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AUTOMATIC COIN SORTING AND COUNTING SYSTEM

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Abstract - *A coin sorter is a device which is used to sort random collection of coins into separate bins for various denominations of coins. Coin sorters are specific to the currency of certain countries since different currencies often distributes similarly sized coins of different value of coins. In this paper, three specific versions of coins have been taken and sorted according to its dimensions. 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. Thus, the coins sorted and counted by this process. This system can be used in places like banks, retail shops for easy coin sorting.*

Key Words: **Maker NANO, Arduino IDE, 3D Printing**

1. INTRODUCTION

A coin sorter sorts a different collection of coins into separate bins. Coin sorters are specific to the currency of certain countries, as the countries are issuing same sized coins for different value. Most of the coin sorters are armed with a screen which displaying the number of coins or the value of the coins that are passed through the machine. A "coin counter" refers to a device which sorts and counts coins simultaneously, or it only counts presorted coins which are of the same size. A coin counter of presorted coins uses a bowl which has a flat spinning disc at the bottom, which is used to distribute coins around the perimeter of the bowl. The opening at the edge of the bowl can accept only one coin at a time. The Coins can be either passed through a light-beam counter, or spring-loaded cam which only accepts one coin at a time. A coin counter's good standard is that it has a counting speed of 300 coins per minute. Separating, sorting and counting coins of the same is an activity that demands accuracy, security and reproducibility. When people have to separate, sort and count coins for multiple currency species, they have to be manually separated before identifying and counting the coins In this project, coin sorting is done based on coin dimensions, coin is identified and counted by infrared sensor and maker nano. The count will be displayed on LCD display.

1.1 Objectives

The counting process can be done faster by use of Maker Nano. After the coin is inserted into the box, it gets detected by IR sensor module and then it is sorted on the basis of coin dimension. The coin count will be displayed on the LCD display.

1.2 Applications

Automatic coin sorting and counting machine can be used in banks, cash counters, hotels etc. This can also be attached to donation boxes. This machine saves time and manpower to sort and count the coins. This can be used wherever coins are paid.

2. COMPONENTS

The components used in this project are:

- Maker NANO
- I2C LCD
- I2C LCD Adapter
- IR Sensor
- Line Tracking Sensor Module
- Jumper Wire
- DC Connector
- Battery
- Battery holder
- Breadboard

Table -1: Component Specification

Maker NANO	Atmega328P, 5 V, Digital I/O Pins:20, Analog input:8
LCD Display	1602(16x2) LCD Display with 12C interface
IR Sensor	3
Line Tracking Sensor Module	TCRT5000 Dual Channel Line tracking sensor module
Jumper Wire	Male to female connector
DC Plug Adapter	DC Plug (Male) to Screw Terminal Adapter
Battery	9V Zinc Chloride battery
Battery Holder	9 V Battery holder with DC Jack
Breadboard	8.5x5.5 cm (400 points)

Maker NANO

The Maker NANO is an Arduino Based Microcontroller which is specially designed for the purpose of building projects. It also maintains all the useful features that are available in the Maker UNO. It's very prone to error and sometimes, it cannot be reversed. Maker Nano board has 12 x LEDs, 1 x programmable push button, and 1 x piezo buzzer, the smaller form factor compared with Arduino UNO it makes this a better choice for learning purposes and also for building projects and having fun with experiments, especially to fit the board into the tiniest space possible.

I2C LCD

A I2C LCD display consists of a HD44780 based character LCD display along with a I2C LCD adapter. These LCDs are used only for displaying text/characters. A 16×2-character LCD display, has an LED backlight and it can display the characters of 16, which includes letters and numbers. It can display 16 characters in two rows each.

IR Sensor

The IR Sensor-Single is a general-purpose proximity sensor. The module consists of a pair of IR emitter and IR receiver. The high precision IR receiver detects an IR signal. 358 comparator IC is present in this module. The output of sensor is high whenever its IR frequency and low otherwise. The on-board LED indicator helps user to check status of the sensor without the use of any additional hardware.

Jumper wire

A jump wire or a jumper wire is an electrical wire or group of them attached in the form of a cable, which a connector or pin at each end, which is generally used to interconnect the components of a breadboard or a test circuit, internally or with the other equipment or the other components, without the process of soldering. Individual jumper wires are connected by means of inserting their "end connectors" into the holes/ slots which are provided in the breadboard, the header connector or a piece of test equipment.

DC connector

A DC connector (or DC plug) is an electrical connector for supplying direct current (DC) power. In comparison with the DC connectors, AC domestic power plugs and sockets have more standard types that cannot be interchanged. The dimensions and arrangement of DC connectors are chosen such that it can be used to prevent the accidental interconnection of incompatible sources and loads.

Battery

The 9V battery, is a common size of battery which was introduced mainly for the early transistor radios. It has a rectangular shaped prism which contains the rounded edges and also a polarized snap connector at the top. This type of battery is generally used in various applications like smoke detectors, clocks, walkie-talkies, electric guitars and effects unit.

