All Sciences Proceedings

1st International Conference on Contemporary Academic Research

May 17-19, 2023 : Konya, Turkey

ICCAR

All Sciences Proceedings
http://as-proceeding.com/

https://as-proceeding.com/index.php/iccar

Development of Intelligent Shopping Cart using Pixy Sensor with Arduino Controller

Danish Nouman*, M. Bilal Khalid Keyani [2] , Mian Farhan Ullah [3] and M. Idrees Hassan Raza [4]

[1]*Electrical/University of Engineering and Technology, Taxila, Pakistan*
[2] *Electrical /University of Wah, Pakistan*
[3] *Electrical / University of Wah, Pakistan*
[4] *Electrical / University of Wah, Pakistan*

(danishnouman1@gmail.com)

Abstract **–** Supermarkets have virtually reached the pinnacle of technical development. People buy various things from supermarkets and place them on a trolley since this is the most convenient way to transport goods in supermarkets. Customers, on the other hand, must actively push the enormous weight of the trolley during the whole buying procedure. We introduce a novel concept "*Intelligent Shopping Cart*" in this research. Customers may enjoy their shopping experience and focus more on their shopping list by using this trolley instead of pushing a shopping cart. It will follow the customer throughout the shopping period leaving a certain distance. If the customer stops then the trolley will also stop at maintained distance by using sharp IR sensor.

Keywords – Pixy Cam 5 Sensor, Arduino Mega AT 2560, DC Gear Motors, IR Sharp Sensor.

I. INTRODUCTION

The shopping center is a place where people from all walks of life can get together their daily requirements such as food products, clothing and hygiene items, garden appliances and other electrical appliances. Due to public demand, the number of small and large shopping malls continues to increase overthe years. Therefore, the level of improvement of shopping malls and infrastructure changes. There are many areas that need improvement to provide customers with a high-quality shopping practice. Customers often face problems while shopping [1]. The manual trolley is not user friendly, especially for older people. Moving a trolley is a difficult task in shopping malls because of the weight of shopping stuff. Nowadays, in malls for purchasing variety of items it requires trolley. The client must pull the trolley from the shelf tothe shelf (stack to stack) to collect items. A lot of energy is needed when shopping. A lot of goods in the shopping cart would be pushed or pulled, so the customers will limit the activity of the hand [2]. When the customer focuses on pushing the trolley, buyers often miss plenty of products that are sold in the supermarket and will only buy important [3]. Technology provides retailers with an opportunity to improve services and provide customers with rapid participation and personalized response services [4]. In order to provide the best service, a trolley was needed that could automatically follow the human movement [5]. Direction can be detected using power transducers, sensors or a detector. In current time, automatic customer following trolley is necessary for everything to run a life [6]-[7]. The main objective of our project is to make shopping easier and more comfortable for each and every customerby providing them with

many facilities right in their trolley [8]. The trolley will move after the customer at the maintained distance. There will be less men power required and easy to operate.

II. Materials and Method

Pixy cam 5 is attached to the trolley & used as a color sensor. Arduino mega2560 is used as a controller. IR sharp sensor & pixy cam 5 are connected inparallel with the Arduino. Color tag is attached at the back of a customer. When the distance between the client and the trolley exceeds 6 inches, the pixy cam sends a signal to the Arduino Mega, which then sends a signal to the L298 motor driver. Two DC gear motors are connected with the L298 motor driver [9]-[11]. When trolley starts following the customer, L298 motor driver runs the motors. When the client goes to the left, the Arduino mega sends a signal to the motor driver to raise the right motor's speed and reduce the left side motor's speed. In this manner, the trolley will proceed to the left. When the consumer goes to the right, the Arduino microcontroller sends a signal to the motor driver to raise the left motor's speed and reduce the right motor's speed. When the distance between the consumer and the IR sharp sensor is less than 6 inches, the IR sharp sensor informs the Arduino that the motors should not be driven. The project's block diagram is given in Fig 1 below.

