COIN SORTING AND COUNTING MACHINE

G. Venkat Vamsi[1], K. Naresh[1], D. Mahendran Reddy[1], G. Hemanth Kumar[1], B. Vamsi[1], O.N.V.P. Bhagavan Kumar[2]

[1]*UG students, Department of Mechanical Engineering, NRI Institute of Technology, Pothavarappadu, Eluru District, AP, India, Pin: 521212*

[2]*Assistant Professor, Department of Mechanical Engineering, NRI Institute of Technology, Pothavarappadu, Eluru District, AP, India, Pin: 521212*

---***---

Abstract: The design was entitled Automatic Coin Sorting Machine for it is to sort the Indian coin denomination. This was done to be able to help different Institutions that deal with large number of coins in their daily operation. Some of these are banks, churches, charitable institutions and the transport sector. The sorting part of the design is basically mechanical as it sorts the coin through their physical size then counts them as they pass through the Arduino. An automatic coin counting and sorting machine prototype is developed by using ARDUINO-UNO as the main controller. This work included design the display panel to show total quantity of each coin and total amount. The coin acceptor has been used as it acts as coin selector to determine the denomination of coins in sorting system is designed by using DC motor to hold and distributes coin to the corresponding slot.

Key Words: Denomination, coin slot, rotating plate, microcontroller

INTRODUCTION

In the Philippines, the first coins were used in 1861.Until now people still use coins in their everyday lives. there are those that deal with coins everyday like. Daily, banks produce and receive coins which they delivery to other establishments to supply their need for coins. Charitable institutions like churches gather coins from donatons during mass. And in public transport sector, coins are widely used whether as fares or change. The biggest advantage of the coin sorter is that it cannot only count the number of coins of each denomination will be clearer to separate, and the face of the coins of different countries do not need to adjust the software, only need to adjust the machine's hardware equipment to meet different coin national inventory needs. Therefore, not only occupy a large market share, but also for the cost of production has also been reduced. Research and design of the coin sorter of mechanical and electrical control system is very important practical significance.

LITERURE REVIEW

A. Paramasivam et. al. [1] In this dynamic era of new evolution of technology, the systems are moving towards smart way to improve the utilization and effectiveness of the system. In this work, an attempt is made to design and develop the coin sorting machine, which can be extended to variety of similar applications. Coins are circulated enormously in public and private transportation sectors, temples and in Retail shops, where sorting and counting done by manually, which increases the monotony the work, less precision and effectiveness.

P. Vibhushan et. al. [2] In This Article A programmed coin checking and arranging machine model is created by utilizing ARDUINO as the primary regulator. This work included the structure of the basic showcase board to show the absolute amount of each coin. The coin acceptor has been utilized as it goes about as a coin selector to decide the division of coin an restrict any invalid or undesirable coins.

S.P. Srinivasan et. al. [3] In This Article Separation and counting of Indian currency coins is considered in this project. Nearly all the temples in India have donation boxes (Hundi). 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.

Prashanna Rangan R. et. al. [4] This project adapts automation for this time-taking process. It involves the usage of digital image processing technology that aids in detecting the coins and differentiating them; thus, making the process faster and more accurate.

N Jayanthi et. al. [5] From This The coins are inserted into a box, in which the slots are made for coins. Each coin falls in the specific slot which is detected by a Dual Channel Line Tracking Infrared Sensor. The sorted coins are counted by Maker NANO board, which has been programmed to count the coins that falls under the specific slot.

Prajwal Wankhede et. al. [7] From These Article The subject of this paper is a particularly challenging machine vision (MV) based sorting application where the `part' is an Indian coin.

The application is challenging in part because of the lack of distinctive features to differentiate between denominations as well as the variability in the features for a given denomination.

Rajnish Yadav et. al. [8] Through the coin sorter electrical control system design, to understand the structure of the coin sorter, he mastered it works and use of the main design is simple, accurate sorting, reliable, easy maintenance, low-cost advantages.

