

A NOVEL CONVEYOR BELT MECHANISM FOR IDENTIFYING AND SORTING PRODUCTS

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Abstract: This paper attempt to design an automation system for package and identification of product color difference. The products are placed on a moving conveyor belt, a color identifying sensor is placed on the conveyor belt that detects two different colored products and a divider separates that product to their destination based on color difference. The passage and separation of the product to the intended destination is done by a color difference mechanism. In most of the bundling industries, sensing of color object and then sorting of that sensed product is a final task that needs to be done at the time of dispatching. In earlier days, industries tend to choose human workers for sorting process. This repetitive work is accomplished by human operators which is monotonous, time-consuming, slow and not consistent. ATmega 2560 is an on-chip microcontroller consists of a powerful CPU tightly coupled with memory. This project is going to interface RGB color sensor with microcontroller. This color sensor is used to detect three different types of colors by Arduino programming. Therefore, the efforts are made to design and implement an automatic technique of product passage and separation via color difference mechanism.

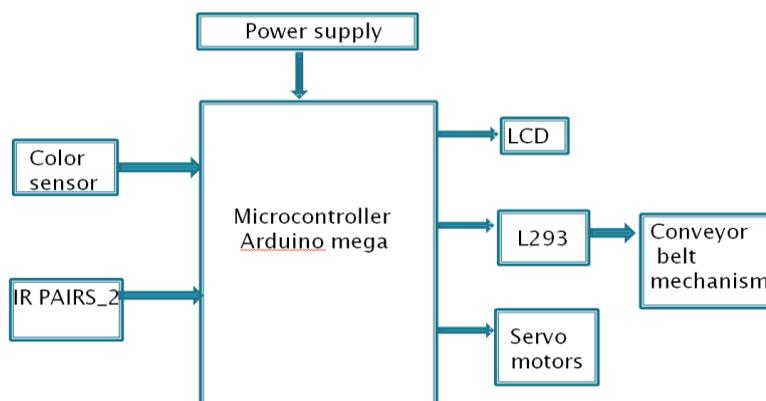
Keywords: Color sensor, AT Mega 2560, Servomotor, product.

I. INTRODUCTION

In many bundling industries, color object sensing and separating is a important task that need to be done at the time of dispatching. Sorting of objects is broadly used in so many industries like food processing industries, toy industries, etc to ensure that the standard of product is to the mark[1]-[4]. This process is simplified by the use of automation. Automatic process is used by the control systems like computers or robots for managing multiple process and machineries to take the place of humans and provides mechanical assistance[5]. Automated systems generally use more complex algorithms which increase the cost of the design and the power consumption[6]. This reduces not only the human efforts, consumption of time, spares more time for marketing, but also prevents the human beings from working in pollutant environment. The improvement of product supplying industries depends on research in manufacturing process and implementation of new products. During this process, the materials are transformed into products. This technique greatly improves the productiveness and is more scalable[7]. The main task performed here is to sort the products manufactured in the company. This project purpose is to save the time consumption and to reduce the efforts in material manufacturing. Based on the color, the object can be separated. The project involves color identification of the product which is controlled by Light dependent diodes arrangement acts as a color sensor which senses the product color and sent the signal to the ATMEGA microcontroller in Arduino [8]-[9].The use of conveyer belt in seperation process is economical method of automation, which transfers product from one place to its destination place. Workers dullness or laziness at the working place may effect performance of the system, Product quality may damage. This project focuses on automatic technique of product identification & separation through color identification. Machines can perform tedious errands superior to people.

II. Proposed Method:

This project focuses on automatic technique of product identification & separation through color identification. A color sensing device is situated on conveyor belt which can identify the color of products during packing process and then divides different colored packaged products to different destination. DC motors are used to control the conveyor belt and servo motors are used for sorting purpose. The schematic diagram of this proposed system is shown in below figure (1).