Breadboard

A breadboard is a plastic board with a bunch of tiny holes in it. These holes easily insert electronic components to prototype. A breadboard is the main construction base for prototyping and designing of electronic circuits. The number of tie points is usually mentioned in the specification of the breadboard.

2.1 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. The Arduino IDE supplies a software library which is useful for various process like wiring project, which provides many procedures. User-written code requires the two basic functions which includes starting the sketch and the main program loop, which are compiled and then linked with a

program stub main, which is then converted into an executable program with the GNU toolchain, which is also included with the IDE distribution.

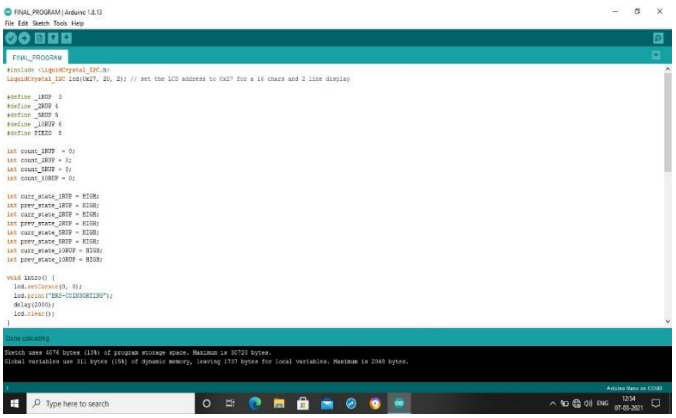

Fig 1: Software Image

3. WORKING

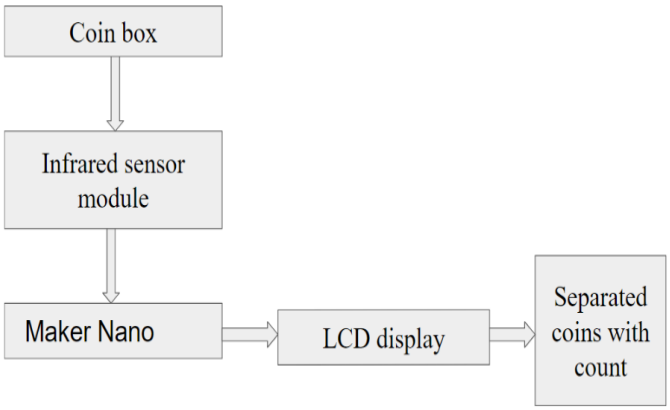

Fig 2: Block diagram

The connections for the coin sorting are made. The coding for the coin sorting has to be uploaded in the maker nano board through Arduino IDE software. The coins are inserted into the box in which the sorting is done. Four slots are made inside the box for the separation of coins. A slope like setup is done in which the slots are made for the coins. Slots are made in the box according to the dimensions of the coins. The coins used include ₹10, ₹5, ₹2, ₹1. These coins after sorting get separated and stored in the boxes kept below the slots. Each type of coins is stored in the separate boxes. Four Infrared sensor modules which are placed inside the slots, which are used to detect the coins. Each time a coin falls in a 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. Hence, sorting and counting can be done by using this project.

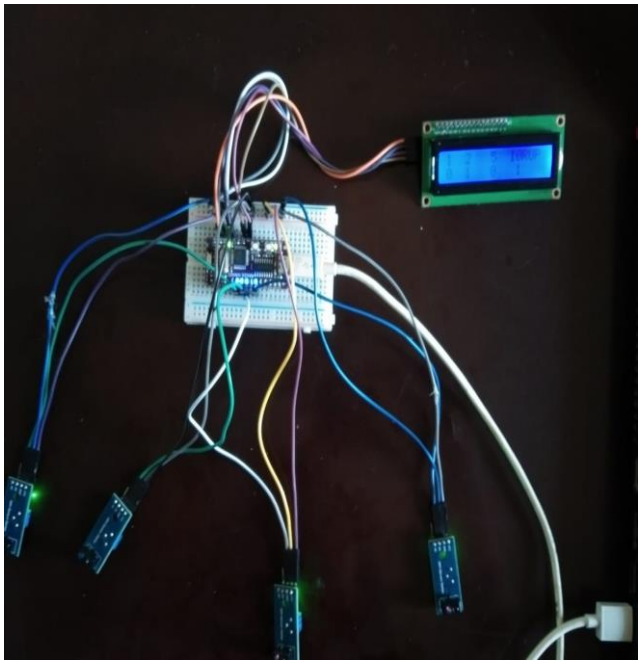

Fig 2: Circuit Image

3.1 Results and Discussion

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.