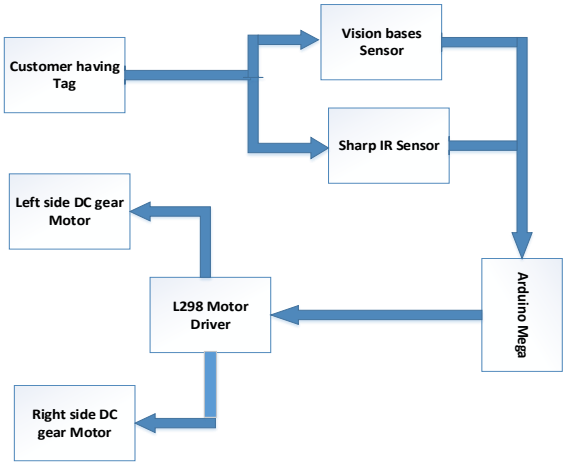

Fig 1: Intelligent Cart Block Diagram.

In below Fig 2, flowchart shows when the pixy cam will start. First, we use the pixy cam to save a certain colour tag. If the front of the pixy has that tag, it will follow the client who has that tag. The quadrants are the focus of Pixy cam. The X-coordinate value is saved between 120 and 220. When the tag is placed between this axis and the distance between the consumer and the trolley exceeds 6 inches, the trolley will go straight. However, if the distance between the customer and the trolley is less than 6 inches, the IR sharp sensor will activate, and the trolley will stop. When the tag is on an axis that is less than 120 degrees, the trolley will travel to the left.

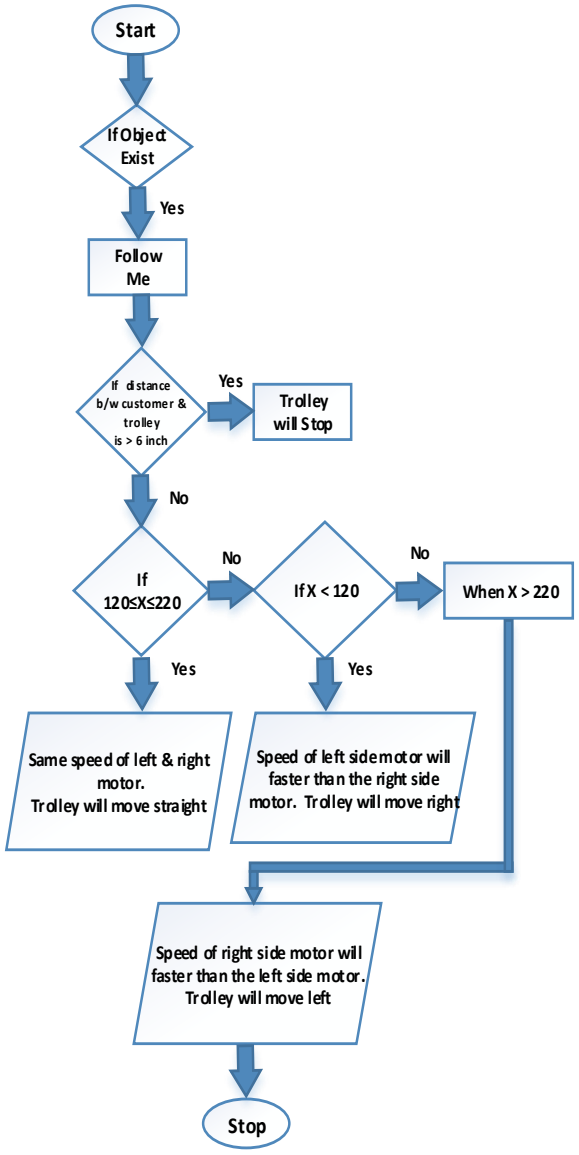

Fig 2: Flowchart of Intelligent Shopping Cart.

