SORTING OF OBJECT BASED ON HEIGHT, WEIGHT AND COLOUR ON A CONVEYOR LINE

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Abstract— Sorting of products in an industry is a tedious industrial process, which is generally carried out manually. Continuous manual sorting creates quality consistency issues. This project describe the new solution of a control system. Segregation based on different characteristics like weight, color, height require different equipment for weighing and then separating. Main purpose of this paper is to design an automated material handling system. This solution provides accuracy, reduction of time, energy conversion and more advantages. We have proposed an efficient method which uses Force resistive sensor, Ultrasonic sensor and TCS 230 colour sensor for identifying and segregating on the basis of weight, height and colour of the object on the conveyor line. Microcontroller is heart of that circuit and control the function , therefore allows dynamic and faster control , that controller.

Keywords—Automatic Sorting System, Object Sorting, Force Sensing Resistor, Ultrasonic Sensor, TCS230 Colour Sensor.

I. INTRODUCTION

Automation is the use of control systems for handling different processes & machineries to reduce human efforts. Automated systems generally use complex algorithms which increases cost of the design & the power consumed. But this not only reduces human efforts, time consumed by the process. Using automation also avoid danger which might occur, when humans are made to work in hazardous environments, thus use of automation is effective in manufacturing and process industries. Sorting based on color, weight and height is done in many industries to ensure the quality of the object is consistent & up to the mark. Automated sorting also reduces the labour cost & the production time. The error caused due to human neglected and are avoided by the use of automated system by color, weight and height based sorting of object.

II. COMPONENTS

2.1 TCS 320 Colour Sensor :

Fig. 2.1

This sensor is used to differentiate between three colors i.e. red, green and blue. The model of the sensor is TCS230. It consists of a TCS3200 RGB sensor chip and 4 white LEDs.

In TCS3200 The color filter is selected by the two select lines, it only allows sensor has four types of filter- red filter, green filter, blue filter, and clear with no filter. The filter is selected based on the high and low of pin S2 and S3 on the module.

S2	S3	Photo Diode
Low	Low	Red
Low	High	Blue
High	Low	Clear filter (No color)
High	High	Green

Table 2.1

The module contains a programmable converter which transforms color light to frequency. When the part of RGB colors in the light reflected by the object passes through the filter selected to the TCS3200 RGB chip, the built-in oscillator outputs square waves. The frequency of the waves is directly proportional to the light intensity the more intense the light is, the higher is the frequency. Also, the frequency of the OUT pin on the sensor module is proportional to the oscillator; the proportion depends on the high and low of pin S0 and S1, as shown in the table below.

S0	S1	Scaling
0	0	Power down
0	1	2%
1	0	20%
1	1	100%

Table 2.2

2.2 HC-SR04 Ultrasonic Sensor :

Fig. 2.2

HC-SR04 offers excellent non-contact range detection with high accuracy & stable readings in an easy-to-use package. From 2 cm to 400 cm i.e. 1" to 13 feet. It comes complete with ultrasonic Transmitter and Receiver module.

The modules includes ultrasonic Transmitters, Receiver & Control circuit. The basic principle of work is 1. Using IO trigger for at least 10 us high level signal, 2. The Module automatically sends eight 40 kHz & detect whether there is a pulse signal back or not. 3. If the signal back through high level, time of high output IO duration is the time from sending ultrasonic to returning back. Test distance = (high level time × velocity of sound (340M/S) / 2, λ Wire connecting direct are as following: 5V Supply, Trigger Pulse Input, Echo Pulse Output, 0V Ground Electric Parameter, Working Voltage DC- 5 V, Working Current- 15mA, Working Frequency- 40Hz, Maximum Range- 4m and Minimum Range- 2cm, Measuring angle- 15 degree ,Trigger Input Signal- 10uS TTL pulse, Echo Output Signal Input TTL level signal and the range in proportion Dimension- 45*20*15mm Vcc Trig Echo GND Timing diagram. You only need to supply a short 10 uS pulse to the trigger input to start the ranging, and then the module will send out an eight cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and range in proportion.

