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Design and Implementation of Automatic Money Counting and Sorting System

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Abstract: *Money counting has been an issue for temple. Long ago, before the arrival of money counting machine, man has to count the money manually, and it is time consuming and tedious for those who handle the counting work. Mistakes on counting happen most of time due to many reasons: eyes tiredness, losing focus, and again new currency and previous currency of some notes causes confusion while sorting and etc. Alternative money counting method can appear to be essential because an accurate money counting is able to provide a quantitative output and time saving. In this paper, color sensor is used for detection of particular note. We are using At mega 328 microcontroller and various components like IR sensors, UV sensor, color sensor, dc motors and LCD display. Note is inserted into the system i.e. paper picking roller mechanism which is used in printer. First IR sensor will be used for detection of notes and then Color sensor will be used for detection of color of notes. Second IR sensor will be used for sorting mechanism. First motor will accept the note and note will be given for sorting mechanism. If in case note is fake then this will be detected by using UV sensor, then it will be given to the faulty compartment. For better output purpose we are using LCD display monitor so that we can get all the information simultaneously and in steady format. In short because of this project donation system will be easier.*

Keywords: Note Picking Mechanism, DC Motor, IR Sensor, Color Sensor, Sorting Mechanism

I. INTRODUCTION

This paper is big solution on social problem which is mainly held at temple. In temples people donate money as per their wish; this donated money is collected at donation box. This donation box is available in all temples. When temple's trusty wants to calculate this money they are using manual method for calculation of money. It is time consuming and tedious for those who handle the counting work. Mistakes on counting happen most of time due to many reasons eyes tiredness, losing focus, rise corruption, fake money are added in calculation, it increases the man power.

To overcome this problem we have designed this new system. In this system money are counted and sorted automatically. That's why we made money counting and sorting system. This system count the money as well as sort it one by one, by this the overall problem of Indian temple is to be solve, as well as this system is useful for all over the country basically for temples.

As we discussed above, the money counting is big issue now a days and no other system can solve this problem. Foreign country can solve counting problem not sorting, so because of that we made such system in that we count the money as well as sort it. Due to this system corruption in temples will be reduced as well as man power will be saved. In this project, we are using At mega 328 microcontroller and various components like IR sensors, UV sensor, color sensor, dc motors and LCD display. Note is inserted into the system like paper roller mechanism which is used in printer.

First IR sensor will be used for detection of notes and then Color sensor will be used for detection of color of notes.

Second IR sensor will be used for sorting mechanism. First motor will accept the note and note will be given for sorting mechanism. If in case note is fake then this will be detected by using UV sensor, then it will be given to the faulty compartment. For better output purpose we are using LCD display monitor so that we can get all the information simultaneously and in steady format. In short because of this project temples donations system will be easier

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II. METHODOLOGY

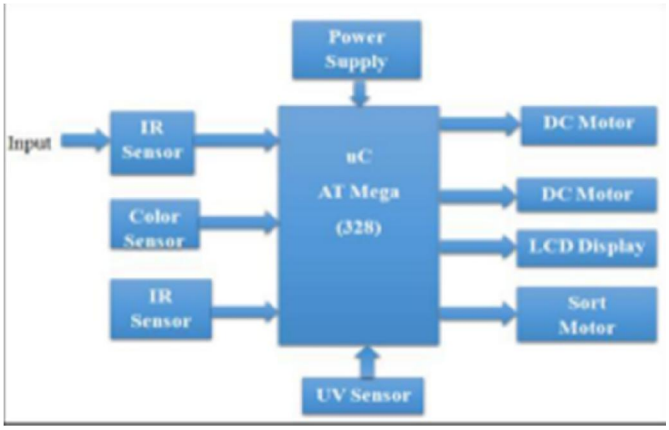

Figure 1: Block Diagram

The block diagram of our project is divided into two mean sections counting section and sorting section. Counting section consists of IR sensors, color sensors, UV sensor and microcontroller. Sorting section consists of DC motor, LCD display and sort motor.