III. MOTOR SELECTION

The motor is dependent on the weight that will be carried by trolley shown in the figure given below Fig 3 shows that the weight vs. motor rating relation is directly proportional to each other. As we increase the value of load the motor rating will also be increased directly. Following Table 1 also shows the different motor rating for carrying desirable weight.

Table 1: Weight vs Motor Rating

Sr. No	Weight (Kg)	Motor Rating (Watt)
1	15	44
2	30	88
3	45	132
4	60	176
5	75	220
6	90	264
7	105	308
8	120	352

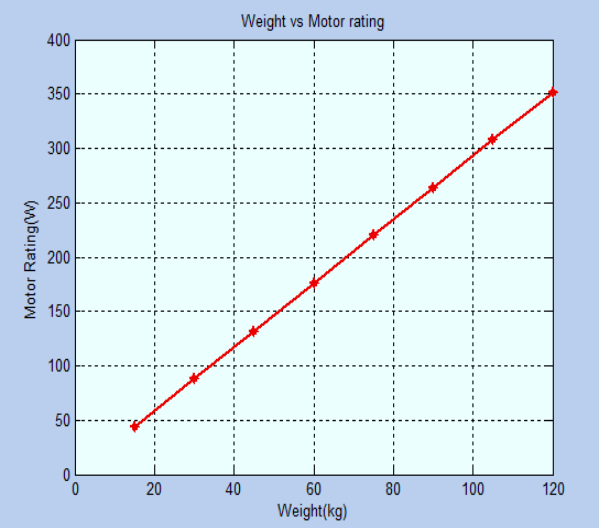

Fig 3: Graph of Motor Rating vs Weight.

IV. RESULTS AND DISCUSSION

The project is working properly according to the given controls. It allows the complete independent movement of a trolley. The project involves the applications of tag following method along with the controller of Arduino mega. The tag is any specific colour or combination of different colour. This colour signature is issued to a consumer for shopping in a shopping centre. If the customer runs, the trolley will follow him by detecting the colour tag that was allocated to him when he entered the shopping centre. This trolley may move in the shopping centre's products racks when customers turn on their chosen settings. Trolley provides men power reducing facility especially for old persons and customer having any physical problem. This is a new idea, and it will create interest in people for shopping from those shopping centre's having automatically shopping trolley due to avoiding the pushingdifficulties during shopping.

- **Case 1: Trolley Forward Direction**

In the Fig 4 given below, it is showing that the trolley movement is directly linked with a tag. When the customermoves forward, the distance between customer & trolley increases to 6 inches, then Pixy cam5 send the signal to Arduinomega AT2560 and Arduino controller sendthe signal to H-Bridge of L298 of motor driver and this driver according to the customer will run the left and right side motors of trolley in the same speed and this process remains continue until the customer remains in front of trolley in forward direction. If customer will stop and the distance between trolley and customer less than 6-inch trolley remains stop. Below Fig 4 is showing the forward movement of trolley.

Fig 4: Forward Movement of Trolley.

- **Case 2: Trolley Left Side Movement**

The trolley action is shown in Fig 5 below, which is directly associated with a tag. When the customer turns left, the Pixy cam5 sends a signal to the Arduino mega AT2560, and the Arduino controller sends a signal to the H-Bridge of the L298 motor driver, who, according to the customer, will run the left side motors at a low speed and the right-side motor at a higher speed, causing the trolley to move to the left. This process remains continue until the customer remains in front of trolley in left direction. If customer will stop and the distance between trolley and customer less than 6-inch trolley remains stop. Below Fig 5 is showing the left movement of trolley.