R. Rajavi et. al. [9]. Based on the status quo of coin sorting machines at home and abroad, a coin sorting machine with false identification function was designed. The coin enters the entrance of the coin, through the rotation of the coin disk and the flattening of the pressing plate, a single coin enters the coin hole of the coin disk, then passes through the false identification device, passes through the four branches arranged in order from small to large, and falls into the collection device of corresponding value respectively.

Li Feng. et. al. [10] In this journal, the coin exit is installed with photoelectric counting device, which counts the coins of each denomination and integrates the total amount to be displayed on the display screen through the operation of single chip microcomputer. The coins of the same denomination will be placed in the same receiving box to be sorted.

METHODOLOGY

The group researched on existing coin sorter machines as reference on how to develop a prototype that would be accurate and fast and that would observe the accuracy of the techniques the existing designs used. Upon observation, the group tested the different techniques used by existing or recent counters. They tried to develop also new ways and improvements of existing techniques. They had performed several tests on how to efficiently and accurately sort and count coins of different denominations. The group first tested a similar technique done by previous studies which use a sorting arm with the exact holes of every coin that are arranged from the smallest to the largest coins. Two to three holes of each coin are placed simultaneously to increase its reliability in sorting coins. The group also found some problems on how to sort the 2- and 10- coins since they are the same in size with a very minimal difference in their thickness. The other test was to use a revolving plate which assures that only a single coin will be sorted in a time, but to be fast, the group decided to create holes in succession.

FABRICATION

- Arduino Uno
- 16x2Display
- Jupper Cable
- i2c sensor
- Arduino Uno cable
- Aluminum foil

Arduino Uno

Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE(Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

16x2Display

The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7-pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data

Jupper wire

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end(or sometimes without them – simply "tinned"), which normally used to interconnect the components of a breadboard or other prototype or test circuit.

i2c sensor

I2C sensor (Inter-Integrated Circuit, eye-squared-C), alternatively known as I2C or IIC, is a synchronous, multi-master/multi-slave (controller/target), packet switched, single-ended, serial communication bus invented in 1982 by Philips Semiconductors.

Arduino Uno cable

This cable is used to interface any of the Arduino board with your computer, you can also connect your USB printer, scanner, and more to your computer. These cables Transmits data at high speeds with the error-free, high-performance transmission.

ARDUINO UNO USING 'Ç'LANGUAGE TO DECALERA THE PROGRAM

```c
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

// Set the LCD address to 0x27 for 16 chars and 2-line display
LiquidCrystal_I2C lcd(0x27, 16, 2);


int cnt1=21,cnt2=21,cnt5=21,cnt3=21;
int r1c=0,r2c=0,r5c=0,sum=0;
void setup()
{
        // initialize the LCD
        lcd.begin();
  Serial.begin(9600);
        // Turn on the blacklight and print a message.
        lcd.backlight();
        lcd.print("Hello, world!");
}

void loop()
{
        int c1=analogRead(A0);
  int c5=analogRead(A1);
  int c2=analogRead(A2);
  int c3=analogRead(A3);

  Serial.println("C1:"+String(c1)  +  "   C5:"+String(c5)  +  "
C2:"+String(c2)+ "  C3:"+String(c3));


  if(c1<100 && cnt1>20)
  {
   r1c=r1c+1;
   cnt1=0;
  }

  if(c5<100 && cnt5>20)
  {
   r5c=r5c+1;
   cnt5=0;

  }

  if(c2<100 && cnt2>20)
  {
   r2c=r2c+1;
   cnt2=0;

  }

  if(c3<100 && cnt3>20)
  {
   r2c=r2c+1;
   cnt3=0;
  }
  delay(50);
  cnt1=cnt1+1;
  cnt2=cnt2+1;
  cnt5=cnt5+1;
  cnt3=cnt3+1;

  if(cnt1>20)
  cnt1=21;
  if(cnt2>20)
  cnt2=21;
  if(cnt3>20)
  cnt3=21;
  if(cnt5>20)
  cnt5=21;

  sum=r1c+(2*r2c)+(5*r5c);
  lcd.clear();
  lcd.print(" 1  2  5 SUM");
  lcd.setCursor(1,1);
  lcd.print(String(r1c));

  lcd.setCursor(5,1);
  lcd.print(String(r2c));

   lcd.setCursor(9,1);
  lcd.print(String(r5c));

   lcd.setCursor(12,1);
  lcd.print(String(sum));

}
```