2.3 FSR 400 Series Round Force Sensing Resistor :

Fig. 2.3.1

Force Sensing Resistors i.e. FSR are a polymer thick film device which exhibits a decrease in resistance with an increase in the force applied to the active surface of the polymer thick film. The force sensitivity of FSR is optimized for use in human touch control of electronic devices. Force Sensing Resistors are not a load cell or strain gauge, though they have similar properties like them.. Force Sensing Resistors are not suitable for precision measurements.

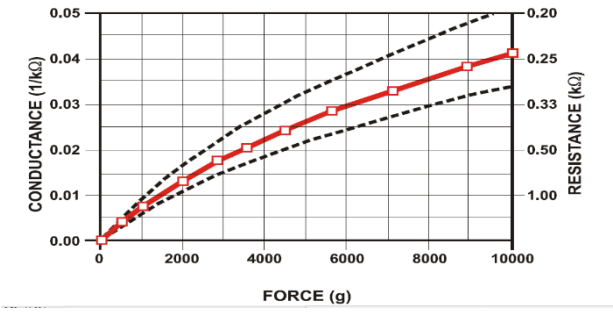
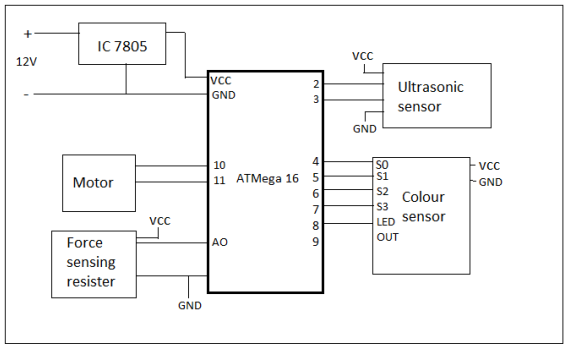


Fig. 2.3.2 The Force vs Resistance characteristic.

The force vs resistance characteristics provides an overview of FSR typical response behavior. For convenience, the force vs resistance data is plotted on a log/log format. These data are representative of our typical devices with this particular Force-Resistance characteristic being the response of evaluation part 0.5" [12.7 mm] diameter circular active area. A stainless steel actuator with a 0.4" i.e. 10.0 mm diameter hemispherical tip of 60 durometer polyurethane rubber was used to actuate the Force sensing Resistors device. In general, FSR response approximately follows an inverse power- law characteristic. This turn- on threshold, or 'break force", that swings the resistance from greater than 100 k∧ to about 10 k∧ is determined by the substrate and overlay thickness and flexibility, size and shape of the actuator, and spacer- adhesive thickness i.e. the gap between the facing conductive elements. Break force increases with increasing substrate and overlay rigidity, actuator size, and spacer adhesive thickness. Eliminating the adhesive, or keeping it well away from the area where the force is being applied, such as the center of a large FSR device, will give it a lower rest resistance. At the high force end of the dynamic range, the response deviates from the power- law behavior and eventually saturates to a point where increases in force yield little or no decrease in resistance. Under these conditions of, this saturation force is beyond 10kg. The saturation point is more a function of pressure than a force. The saturation pressure of a typical FSR is on the order of 100 to 200 PSI. Forces higher than the saturation force can be measured by spreading the force over a greater area, the overall pressure is then kept below the saturation point and dynamic response is maintained.

III. BLOCK DIAGRAM



IV. RESULT

We have developed a automation system to sort the object based on weight, height and colour. The object is kept at platform to measure the weight of the object and pushed on the conveyor line. Now object will pass through the Ultrasonic and Colour Sensor. The Ultrasonic Sensor will measure the height of the object and move forward towards the colour sensor. If all the conditions are passed by the object then the object will be collected or otherwise rejected by using flipper mechanism.

V. CONCLUSIONS

We have proposed a system which would segregate the object based on the color, weight and height and also increase the production rate and accuracy of material handling systems. Use of Micrcontroller with the frame of logic gates will make program modification easy and thus we can modify the system according to the requirement of the users.

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