AUTOMATIC RESISTOR COLOUR CODING

DETECTION & ALLOCATION

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ABSTRACT

In this modern world, the use of electronic components and equipments has increased at an enormous rate. Electronic equipments have a significant role in every field from automobiles to agriculture. Resistors are inevitable components in every electronic equipment. So this project is significant in every electronic industry for sorting the resistors according to the resistance value. This system can be used to sort any number of resistors, but the patterns initially created must include all the types. In this system two conveyor belts are employed, first conveyor belt is to move the resistors and the other one to adjust the position of the collectors to collect the sorted resistors. The conveyor belts are moved using DC motors which are interfaced to a Arduino through a motor driver circuit.

Keywords: Arduino, Conveyor belts, DC Motor, Resistor

I INTRODUCTION

Electronic components are classified into two categories, namely passive and active. Resistors are one of the important passive components in electronic circuits which exhibit the property of resistance. Resistors are characterized by its resistance value, power handling capacity, tolerance, stability, temperature coefficient etc. Among these the most important terms are its resistance value, tolerance and power rating. Tolerance is the allowed variation of resistance value from its normal value. In carbon resistors, resistance value and tolerance can be found by the colour codes in it.

In this project an automatic batch process is designed to sort the various resistors according to the resistance value. In this system two conveyor belts are employed, first conveyor belt is to move the resistors and the other one to adjust the position of the collectors to collect the sorted resistors. The conveyor belts are moved using DC motors which are interfaced to a Arduino through a motor driver circuit. The motors are connected to the motor driver circuit. The requirement of the motor driver is that the output voltage from the Arduino is just 5V which is not sufficient to drive the DC motors. The motor driver circuit provides the supply voltage at its output pins whenever the digital signal from the Arduino is high. A high definition camera is also used for acquiring the images of the resistors on the conveyor.

After placing the resistors on the first conveyor, it is moved by using the switch, which detects the presence of resistors on the conveyor. The signal from the Arduino triggers the camera to take the images of the resistor on the conveyor. The acquired images are processed in MATLAB. The acquired images are compared with the

templates. If a match occurs then the second conveyor belt is moved correspondingly and the resistor moves to the appropriate container. The resistance value of the resistor is also displayed on the LCD screen.

II LITERATURE REVIEW

The colour coding technique is used to indicate the values of resistors. Since it is not practical to print the resistance values on the resistor due to its small size, a method called colour coding is adopted.

2.1 Four Colour Band System

The resistor values are generally printed on the body of bigger resistors like wire wound and meal film resistors. But for the carbon resistors the values are colour coded since the size is small to print the value directly in figures. Colour coding is standardized by Electronic Industries Association. Coloured bands are marked on the surface of the resistors at one end. Each colour represents a numeric value ranging from 0-9. Usually three colour rings are closely marked at the left end to indicate the value of the resistance and another ring at the right end to indicate the tolerance.

Table 2.1: Colour code of resistors

Colour	I ring (I value)	II ring (II value)	III ring (Multiplier)	IV ring (Tolerance)
Black	0	0	1	-
Brown	1	1	10	-
Red	2	2	10^2	-
Orange	3	3	10^3	-
Yellow	4	4	10^4	-
Green	5	5	10^5	-
Blue	6	6	10^6	-
Violet	7	7	10^7	-
Grey	8	8	10^8	-
White	9	9	10^9	-
Gold	-	-	0.1	5
Silver	-	-	0.01	10
No colour	-	-	-	20

2.2 Available Resistance Values

The values of resistors are derived from the standard set of two digit base number. Values are derived by assigning sufficient number of zeroes or decimal points to these numbers: 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68 and 82. List of available standard values of resistors is given below:

1.0Ω, 1.2 Ω, 1.5 Ω, 1.8 Ω, 2.2 Ω, 2.7 Ω, 3.3 Ω, 3.9 Ω, 4.7 Ω, 5.6 Ω, 6.8 Ω, 8.2 Ω

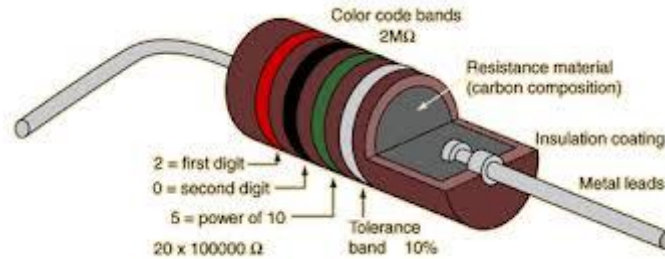10Ω, 12 Ω, 15 Ω, 18 Ω, 22 Ω, 27 Ω, 33 Ω, 39 Ω, 47 Ω, 56 Ω, 68 Ω, 82 Ω etc

Fig. 2.1: Colour coding in carbon resistors

Currently there is no existing method to sort resistors automatically. In this project an automatic batch process is designed to sort the various resistors according to the resistance value. In this system two conveyor belts are employed, first conveyor belt is to move the resistors and the other one to adjust the position of the collectors to collect the sorted resistors. The conveyor belts are moved using DC motors which are interfaced to a Arduino through a motor driver circuit. The motors are connected to the motor driver circuit. The requirement of the motor driver is that the output voltage from the Arduino is just 5V which is not sufficient to drive the DC motors. The motor driver circuit provides the supply voltage at its output pins whenever the digital signal from the Arduino is high. A high definition camera is also used for acquiring the images of the resistors on the conveyor.