SOFTWARE

The Arduino Integrated Development Environment is a cross-platform application that is written in functions from C and C++. It is used for writing and uploading the programs to Arduino boards. The source code for the IDE is often given under the GNU General Public License, version 2. The Arduino IDE supports the languages like C and C++ by the use of special rules for Coding as shown in the below fig-1.
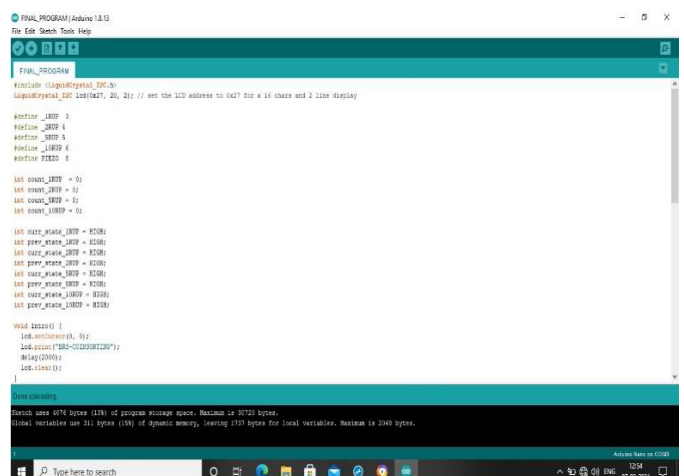

Fig -1: software image

WORKING

The coin sorting works by sorting the coins by their diameter and counts the coins using a Sensing of Aluminum foil tape. The sorting arm then sorts the coins by their diameter and drops them to corresponding conveyor. The count is then stored on a computer system for it to be totaled. Coins are fed into the machine, usually via a hopper or a tray. The machine uses gravity to guide the coins through the sorting process as shown in the fig-3.
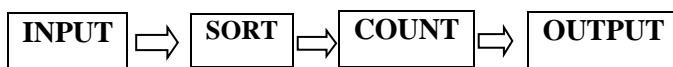
BLOCK DIAGRAM

Fig -2: Block diagram of sorting & counting machine

Fig -3: Circuit Image

RESULT AND DISCCUSSION

The coins are tested with the coin sorting machine for various trials. Since the machine is automated. From the study its reveals that the one-rupee coin efficiency is higher than the ten-rupee coin and 2-rupee coins. The variation is due to the coefficient of friction, geometric shape of the coin and weight. This is calculated using the 10 trials of inserting the coins in the slots and number of times the coins were accepted and rejected was noted. In an Automatic coin sorting and counting machine, once a coin is inserted it gets sorted based on the coin dimension. The infrared sensor detects the coin, Maker NANO increases the coin count and an LCD display is used to show the coin count. This eliminates the manual work of sorting and counting the coins. This project is used to sort and count Indian coins like rupees 1, rupees 2 and rupees 5 as shown in below fig-4.
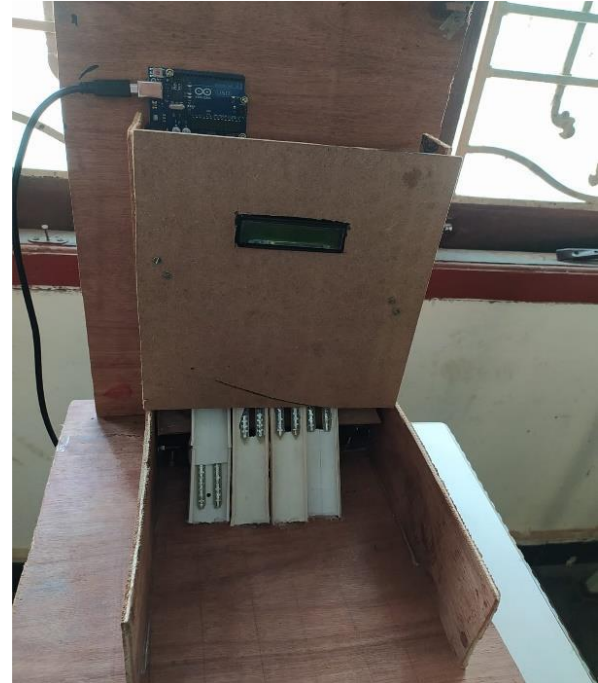