In this project, we are using AT mega 328 microcontroller and various components like IR sensors, UV sensor, color sensor and dc motor. At input, note is inserted into the system by using printing mechanism, especially we are using paper picking mechanism. which is used in printer for picking documents automatically for printing likewise in this system this mechanism will pick the note automatically and inserted into the system. With this mechanism we are using one IR sensor which senses the presence of note into the system. As soon as the system gives conformation that the note is inserted, then IR sensor will activate the color sensor.

2.1 Color Sensor

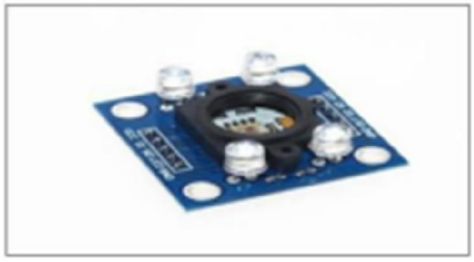

Figure 2: Color Sensor

The heart of this project is RGB color sensor. This color sensor can be divided into three “modules”. A “sensor module” is able to recognize the color tone of the lamp supporting surface. A “processing module” capable of decoding the output signal from the “sensor” and process it to produce as output “Something” capable of driving a “programmable” light source.

2.2 Sensor Module

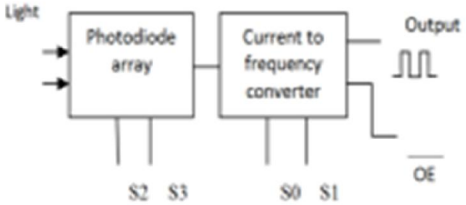

Figure 3: Sensor Module

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Basically color sensor will give RGB color mode. The TCS320 senses color light with the help of an 8 x 8 array of photodiodes. Then using a Current-to-Frequency Converter the readings from the photodiodes are converted into a square wave with a frequency directly proportional to the light intensity.

Table 1

S2	S3	Photodiode
L	L	Red
L	H	Blue
H	L	Clear(no filter)
H	H	Green

This output from sensor module is fed to arduino board. This arduino board read the square wave output and gives the output for color. The sensor module has total four controls signal i.e. S0, S1, S2 and S3. So, by using two control pins S2 and S3 it will select which value of color will be read. So for example, if we want to detect Red color, we simply use 16 red filtered photodiode by setting two control pins (S2&S3) to logic low level according to table. The whole operation of detecting different color is summaries in below table.

S0	S1	Output frequency scaling
L	L	Power down
H	L	2%
H	L	20%
H	H	100%

The color sensor has two more control pins. S0 and S1 which are used for scaling the output frequency of input signal. The frequency can be scaled to three different preset values of 100 %, 20 % or 2%. This frequency scaling function allows the output of the Sensor to be modified.

2.3 UV Sensor

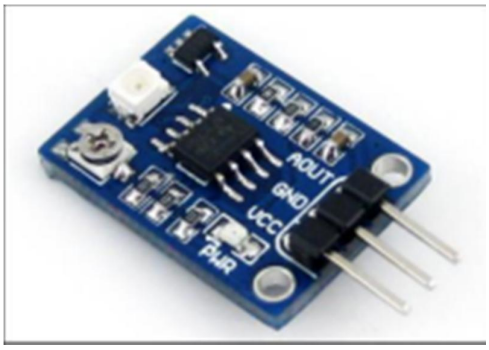

Figure 4: UV Sensor

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2.4 Sorting Section

Now come towards sorting section, in sorting section we are using different compartment for different note sorting. We are connecting DC motor which has low RPM and high torque for rotating the sorting mechanism. Sorting IR sensor is use to select the compartment. On each compartment, there will be photodiode which check the different intensity on different compartment and it also check if

Basically UV sensor is used for detection of fake note. This sensor is situated next to the color sensor. This sensor move the UV light over the currency till it come across optical fibers. It should be able to locate them in and around Mahatma Gandhi's face and also towards the empty space a

To be doubly sure point the UV towards the nine digit number, this can be found above Gandhiji's head and below the Ashoka Emblem. If the nine digit number glows bright red then and then currency is genuine else it is fake. Do take into account that the intensity of "Red" depends on the overall brightness of the UV light as well as the ambient light. Both

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sensor output feeds to the microcontroller. Microcontroller takes decision about note. After that this identified notes are sends towards sorting section as per there. the compartment get filled or not.