We propose a methodology for automatically sorting the resistors according to their resistance value. We have made use of National Semiconductors MATLAB software for its precision and reliability. It must have high speed for sorting resistors, must minimize the requirement of human attention. The proposed system must be suitable to use in industries to reduce human efforts and labour. This method of sorting resistors must be more precise and error free than other conventional methods.
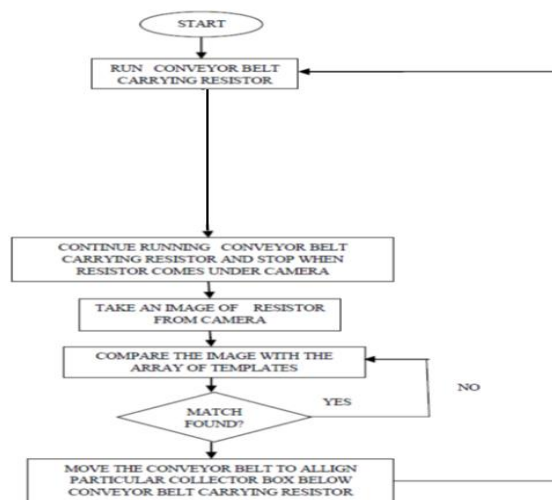
III PROPOSED METHODOLOGY

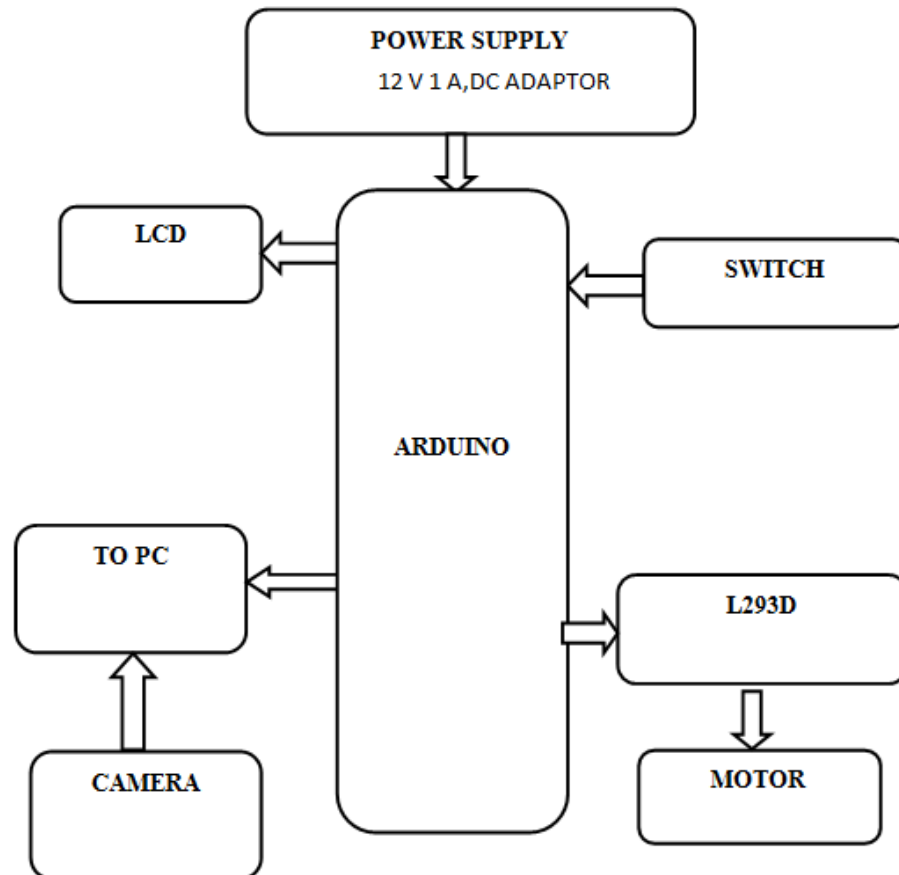**Fig. 3.1 Flowchart**

IV BLOCK DIAGRAM

Fig. 4.1 Block Diagram

4.1 Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

4.2 LCD Display

A liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. The most common application of liquid crystal technology is in liquid crystal displays (LCDs). A liquid crystal display consists of an array of tiny segments (called pixels) that can be manipulated to present information. The LCD screen is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment.

4.3 L293D

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC

motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

4.4 DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. Here we use dc gear motor having Rpm less than 35.

4.5 Camera

Here we use High Resolution camera in order to take the accurate image of resistors. In order to detect the colour bands precisely we need to use camera having resolution above 12 Mega Pixel.

4.6 Switch

Here we use a reset switch to move the conveyor belt initially and initializing the camera to take picture using MATLAB.

V .WORKING

In this proposed methodology we initially place the resistor in the upper conveyor belt. By making use of the reset switch, the upper conveyor belt allowed to move. The movement of this belt stops when the resistor comes under the camera. Then the arduino sends a signal to the MATLAB indicating the presence of the resistor and initializes the camera to take the picture of the resistor. Prior to the process we are created some templates and loaded into the pc for the comparison process. Then the taken image is compared with the preloaded images by making use of digital image processing. Then the MATLAB identify the resistor value and sends it back to the Arduino. On receiving the resistor value, the Arduino then controls the movement of lower conveyor belt carrying the boxes. Simultaneously, both upper and lower conveyor belt moves and the identified resistor is allowed to fall in the appropriate box. At the same time the LCD displays the detected value on the screen. After completing the process both the conveyor belts comes back to the initial position.

VI .CONCLUSION

This model developed a system for automatically sorting the resistors according to their resistance value. this sorting of resistors is based on image processing. we have made use of MATLAB software for its precision and reliability. for checking the images of the resistors we use high definition camera. the proposed system is more suitable to use in industry for sorting the resistors as the system is more accurate and avoid wastage of time, and requires no human effort. as electronic devices are increasing nowadays, sorting of resistors is an inevitable part of manufacturing. hence the model is valuable for the present as well as for the future.

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