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Implementation of Date Fruit Sorting Machine Using a Sensor Based Technology



Abstract: - The date palm has significance in Gulf nations, particularly in the Sultanate of Oman. Every summer, the palm produces a large number of date fruit that may be picked. Approximately 70% of it is used for human consumption, while the remaining 30% is used for animal feed and other purposes. Because there are so many different types of dates, they must be classified properly. Omani citizens, used to sort dates by hand. That procedure takes longer time and requires more work. So, while there are various strategies for making the process of sorting date fruit easier and faster, the most efficient one is to use a date sorting machine using color sensor. This machine works with Arduino, color sensors, pistons and conveyor belt. The ultimate objective of this project is to categorize the dates based on the color. The project uses an Arduino microcontroller to receive data from a color sensor and transmit them to pistons in the appropriate order. The date fruit is kept in a conveyor belt that is fixed in a constant low speed. When the color sensor identifies the dates, it activates a specific piston for each color, which pushes the dates into a corresponding basket.

Keywords: Dates sorting, Fruit sorting, Color sensor, Arduino, Pistons, Conveyor belt.

I. INTRODUCTION

Omanis used to take care of palms and dates in the hot season with a series of inherited traditional customs practiced by both males and females. These are various agricultural activities that indicate their close association with the date palm and dates that shaped their way of life. The "myth" process, which is the process of harvesting the dates, is carried out by ascending the palms at regular intervals to pick the dates, and it lasts more than four weeks for one type of palm. The farmer is distinguished by his experience inherited from his ancestors in knowing the types of dates that he harvests during this period, and the dates may reach about 15 varieties [3,11,12]. In the major operation, "Gdad", where the fruits are harvested after turning into dates and they are cut with scythes or shears, and families, men, women and children at this stage share a beautiful image that embodies social solidarity, singing popular songs that help them perform their tasks. But at the present time, with the development of technology, we may see a small number of families that still rely on this approach, and this contributes to taking a long time and greater effort to complete this process. Hence the problem of distributing and categorizing the date at the present time, which needs a quick treatment to reach the farthest possible countries before it is too late for the season, especially since the dates is a basic and huge income for the individual and society because of its many benefits [7,8,9]. The problem lies in distributing the varieties of dates that need time and effort, and since technology plays an important role through which we can eliminate time and effort. With time constrained and the date season approaching, there must be an effective solution that speeds up the pace of distributing and categorizing dates, especially since dates are considered a basic meal in many countries because of their great benefits [1,2,4]. After thinking and focusing on technology, we found what is capable of eliminating this problem through classifying dates by color through the color sensor and pushing each date identified by sensor to specific

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place by piston, whereas the dates move on conveyor belt and reach to color sensor, then the piston will block the way of dates and put it in a basket. This process will achieve a speed up of the work and accuracy in distributing dates. Literature review were done in various methodologies and found the method discussed is easy one [5,6,10]. The goal of this study is to reduce the time spent on sorting dates and boost production while reducing human stress.

II. DETAILS EXPERIMENTAL

Six key components are used to achieve the goal of this paper.

A. Conveyor belt

A conveyor belt shown in figure 1 is a constantly running machine with synthetic rubber or steel utilized in manufacturers to move goods or objects along so that they may be processed as rapidly as possible. It comes with a speed controller to control the speed as required.



Fig.1. Conveyor belt

B. Arduino

Arduino in figure 2 is associate ASCII text file platform that will be accustomed with required software and hardware. Arduino is formed as programmable panel (microcontroller) and computer code, referred to as associate Integrated Development Environment, that works on your laptop as well as it employed to form and transfer program to the basic panel. In contrast to most previous program circuit panels, Arduino doesn't need a split part of hardware to upload new program to the panel; as an alternative, a USB wire is enough. What is more, Arduino software makes writing the program easier by employing a basic style of C plus.



Fig.2. Arduino Uno Board

C. Color sensor

A color sensor in figure 3 is a kind of "photoelectric sensor" that utilizes a transmitter to create illumination after that employs receiver to sense light indicated from the identifying target. A color sensor can sense the received light strength for RGB permitting the color of the focused body to be defined. Color sensors are divided into categories. One uses broad wavelength light to illuminate the item and the receiver to distinguish between the

three sorts of colors. The other version uses three different forms of light (red, blue, and green) to illuminate the item.



Fig.3. Color sensor

D. Motor driver



Fig.4. Motor driver

Figure 4 is a L298 H-bridge motor driver module that is used to drive DC motors. This module has to be energized with 12 v DC in V_{in} terminal. Then grounded in GND to battery. It also has output of 5v that can supply Arduino board. Two DC motors or stepper motors can be connected at the same time in L298 H-bridge motor driver. There are ENA and ENB pins for motor A and motor B to control the speed. IN1&IN2 pins are used to control the direction of motor A. on the other hand, IN3 and IN4 pins are used to control the direction of motor B. after all, L298 H-bridge motor driver will be connected to Arduino through the pins, then it will be working based on the programming codes.