Figure(1): schematic diagram

Microcontroller: AT Mega 2560:

The Arduino Mega 2560 is a microcontroller board dependent on the ATmega2560. It has 54 advanced yield pins (of which 14 can be utilized as PWM yields), 16 simple data sources, 4 UARTs (equipment sequential ports), a 16 MHz oscillator, USB connection . It contains everything expected to help the microcontroller; essentially interface it to a PC with a USB link or power it with an air conditioner to-DC connector or battery to begin. The microcontroller can work up to the limited input voltage range of six to twenty volts. Whenever provided with under 7V, that may supply under five volts and the board might be at high temperature. The ATmega2560 has 256 KB of memory for putting away code (of which 8 KB is utilized for the bootloader), 8 KB of SRAM and 4 KB of EEPROM.

Every one of the 54 advanced sticks on the Mega can be utilized as an yield, utilizing pinMode(), digitalWrite(), and digitalRead() capacities. They work at 5 volts. Each stick can give or get a limit of 40 k Ohms and has an inner draw up resistor of 20-50 k Ohms.

At the point when the Mega2560 is associated with either a PC running Macintosh OS X or Linux, it resets each time an association is made to it from programming (by means of USB). For the accompanying half-second or something like that, the bootloader is running on the Mega2560. While it is modified to disregard deformed information (for example anything other than a transfer of new code), it will catch the initial couple of bytes of information sent to the board after an association is opened. On the off chance that a sketch running on the load up gets one-time design or other information when it first begins, ensure that the product with which it imparts holds up a second in the wake of opening the association and before sending this information.

A digital read pin will read the digital value of the given pin similarly digital write pin will write the digital value of given pin. pin mode will set the pin to input output mode. Analog read and write pin reads and writes the worth of pin respect.

IR SENSOR:

An IR sensor is also known as photo voltaic sensor that detects the infrared light . IR sensor mainly having the transmitter and receiver led to transmit and receive the infrared light. IR sensor is capable of measuring the heat emitted by the object and it also measure the position of object. IR sensor works on the principle of reflected light which will detect the reflected light coming from the object and it measures the distance between the sensor and the object. This sensor provides the binary output. In our project we are using these IR sensor to detect whether the object is placed on the conveyor belt or not. if there is an object it will produce an binary output as one and if there is no object it will produce the binary output as zero.

SERVO MOTOR:

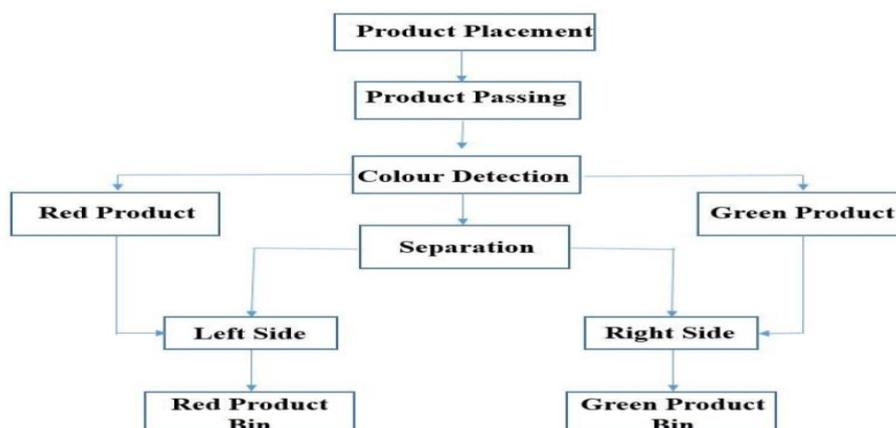
There are two types of motors for the rotating purpose namely stepper motor and servo motor. In our project we only prefer the servo motor for sorting purpose because as compare to the stepper motor ,servo motor works very fast and also the cost of the stepper motor is also high compare to the servo motor. servo motor is closed loop system and it mainly consists of dc motor, gears and the control circuit and it consists of three pins voltage(Vcc), ground (Gnd), control signal pin. They are small in size and used in many applications like robotics ,cars and aeroplanes. Servo motors has the ability to precise control over the shaft. Servo motor works on the principle of PWM(pulse width modulation).The width of the pulse determines the angular position of the shaft .Normally the servo motor can rotate at an angle 90 or 180 degrees.

