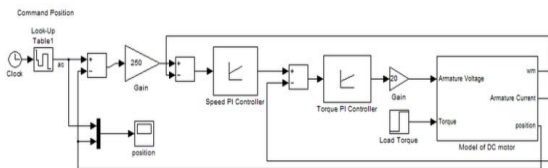


Fig. 4. Control System Stepped Motor

Figure 5: shows that the structural notification to control the stepper motor. A stepper motor is electro mechanical device which converts electrical pulses into discrete mechanical movements. The sequence of the applied pulses is directly related to the direction of motor rotation. The speed of the motor shaft is directly related to the number of input pulses applied. One of the most significant advantages of a stepper motor is its ability to be accurately controlled movement is required. A stepper motor can be a good choice whenever controlled movement is required. In this proposal the mat lab program are developed for programming and controlling the stepper motor. All kinds of stepper motors having up to 8- separate-excitation signal can be programmable and controllable real timely by using this software via parallel port of a PC.

On the contrary, the computer program using built in functions can make a lot of complex motions successively. The parallel port of a PC is used to drive stepper motors by using the DB-25 parallel port connector.

By using the built in function keywords the periodic or the continuous rotation of motor will be determined. Thus the rotation of the drive will ensure to an appropriate position.

### 10. Connection between LabView and Matlab

The idea of incorporating the two software for the computer based control system enable us to have an easy acquisition from lab VIEW and the signal is transferred to MATLAB which conventionally acts as the controller to perform control calculation. Then motor will be drive. In order to connect these two software, there are number of toolboxes in Lab VIEW which can help the user to easily connect them based on the needed environments. The feedback control loop was built in SIMULINK, MATLAB software. Thus the connection of lab view and the matlab will be done by the existing systems

### 11. Overlook of this Design and Operation

The existing proposals have given only the paper but in this proposal we will give our suggestion design for this system shown in the figure 3.

The upper trapezoidal container has a hole which allows only one coin in a time. This will be in continuous back and forth motion to avoid the clotting of coin.

Then the coin will be dropped one by one safely in the conveyor belt. It is made up of fiber because we needs the transparent belt.

The moving images of coin captured by the camera which fixed on the two different positions as shown in the figure.

Then the image comparison will be done by the lab view software and counting also done. Then the output of the lab view will be passing to the matlab.

Hence the drive will be controlled and the specified containers will be faced over the coins which allotted for the container.

### 12. Simulation Output for this Proposal

From the figure (2) we could get the could the comparison result by the input which will be feed by us in the systematic table given in the figure (4)

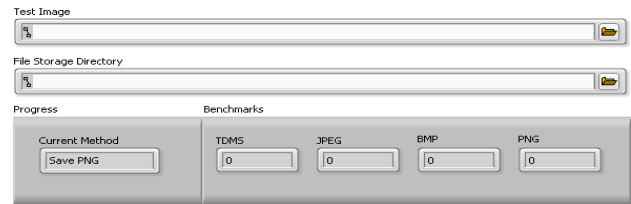


Fig. 5. Systematic Table for Input

Then output of this comparison is given to the control system which is shown in the figure (3). Thus the position, speed, torque will be controlled using the matlab. Hence the output waveform is shown in the below figure.

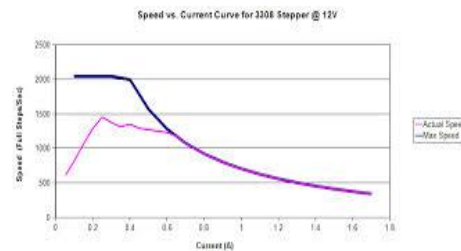


Fig. 6. Output Graph for Stepper Motor

From this we noted that normally there will some distortion in the stepper motor when change its position. But most probably it will be solved by using matlab.

### 13. Conclusion

In this project we have represent some features for sorting and the counting of coins. Every system has some disadvantage, likewise in this system the initial cost is the main disadvantage, periodic maintenance and there is a need

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of some technicians for operating. However this system will be the next mile stone for the coin sorting techniques. By using this technique not only the coin is segregated but any object can be segregated and also the better programming will determine its efficient way of operation.