ISSN XXXX XXXX © 2019 IJESC

Research Article Volume 9 Issue No.3

Design and Fabrication of Innovative Trolley using Ultrasonic Sensor

Rajasekar. C[1], Jeyasoorya. M[2], Karthik. M. G[3], Parthasarathy.V[4], Thilak. S[5]
Department of Mechatronics Engineering
Akshaya College of Engineering and Technology, India

Abstract:
Our project focuses on benefit of the society and bringing automation in the field of weight carriage particularly trolley which is not in existence that is widely used by masses in airports, railway stations, colleges. After undergoing a survey on existing automation in trolleys we have come up with new ideas to benefit all the particulars. Our goal is to solace every individual effort by making trolleys run automatically with the use of ultrasonic sensors. A shopping trolley is a necessary tool for shopping in supermarkets or grocery stores. However, there are shopping trolleys abandoned everywhere in supermarkets after being used. An automatic mobile trolley was a prototype of wheel robot that serves as a trolley or shopping cart.

Keywords: IAQ (Indoor air quality), PIC Controller, Ventilation

I. INTRODUCTION

Nowadays in Metro cities, People face a lot of problem in supermarkets to buy things using trolleys. Every time we need to push the trolley to the place where the object required by us in present. Imagine that there is a trolley which will follow you continuously wherever you go to the malls and grocery stores and carry the things you buy. As the name itself indicates Human following smart trolley is a trolley having some special features and has the capability to follow its leader that is, the customer. Even though this work is dealing with the aspects of the trolley, with minor alternations it can be used in various sections of the day to day life. This includes sections of Medicare, Childcare and material handling. Automation in day to day life with IoT technologies are the latest trend embracing the world and global markets. Human following smart trolley, which is mentioned in this work, will be another stepping stone in to the fully automated life of human beings. After the implementation of the above mentioned product the growth to fully automated stores will be more vibrant. As of now Amazon has started a fully automated store in the United States of America. With implementation of our work and integrating the same with automatic stores it will be changing the whole world scenario of shopping. In this work further applications are not detailed. Rather it is focused on navigation and other facilities of the trolley. As stated in the earlier paragraphs the applications of the work is not confined only to a single sector. It has got wide range of applications. Especially in manufacturing sector during the complete swing of Industry 4.0. Recent studies regarding the navigation of a robot or a device following a human being gives extra motivation to our work. Academicians and researches are always interested in the optimum method to follow a human being by avoiding collisions and other navigation issues. Even though there are several methods available like the usage of Ultrasonic senor, Laser beams or gyroscope each of the methods has its own difficulties. The latest methods used by several researchers are the method of Kinect sensor. Kinect sensor is actually a complicated sensor made for Xbox games by Microsoft. But the same is widely used these days in robotic applications. The same method will be tried to use in optimum manner in this work. Other facilities such as auto bill generation, automatic parking and theft prevention are comparatively easy tasks to implement since, it has some former examples to follow. Recent trends in the industry and academics clearly establish the fact that automation will be the future of humankind. Hence, the work like this will provide an extra boost to the same. Human following smart trolley is a non-traditional trolley which has the capability to follow the human footsteps rather than being taken on by the consumer. To name it as smart it has some special features like, auto bill generation, automatic parking, theft prevention feature and tracing of the same in place. On the further development of the product an application is developed to control the navigation system of the trolley. In the application it has two different operating modes such as shopping mode and parking mode. After the purchase of items by activating parking mode the trolley will automatically parked in the specified area for parking. At that situation it is acting as a line following robot. On the other hand during shopping mode it is an obstacle avoiding human following robot. In this paper proposed an automatic mobile trolley using ultrasonic sensors. It can follow human movement automatically. It did not need to be encouraged or withdrawn. It would make an easier shopping for people as customers. The trolley controlled by a microcontroller module unit. It can stop, turn right, turn left, forward and backward. It can follow wherever they go, during they were in range.

II. SYSTEM DESCRIPTION

Frame: A chassis is the framework of an artificial object, which supports the object in its construction and use. An example of a chassis is a vehicle frame, the underpart of a motor vehicle, on which the body is mounted; if the running gear such as wheels and transmission, and sometimes even the driver's seat, are included, then the assembly is described as a rolling chassis.

DC Motor:A DC motor is any motor inside a category of electrical machines whereby electricity electric power is reborn into mechanical power. Most often, this kind of motor depends

on forces that magnetic fields turn out. despite the kind, Fig 3.3 shows the double-geared DC motors, that have some quite internal mechanism, that is electronic or mechanical device. In each cases, the direction of current flow partly of the motor is modified sporadically. The speed of a DC motor is controlled employing a variable provide voltage or by dynamic the strength of the present inside its field windings. whereas smaller DC motors are ordinarily utilized in the creating of appliances, tools, toys, and automobile mechanisms, like car seats, larger DC motors are utilized in hoists, elevators, and electrical vehicles. A 12v DC motor is tiny and cheap, nevertheless powerful enough to be used for several applications. during this project we tend to used the 100rpm brushed gear motor to supply the high force that makes the conveyor to hold the specified weight.