LCD:

LCD is most prominent electric circuit utilized in electronic activities. It has 16 pins. One is gnd, vcc, register select pin ,read or compose stick, the enable stick, eight information pins and one anode and cathode stick. In our venture we are utilizing a 16x2 LCD. It implies LCD show having the two lines and each line will show 16 character for every line and show the each character as 5x7 pixel box. it implies each character will show in five lines and seven sections . it working voltage is 4.7 to 5.3v. It is perfect with 8-bit or 4-bit mode.LCD can be effectively programmable. It having primarily two registers namely direction and information register will store the information. Command register stores the directions given to the LCD.

System design and methodology:

The flow diagram of the proposed model is as shown in figure (2).



Figure(2): Flow diagram of proposed method

The proposed system works in following three steps:

1. color sensing
2. sorting mechanism
3. counting of products

Color sensing:

The color sensor as shown in figure (3) is placed on top of the conveyor belt which senses three different colors namely red, green and blue. This color sensor has red, green, blue color filters and a photodiode which are used to convert the incident light energy into electrical current. This current is again converted into voltage which is understandable by arduino.

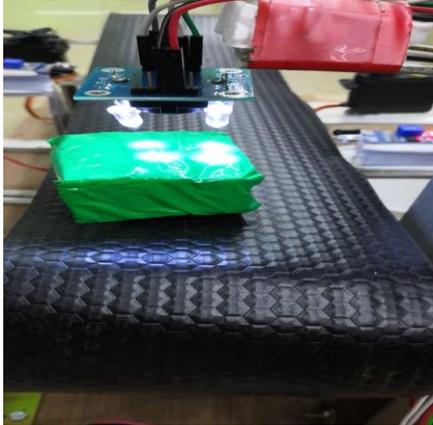


Figure (3):color sensing of an object.

Sorting mechanism:

For the separation of product, a divider was used that was directly attached to a servo motor. When the product is moved on the conveyor belt was run by the help of DC motor which acts like an actuator. The servo motor working is to rotate 180 degrees that means it can rotate 90 degrees in one direction to separate the red colored object and another 90 degrees in opposite direction to separate green colored product covering the overall 180 degrees rotation. Every time the servo motor rotates right or left based on the color sensing. The schematic view of the above description are shown in following Figure (4).

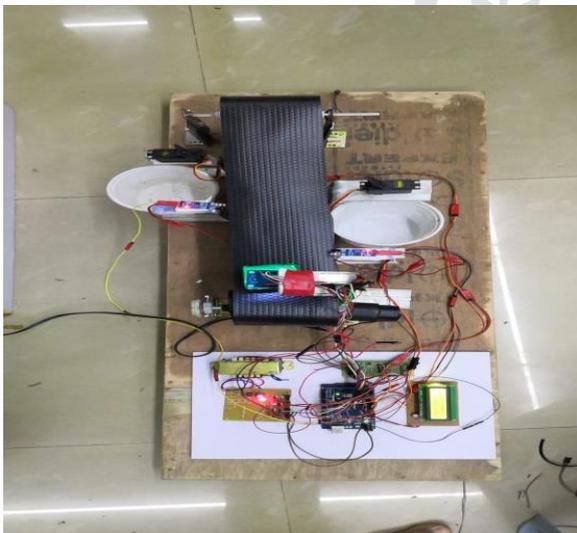


Figure (4): Sorting of two objects.

Counting of products:

Detecting and counting of products in the machine ensures the continuous monitoring product flow as shown in figure (5). The entering of products on conveyor belt is modified and fall down product in the conveyor belt reliably are detected. The reliable detection of products is guaranteed with IR pairs.