E. Piston

Figure 5 shows a piston. It's a mechanical device that uses an electric energy and convert it into a mechanical energy to push a material under programmed order. In our project implementation dates sorting machine, the piston is used to push a specific type of dates then it passes through it in a basket. The piston will be connected to an Arduino and power supply.



Fig.5. Piston

F. Battery



Fig.6. Battery

We have used DC power supply i.e battery as shown in figure 6 to power the system. 5 V have been used for the Arduino and 12V for the piston. the power supply is connected from battery to motor drive then from motor drive to Arduino and piston.

G. Methodology

The main focus of the project was to design a date sorting machine. The system of this machine will be operated by Arduino as a microcontroller. Arduino will be receiving signals from sensors and sending signals to pistons. The proposed system is limited only to sort different types of Omani dates. The project can be used in four particular types of dates fruit in Oman. Some calculations, assumptions, and selections were made as a consideration of a proper and realistic design. The project is implemented with one color sensor as shown in figure 7.

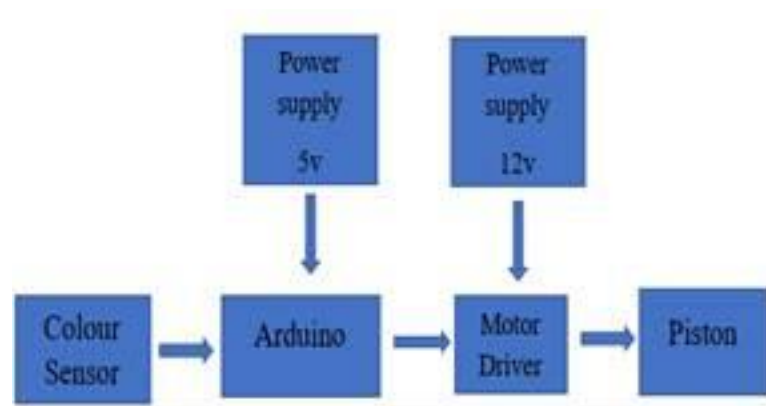


Fig.7. Block Diagram

First, the color sensor is connected to Arduino. Vcc and Gnd of color sensor are connected to 5v and Gnd of Arduino. Then, OUT of color sensor is connected to pin number 12 of Arduino. S0, S1, S2, S3 of color sensor are connected to pins number 8, 9, 10 and 11 respectively of Arduino. Now, considering the connection of motor driver, here we are connecting four pins, INT1 and INT2 for the first piston and they will be connected to Arduino through pins number 2 and 3. For the second piston, INT3 and INT4 of motor driver will be connected to pins 4 and 5 respectively. After that, 12v battery is connected to motor driver (positive terminal of battery to +12v terminal of motor driver, and negative terminal to ground). Finally, from +5v output of motor driver to Vin of Arduino a wire is connected to energize the Arduino. All the connections are shown in figure 8.