R=72	G=96
R=75	G=94
R=70	G=97
R=76	G=92
R=76	G=92
R=76	G=91
R=76	G=70
R=76	G=96
R=76	G=96
R=76	G=96
R=76	G=96
R=76	G=97
R=77	G=98

The whole operation status is displaying on LCD display. Reorganization. Simultaneously money will be counted and displayed on LCD display.

2.5 Note Calibration

For reorganization of particular note first we have to do calibration of various notes by using color sensor. For calibration of notes we have to do serial monitoring of various notes as follows: **See Table: 1**

A. Case no 1:

In first case, put the color sensor at the center of the note. The photodiode of the color sensor detect the different value of the RGB in the range from 0 to 255. This value's range is varying continuously and it is located on the screen of monitor. We have to do serial monitoring on the screen of monitor for various range of different color.

B= 50 to 52

For example:

B=80 B=78

B=77 B=80

B=79 B=77 B=79 B=81 B=79 B=79 B=79 B=79 B=78

Figure 6: Note calibration by one colour sensor

In first case, we have to set one fix threshold value for identification of different notes. In this case we fix the threshold value which is in red color range of note. But due to some mismatching in range the accuracy of the identification is less. It gives 50% accuracy.

B. Case 2:

Now in 2nd case, for increasing the accuracy of identification of note, we take the average of three different color of different notes and set the fix threshold value of that average of note.

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If we want to calibrate 50 Rs, the range of calibration is as follows:
For 200Rs:- R=60 to 65 G=78 to 80
For example:
Calibration of 200 Rs: R=62 to 65
G=70 to 72
B=45 to 50
Average=R+G+B 3
In this 2nd case the average of the note is near about same to each other. Due to this, microcontroller takes much time for taking the final decision therefore it does not gives 100% accuracy of identification. It gives 75% accuracy and it increases the accuracy of note from 50% to 75%.

C. Case 3:
In this case, we take two color sensors. These two color sensors are put at the both ends of the note. According to this we take two different values of RGB (R, G, B and R2, G2, B2)
For example:
For the calibration of 200 Rs note: R1= 75 R2= 68
G1=80 G2=70
B1= 85 B2= 80

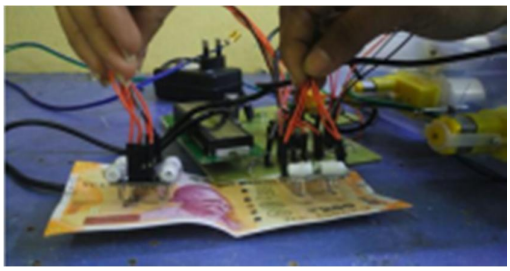

Figure: Note Calibration By Two Color Sensor

For identification of note we take one fix value among three color value and set it as threshold value. This 3rd step gives 100% accuracy of identification of note.

III. CONCLUSION

In this paper we are introducing money counting and sorting system using color sensor. This is one of the big step towards Digital India. Whole operation of this system is performed digitally. For this we are using at mega 328 microcontrollers. The designed system for digital donation. boxes will save lots of human efforts and time and also it tends to decrease any possibility of corruption and miscalculation in note counting. Due to the use of Electronics technology for the calculation it stores all the data regarding to the calculation because it has its own data sorting memory. This is big improvement in the calculation. By using this facility corruption will be reduced and another big benefit of this system is to detect the fake note by using special detection sensor i.e. UV Sensor. This system saves the man power and increase the accuracy in calculation.

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