Fig -4: Final assembly

CONCLUSION

The coin sorter objective isto save the time where huge collections of coins are stored and periodically valued. The proposed model can be extended to any type and size of coin to value the time value of the individual. The proposed system improves the accuracy and effectiveness. The proposed coin sorting methodology and model results with exactness in determining the value of the coin and sorting the same. The fundamental challenging issues are in identifying and sorting various small size coins universally. This can be addressed with the help of picture sensor in the start of the slide and having servo engines that are constrained by Arduino so the coins don't blend out and out.

REFERENCES

[1] A. Passeraub, P.A.Besse C.de. Read, O. dezuari, F. Quinet, R.S. Popovic"Coin Recognition using an Inductive Proximity Sensor Microsystem", IEEE Volume 12, pg -389-392, 1997.

[2] Iyasue Mitsukura, Minoru Fukumi, Norio Akamatsu "Design and Evaluation of neural Networks for Coin Recognition by using GA and SA", IEEE Volume 18, pg- 178-183, 2000.

[3] R. Bremananth, B. Balaji, M. Sankari, A.Chitra "A New approach to Coin recognition using Neural Pattern Analysis", IEEE Indicon Conference , Volume 8, pg-366-370, 2005.

[4] Rohan S.Prabhu,Sahil G. Khorjuvekar, Akshat G .Poi, Vaibhav Naik,Sairaj Shirodkar," INDIAN COIN DETECTION AND SORTING using SIFT ALGORITHM " ,IJSTE,Volume 2,Issue 10, April 2006.

[5] Rui Carlos B. A. da Silva, Rafael A. Miranda, Tiago E. R. Brito, Ednaldo F. Marques, Caiuby A. da Costa, Herman A. Lepik son e Leizer Schnitman "Coin Separator, Sorter and Counting System" by 23rd ISPE International Conference on CAD/CAM Robotics and Factories of the Future Volume 8, pg345-359; 2007.

[6] SILVA, Rui Carlos B. A. da, et al. Máquina Separadora, Selecionadora e Contadora de Moedas. V SNCA –Seminar Nacional de Controle e Automação Industrial, Elétrica e de Telecomunicações Volume 15. Jun/2007.

[7] C.M. Velu and P. Vivekanandhan "Indian Coin Recognition System of Image Segmentation", Int.J.Open Problems Compt.Math.,Vol. 13, No.2,pg 789-795, June /2009.

[8] Velu CM, P. Vivekanadan , Kashwan K R, "Indian Coin Recognition and Sum Counting System of Image Data Mining Using Artificial Neural Networks". International Journal of Advanced Science and Technology Volume 17, 67–80p, June/2011.

[9] Shatrughan Modi, Seema Bawa, "Image Processing Based Systems and Techniques for the Recognition of Ancient and Modern Coins". International Journal of Computer Applications Volume 11;1–5p. Jun/2012.

[10] Dhanabal.R, Saratkumar Sahoo, Bharathi V, "FPGA based image processing unit usage in coin detection and counting", International Conference on Circuit, Power and Computing Technologies Volume 7 [ICCPCT], pg.238-243;2015.