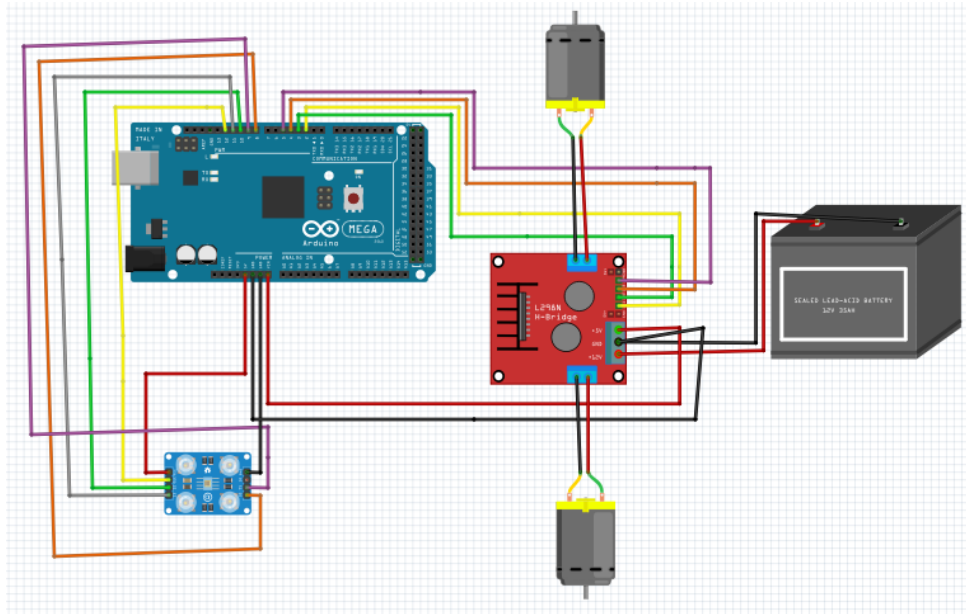


Fig.8. Circuit Connection



Fig.9. Actual Components Connection

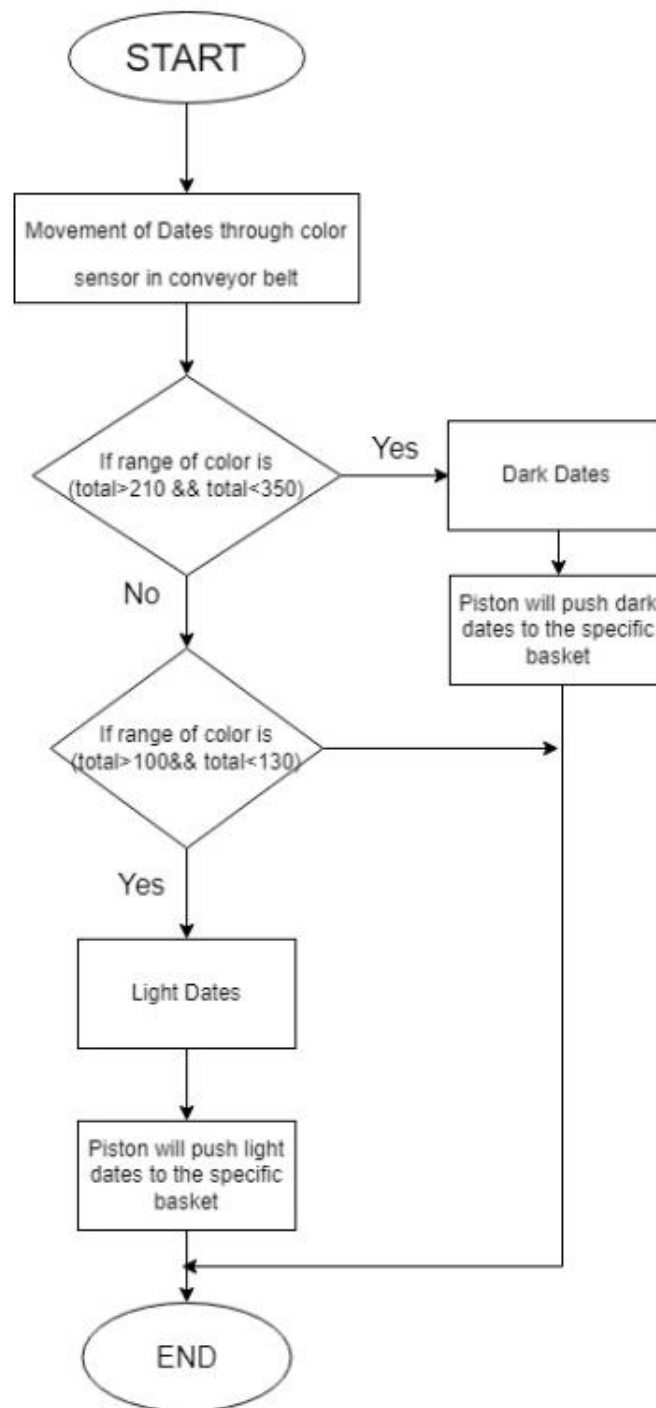


Fig.10. Flowchart

The figure 9 shows the actual connection of the components such as Arduino uno, color sensor, motor driver and the piston. The motor driver is used to operate the piston in both direction upon receiving the signal from the color sensor. A 12 V battery is connected to the piston and Arduino is powered by the battery.

The system's operation is depicted in below figure 10. The process is explained very clearly the if the range of color sensor is between 210 to 350 the dates is identified as dark color dates. If the range is between 100 to 130 then it is identified as light color dates.

III.
IV. RESULTS AND DISCUSSION



Fig.11. Actual setup

Figure 11 shows the actual setup of the project implemented.

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COM3
SERIAL
other color
Red value= 59 Blue value= 59 Green value= 73
Red value= 58 Blue value= 58 Green value= 68
182
other color
Red value= 57 Blue value= 58 Green value= 71
176
other color
Red value= 57 Blue value= 58 Green value= 72
187
other color
Red value= 56 Blue value= 58 Green value= 72
188
other color
Red value= 57 Blue value= 57 Green value= 71
189
other color
Red value= 58 Blue value= 58 Green value= 71
187
other color
Red value= 56 Blue value= 58 Green value= 72
188
other color
Red value= 58 Blue value= 58 Green value= 72
188
other color
Red value= 57 Blue value= 58 Green value= 72
187
other color
Red value= 57 Blue value= 49 Green value= 71
177
other color
Red value= 57 Blue value= 57 Green value= 72
188
other color
Red value= 57 Blue value= 52 Green value= 71

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Fig.12. Testing of color sensor

The figure 12 is showing the testing result of color sensor for various dates. Each date is tested with color sensor to find the RGB value. Based on the RGB value range found for each dates the program is written to identify the particular dates for piston action.

CONCLUSIONS

No one can ignore how it is so important to talk about implementation of dates sorting machine, because all of us know the way that topic improved the selection of variety of dates in Oman as easy as possible. In this project, the design of a prototype of a date fruit sorting machine is discussed to sort them by color. The experimental results, after testing each component, showed high efficiency and accuracy in sorting dates by color. Here for the implementation process only one color sensor is used but we can connect as many depends upon the dates variety. The model was designed using steel and wood.

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