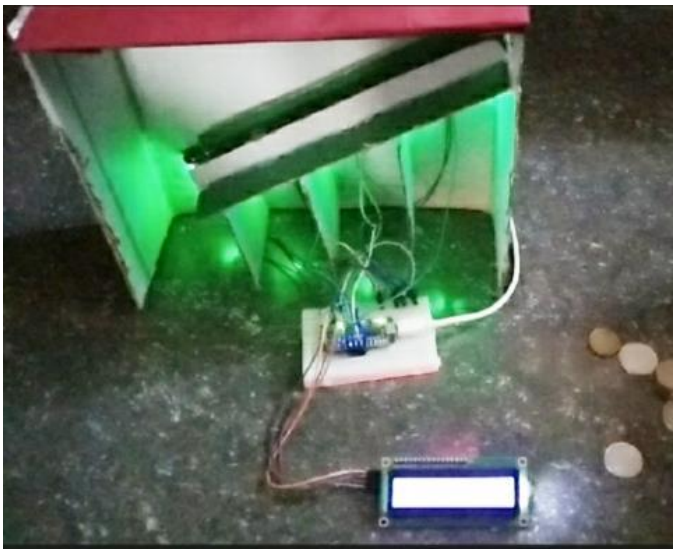

Fig 3: Result Image

4. CONCLUSION

An Automatic coin sorting and counting machine enables the sorting of coins on the basis of dimensions and to display the count automatically. In this project, Infrared sensor detects the coin, Maker NANO increases the coin count and an LCD display is 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] “Machine vision-based coin separator and counter” by Prashanna Rangan R, STM Journals, STM Journals, Volume 5, Issue 1, 2018

[2] “Coin counting and sorting machine” by Prof.Anupa Kavale, Prof.Shraddha Shukla, Prof.Prachi Bramhe, 2019, 9th International Conference on Emerging Trends in Engineering and Technology - Signal and Information Processing [ICETET-SIP-19]

[3] “Coin detection and recognition using neural networks” by S.Mohamed mansoor roomi, R.B.Jayanthi rajee, 2015, International Conference on Circuit, Power and Computing Technologies[ICCPCT]

[4] “Study on Automatic sorting and counting machine for coin” by Liai Pan, and Qiulei Du, vols 427 - 429 (2013) pp 872-875 (2013), Trans Tech Publications, Switzerland

[5] “Automatic South African Coin Recognition through Visual Template Matching” by Tharish Sooruth, MandlenKosi V. Gwetu, 2018, IEEE

[6] "Indian Coin Recognition System of Image Segmentation by Heuristic Approach and Houch Transform (HT)" by C.M.Velu and P. Vivekanandhan , Int.J.Open Problems Compt.Math.,Vol. 2, No.2, June 2009.

[7] "Indian Coin Detection and Sorting using SIFT Algorithm" by Rohan.S.Prabhu,Sahil.G.Khorjuvekar , Akshat.G.Poi, Vaibhav Naik, IJSTE -International Journal of Science Technology & Engineering, Volume 2, Issue 10, April 2016.

[8] "Coin Sorter Electrical Control System Design" by Qixing Liu, International Conference on Education, Management and Computer Science (ICEMC), 2016.

[9] "Real Time Recognition and Counting of Indian Currency Coins using Machine Vision: A preliminary Analysis" by Keyur D. Joshi,Vedang D. Chauhan, and Brian W.Surgenor, Proceedings of The Canadian Society for Mechanical Engineering International Congress, June 2016

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

[11] "FPGA based image processing unit usage in coin detection and counting" by Dhanabal.R, Saratkumar Sahoo, Bharathi V, International Conference on Circuit, Power and Computing Technologies [ICCPCT], 2015.

[12] "COIN-O-MATIC: A fast system for reliable coin classification" by L.J.P. van der Maaten, P.J. Boon.

[13] "Towards automatic coin classification" by Laurens J.P. van der Maaten and Eric O. Postma.

[14] "Analysis of Methods for the Recognition of Indian Coins: A Challenging Application of Machine Vision to Automated Inspection" by Keyur D. Joshi, Brian W. Surgenor and Vedang D. Chauhan.

[15] "Design of Coin Sorter" by Li Feng, Ning Tingzhou, 4th Workshop on Advanced Research and Technology in Industry Applications (WARTIA), 2018.

[16] "Smart digital hundi for identification of Indian coin and currency using Image processing " by Rajasekaran.C, Akshaya P, Gokilavani S, Gokulraja V, Hari Balaji, Proceedings of the 2nd International conference on Electronics, Communication and Aerospace Technology (ICECA), 2018.

[17] "Coin Sorting and Counting Machine” by Ray Anthony C., Reyes Mark Phillip P., Tan Timothy Jude O, November 2008.

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

[19] "A Robust Coin Recognition method with rotation Invariance" by P.Thumwarin, S.Malila, P.Janthawang, W.Pibulwej, T. Matsura, IEEE, pp 520-523, 2006.

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

[21] "Coin Recognition using an Inductive Proximity Sensor Microsystem" by Ph.A.Passeraub, P.A.Besse C.de. Raad, O.dezuari, F.Quinet, R.S.Popovic, IEEE, 389-392, 1997.

[22] "Are case-based reasoning and dissimilarity-based classification two sides of the same coin?" by Petra Perner, Artificial Intelligence, 193-203, 2002.