Design of Object Sorting and Lift Automation System

Dhanamjayulu C, Vrishank Panchal, Falguni Joshi, Anandita Narayan

Abstract—Presently globalization is an essential issue, it is the fundamental that ventures investigate strategies for improving mechanization and profitability to get more prominent aggressiveness. In such manner Material Sorting and Lift Automation is an innovation that guarantees to be exceptionally valuable for any sort of assembling association. In this paper a framework is built which consists of conveyor and lift system using arduino. Sensors will be fitted on the conveyor belt to sort articles of different sizes or colors. Then the automatic lift will lift them to respective floors for storage and the sliding mechanism will push the articles to their respective storage. Despite the claims of high quality from good workmanship by humans, automated systems typically perform the process with less variability than human workers, resulting in greater control and consistency of product quality.

Index Terms—arduino, lift automation, sorting, ultrasonic sensor

I. INTRODUCTION

The process by which a system or method is performed with less human undertakings is known as automation. Automatic control is the use different types of control frameworks to work equipment, for instance, hardware, modern methods, factories, boilers, heat exchanger, communication networks planes and distinctive vehicle applications[1]. Automation covers applications beginning from a home unit indoor regulator to controlling a heater to a considerable present day control structure with countless and yield control signals. In control framework it can go from direct on-off mechanism to multi-variable control mechanism[20].

In the most essential sort of automatic control loop, a controller can analyze an estimation of a procedure with definite arrangement of qualities and processes the subsequent load to control the contribution to the process so that it remains at its underlying set-point regardless of unsettling influences[1].

Automation has been developed by different ways that incorporates mechanical, water driven, pneumatic, electrical, electronic appliances like PC and so forth. Complex frameworks, for instance, the production lines, flights, ships make utilization of each of these techniques[3]. The benefits of automation are less funds for human labor, high production, lesser time, ease of process, etc. Hence, in this paper a lift automation and material sorting framework is designed, so that industries can utilize the benefits of automation. Our contribution can be summarized as follows:

- We design a material sorting and lift automation system

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that diminish human efforts and buttresses the organization towards their technological advancement.
- The framework sorts the cartons in accordance to their size and transfers them through the conveyor to their respective storage via an automatic lift.
- Arduino software is used to make the entire system work.

II. SYSTEM DESIGN

This proposed methodology approaches to design a material sorting and lift automation system that diminish human efforts and buttresses the organization towards their technological advancement. It will sort the cartons in accordance to their size and transfers them through the conveyor to their respective storage via automatic lift as shown in Fig.1.
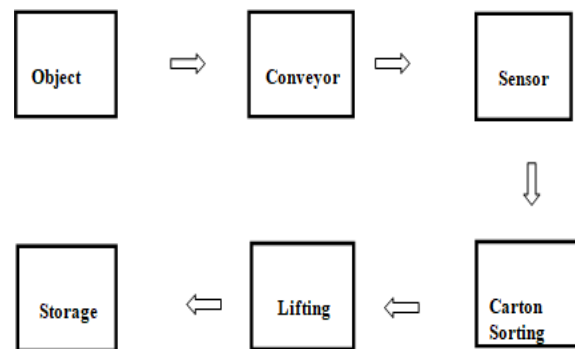
Fig. 1. Flow chart for sorting and lift automation process.

The described sorting process is based on ultrasonic sensor. The items to be sorted are kept on a conveyor belt which is working using arduino. The objects passing through the conveyor belt are sensed by the ultrasonic sensor that has been placed in position such that it measures the size of the object with accuracy and minimum error.

It categorizes the object size while they passes through the conveyor and the lifts them up to their respective storage floor. This results in reducing human labor, and improves productivity.