ARDUINO UNO: Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Figure.1. Arduino UNO

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards. Fig 1 shows the diagram of Arduino Uno.

Ultrasonic Sensor: As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Fig 3.4 shows the ultrasonic sensors to measure the distance to the target by measuring the time between the emission and reception. An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately.

Figure.2. Ultrasonic Sensor

III. SYSTEM IMPLEMENTATION

In proposed design, Detection and tracking of objects in the side-near-field have attracted much attention for the development of advanced driver assistance systems. Ultrasonic sensors applied the principle of "time of flight" (TOF) to measure distance, which computed the travel time of ultrasonic echo reflected from the target. Therefore, the performance of ultrasonic sensors highly depends on the reflective characteristics (e.g., shape, surface material) of the target surface. Thus, an accurate and reliable model of ultrasonic sensors is of critical importance to the design of detection and tracking algorithms. In the literature, the models can be divided into two types based on their modeling principles: physical models and empirical models.

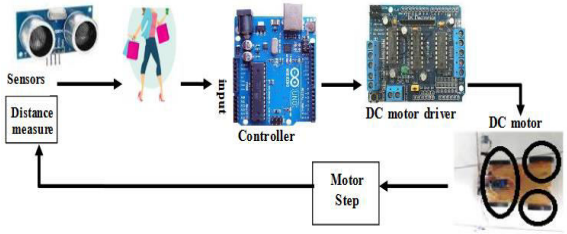

Figure.3. Block Diagram of Automatic Trolley

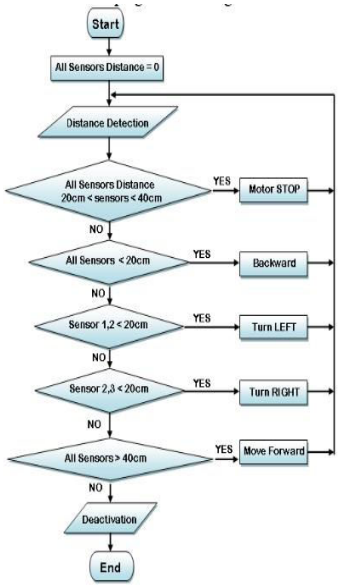

Figure.4. Flowchart of Automatic Trolley

The distance measure must be set on the sensor to detect the customer in front of it. When the value on ultrasonic sensor was 0 cm or not detecting would make the automatic trolley turned

on at the beginning. When value on sensor <=20cm; sensor 2 <20 cm and sensor 3<20 cm, the trolley would move straight. When the value on the sensor1 >20 cm and <40 cm, sensor2 >20 cm or<40 cm and Sensor 3 = 0 cm, the trolley would move to the right. When the value on sensor1 = 0 cm, sensor 2 >20 cm or < 40 cm, sensor 3>20 cm or <40 cm, the trolley would move to the left. When value on sensor 1and Sensor 3 = 0 cm, sensor 2 >20 cm or<40 cm, the trolley would stop (at rest but still detect).When value on Sensor 1 and Sensor 3 = 0 cm, sensor 2 >40 cm, the trolley would move forward. When the value on sensor 1 > 40 cm, Sensor3 = 0 cm and sensor 2 >40 cm, the trolley would move forward. When value on sensor 1 = 0 cm, Sensor3 > 40 cm andsensor2>40 cm, the trolley would move forward. Fig 4.2 shows the flowchart of trolley system. The overall operating process of the system is shown in Fig 4.

Developed Hardware

Some types allow you to adjust the sensitivity using a potentiometer or digitally. In the case of sensors that can be connected via the communication interface to the PC, it is possible to set detailed parameters of all the sensor's operating range and measured distances. Three sensors were used to detect a person that walked in front of it. We used ultrasonic sensors type HCSRF04. The sensors were installed in the front side of the trolley. Design of the sensors can be seen on Fig 5.

Figure.5. Prototype of Design and Fabrication of Innovative Trolley Using Ultrasonic Sensor.

IV. RESULT

In this design, we used sensors to control the distance and direction of user movement and location. Ultrasonic sensors were used as a detector. The ultrasonic sensor was also can be used as a directional detection. Ultrasonic sensors are often used in automation tasks to measure distance, position changes, level measurement, such as presence detectors or in special applications.

V. CONCLUSION

The main purpose of developing this product is to automate the trolley used in domestic applications which reduces the risk of carrying weight by the humans from one place to another place by implementing technologies that suits customers economically. The cost of the trolley is affordable for worker class, middle class and upper middle class. Using this technology end user satisfaction is achieved by giving security for their belongings, charging facility and using different way of operating trolley based on population density.

VI. FUTURE WORK

The ongoing and future work is concentrated on improvement sensor, which is used to improve the sensitivity and transmitting speed. Also human make use of this technology in a specific field like luggage trolley and extending it in all fields that involves weight lifting in future.

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