Fig 5: Left Movement of Trolley

- **Case 3: Trolley Right Side Movement**

In the Fig 6 given below, it is showing that the trolley movement is directly linked with a tag. When the customer turns right, the Pixy cam5 sends a signal to the Arduino mega AT2560, and the Arduino controller sends a signal to the H-Bridge of the L298 motor driver, who, according to the customer, will run the left side motors at a higher speed and the right-side motor at a lower speed, causing the trolley to move to the left. This procedure will continue until the consumer is in front of the trolley and moving in the correct direction. If the gap between the trolley and the consumer is less than 6 inches, the trolley will stop. Below Fig 6 isshowing the right movement of trolley.

Fig 6: Right movement of Trolley

V. CONCLUSION

The intelligent shopping cart is most certainly a necessity for the retail marketing store to step up their portfolios, to cope with the advancement in technology, and to save time and manpower. The project is developed with low power consumption by considering changing trends in retail shopping. Users may enjoy themselves without having to push or drag their shopping carts. Because the trolley is controlled by a microcontroller by utilizing a colour sensor to follow the user. The intelligent shopping cart is worth marketing in an era when humans are more reliant on technology for their comfort. It allows us to save time and manpower.

ACKNOWLEDGEMENT

I am grateful to Engr. Muddasar and Engr. Mian Farhan Ullah for their ongoing support and advice. I'd also want to my group members for their encouragement and support. Without their wonderful encouragement and assistance, I would never have been able to complete this

research project.

REFERENCES

[1] J. Spohrer, Demirkan and Haluk, "Developing a framework to improve virtual shopping in digital malls with intelligent self-service systems." Journal of Retailing and Consumer Services 21, no. 5 (2014): 860-868.

[2] E. Dodi, Suryanto, , H. Siagian, D. Perangin-Angin, R. Sashanti, and S. Yogen. "Design of automatic mobile trolley using ultrasonic sensors." In Journal of Physics: Conference Series, vol. 1007, no. 1, p. 012058. IOP Publishing, 2018.

[3] E. Bilotta, P. Pantano. Bertacchini, Francesca, "Shopping with a robotic companion." Computers in Human Behavior 77 (2017): 382-395.

[4] H. Siagian, D. P. Angin, R. Sashanti, and S. Yogen, "Design of automatic mobile trolley using ultrasonic sensors." In Journal of Physics: Conference Series, vol. 1007, no. 1, p. 012058. IOP Publishing, 2018.

[5] Hanooja, T., C. G. Raji, M. S. J. Koniyath, VK Muhammed Ameen, and M. Mohammed Noufal. "Human friendly smart trolley with automatic billing system." In 2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA), pp. 1614-1619. IEEE, 2020.

[6] S. Vidhiya, Harsitha A.P.A, Kalaivani.R, Nalina.R, Prakash.V," Humanfollowing intelligent cart system" International Journal of Electrical, Electronics and Data Communication, Volume-6, Issue-6, Jun.-2018.

[7] L. Thomas, R.M. George, A. Menon, G. Rajan, R. Kurian " Smart Trolley with Advanced Billing System", International Journal of Advanced Research in Electrical, Electronicsand Instrumentation Engineering, Vol.6, Issue 3, March 2017, Number23,2018 pp. 16545-16547.

[8] L.S.Y. Dehigaspege, M. K. C. Liyanage, N. A. M. Liyanage, M. I. Marzook, " Follow Me Multifunctional Automated Trolley", InternationalJournal of Engineering Resaearch & Technology (IJERT), Vol.6, Issue 07, July – 2017.

[9] D. Pandita, A. Chauthe, N. Jadhav , " Automatic Shopping Trolley using Sensors", International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue:04, Apr -2017.

[10] D. Nouman, I. A. Sajjad, A. Ali, "Distribution Network Voltage Improvement using Dynamic Voltage Restorer with Smooth Super Twisting Sliding Mode Control", 1st International Conference on Scientific and Innovative Studies (ICSIS), Vol.1, April-2023.

[11] A.A. Tawar* and S.V. Deodhar, " Smart Trolley using Accelerometer and Omni Wheels"International Journal of Current Engineering and Technology, Vol.4, No.3 (June 2014).