A. Solidworks Simulations

- Solid works is software used to design 3D model of a structure. Here, we have designed the total set using the software.
- Individual shapes were first designed in 2D and then the software converts them to 3D objects. Then the individual 3D parts of the model are assembled using the assembly option provided in the software.
- The dimension of the 3D objects is altered according to the requirement and iterations are made so that the correct ratio is obtained.
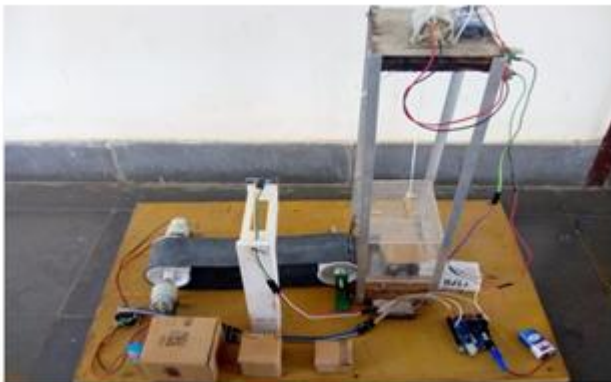
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The model is then used to design the actual set up. The solid works model is shown below in Fig.2.
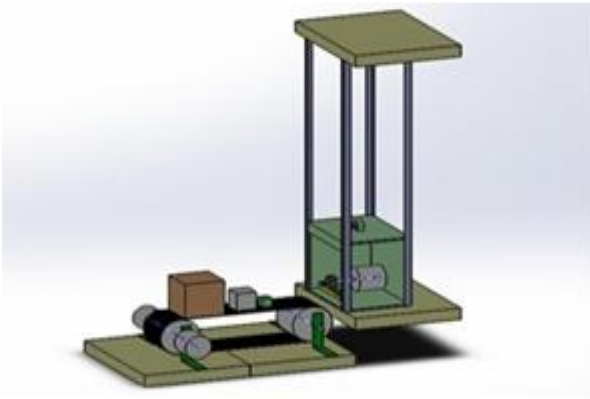
**Fig. 2. SolidWorks simulation model**

B. Arduinouno

To run the arduino, a software is needed which provides the platform to write, compile and upload the code for performing the required function. Arduino IDE is the software developed by arduino which supports java programming language. It consists of several options. It has a code debugger, compilers, port option, basic examples, serial monitor to print the value, graphical features and many more options to run and upload the code in the arduino board through a USB cable.enditemize

Fig. 3. Structure for object sorting and lift automation system

C. Circuit diagram andStructure

The circuit diagram for the proposed model is shown in Fig.4 and the structure for the proposed model is designed as shown in Fig.3.
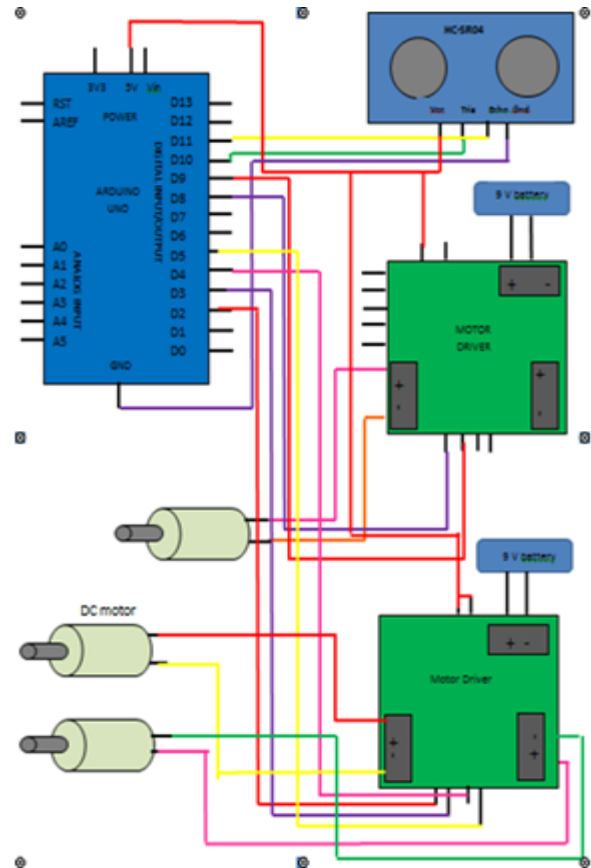
Fig. 4. Circuit Diagram

III. HARDWARE COMPONENTS

Thecomponentsusedareasfollows:

1) Arduino:Arduinoboardsmakeuseofdifferentchips and controllers. They are provided with set of in- put/output pins that serves different functions when connected to different electrical components. The board contains supply voltage, USB, analog inputs, LED, etc. They can be programmed using different programming languages like c/c++. They come in different sizes for different scale of requirement.