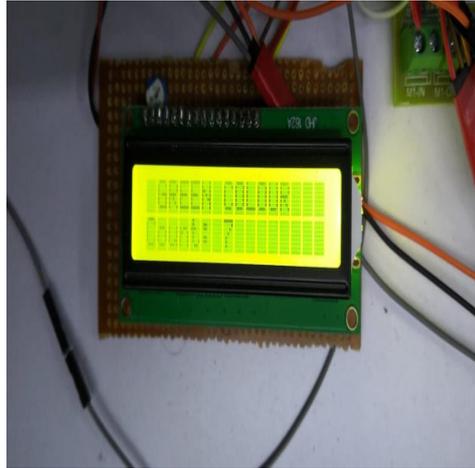
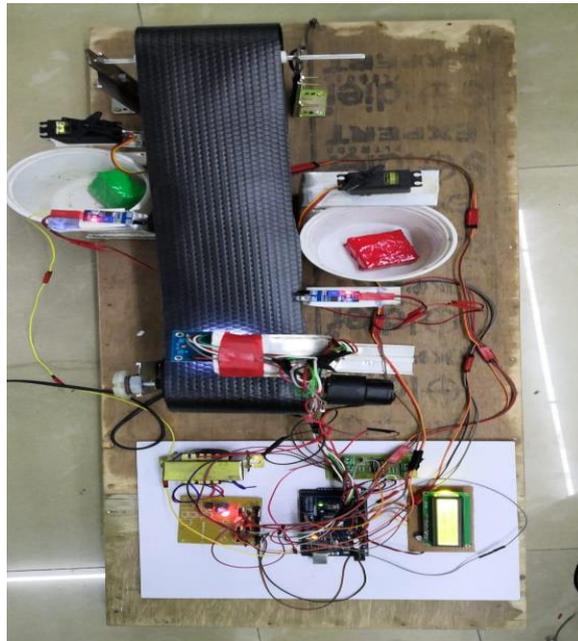


Figure (5): counting of products.

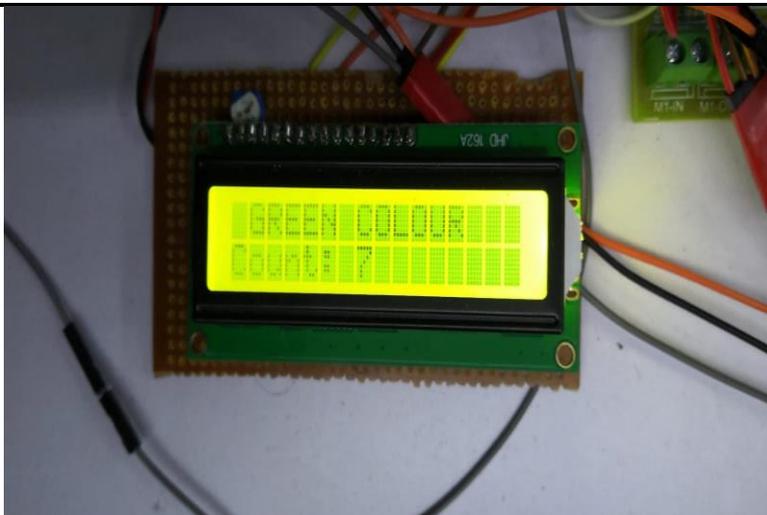
III. Results and discussion:

In this project, color of an object is sensed by color sensor and sorting of the objects is done by servo motor taking into consideration three colors namely green, red, blue(RGB).



Figure(6): color sensing and sorting of objects.

As shown in the figure (6), the AC power supply is converted to the DC power supply by rectifier, this power supply is maintained by the transformer and it is given to the Arduino microcontroller. Here the object is positioned on the conveyor belt, which is rotating in clockwise direction by the working of DC motor. The color of the product is sensed by the color sensor which is kept on the conveyor belt. The object is sorted by the servo motor and placed in their respective destinations. The counting of the products based on value of color is realized by IR sensor pair and this process is programmed by using arduino software is shown in figure (7).



Figure(7):Counting of products

VIII. Conclusion and Future scope:

As the world is getting modern and digitalized, human labor is being replaced by technologies and intelligence for bringing higher comfort in human life and also for saving time and precise operation and mass production. In small and big enterprises, to separate the products based on the various parameters or in food industries to detect the spoiled and damaged fruits, this system of product separation based on color is essential for quick, accurate operation and mass production than using traditional human labor. Not only for bringing comfort but also for improving product quality and reducing cost. The system is more improved and modified and very much essential in Practical life and Industrial activities. Color sensing and sorting is helpful in so many applications of industries especially in the packaging application.. It guarantees remarkable processing capability and improved performance including color detection. One can add high speed DC motors and sensors with fast response to speed up the process for industrial application. The implementation in this project are, a load cell is added to measure the weight of the product, the Speed control of the system can be incremented according to the speed of production, the system can be used to improve standards by adding different sensors, the sensor can be replaced based on the type of product which means the DC motor can be replaced with stepper motor.

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