2) HC-SR04 ultrasonic sensor: This helps us in measuring the distance at which the object is kept or to detect the position of the sensor. It uses ultrasonic waves for the above purpose. This comprises of a transmitter and receiver which are responsible for giving out and taking in the ultrasonic waves respectively. These sensors does not measure the distance directly. It measures the time of the wave to travel towards the object and the return back and then using the distance time formula itconverts it into distance. These does not have actual transmitter and receiver instead consists of a solitary oscillator for discharging and collecting ultrasonicwaves.

3) Geared DC motor: These are the type of dc motor which are provided by gears mounted on them. The gear mounting is capable of increasing the torque value and decreasing the speed of the motor. They are the most basic type of motors used in most of the automation projects. The fact that torque is increased on decreasing the speed aids value to the motor and is the major advantage of using them.

Apart from geared assembly, rest all the components are same as other dcmotor. These are available for different rpms and are light weight.

4) Motor controller: It is a device that helps us to perform various operations on dc motor. It can change direction of rotation of dc motor by changing the terminals. It can facilitate the start- stop operation of the motor. It requires a program, for example, an arduino program that gives commands to perform the operations stated above. It can work on varying loads and with different types of motors. They need to have an external voltage supply through abattery.

IV. ALTERNATIVES AND TRADEOFFS

This project approaches to design a material sorting and lift automation system using arduino and ultrasonic sensor. It will sort the cartons in accordance to their size and transfer them through the conveyor to their respective storage via automatic lift. Arduino is the simplest and less complex microcontroller to design a prototype like this. For large scale projects various other control schemes and algorithms can be used. Some of themajoralternativeapproachesareasfollows:

1) PLC:- It is a mechanical computerized PC which has been ruggedized and balanced for the control of gather- ing shapes, for instance, successive development frame- works, or robotized devices, or any development that requires high constancy control and effortlessness of programming and strategy accusefinding[16,21,22].

2) Neural networks:- The CNN system network can be utilized as it investigates the visual images. It can help in arranging the articles based on shape or shades of colors. CNNs utilizes pre- handling when contrasted with other picture characterization systems[3]. It implies that the system learns the channels that in customary calculations were hand-designed. This freedom from earlier information and human exertion in highlight configuration is a noteworthy favorableposition.

3) Robotic arm:- It is also a simple method for transfer- ring objects from a place to the other. It can replace conveyor belt at places where the transferring area is not that large[12]. It uses microcontrollers like arduino orraspberrypianddifferenttypesofmotors.

4) Image processing:- It is a digital signal processing that analyzes or manipulates the image to improve its quality for betterresults.

5) Raspberry pi:- It is a progression of little single-board PCs. It doesn't include peripherals and cases[15]. It has various interfaces, most strikingly RS-485/232 sequential ports, analog and digital input/output, CAN and efficient 1-Wire transports, all are broadly utilized in the automationenterprises.

V. CONCLUSION

The object sorting and lift automation framework results in higher production rates, less human labor, accuracy, bet- ter product quality and greater economic growth. This also reduces working hours for employees and industry timings are shortened. This uses arduino as the microcontroller to control the movement of the engine and ultrasonic sensor to sort the article based on size. The use of automation is always dependent upon the production and machine development in any industry. Although human labor is primitive and quite efficient but automation is far more better, fast, accurate and efficient in any situation. It doesn't compromise with product quality and quantity of production. Therefore, automation is the key need in any industry as it spare interest in labor and attachestheprocedureandincrementtheefficiency.

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