International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Smart Shopping Trolley Robot

Prof.S.S. Mahulkar[1], Arati Phapal[2], Ashwini Panchal[3], Shruti Malgonde[4]

[1]Prof.S.S. Mahulkar, Dept. Of ENTC, JSPM's JSCOE, Pune, Maharashtra, India[2]Arati Phapal, Dept. Of ENTC, JSPM's JSCOE, Pune, Maharashtra, India [3]Ashwini Panchal, Dept. Of ENTC, JSPM's JSCOE, Pune, Maharashtra, India
[4]Shruti Malgonde, Dept. Of ENTC, JSPM's JSCOE, Pune, Maharashtra, India

Abstract - Robotics technology has advanced significantly in the lastfew years. Robots that can identify and follow humans are necessary to support them in their work; thus, devices that can communicate and coexist with humans—such as the "RFID based Human Following Load carrier"—must be developed. One of the main challenges in enabling the robot to do various tasks in the actual world is localizing both the robot and the objects in its environment. To track a person incrowded areas, in an indoor and outdoor environment, and through traffic, a robot must possess advanced navigational skills. The project's objective is to construct a following robot that can carry objects beside people.
Airports, shopping centers, construction sites, and agriculture can all make use of it. The gadget that controls the entire system is a microcontroller. RFID readers can identify items by using the RF signal that the object transmits. The identification and location of items are aided by sensors like infrared andultrasonic sensors.DC motors and an RFID module are attached to the microcontroller. To do this, a programme written in the Embedded 'C' language is loaded onto the controller.

Key Words*: *Human following, Trolley, Arduino UNO, Sensors.

I. INTRODUCTION

These days, robotics and automation are widely used terms. We can picture a world run by machines in the future.
We require an automated device everywhere we go. such as voice or smartphone controllable automatic doors, automatic fire protection, and automatic appliances. A robot can readily perform a task where there is a significant risk to a human's life. While a living thing's energy and adaptability are limited a robot never runs out of power. We also save a lot of time and find it to be. quite efficient. In our minds, the robot is a very common and fascinating object. There is now a need for support or assistance. An alternative solution to this issue could be a human-following robot.

A cutting-edge area of study that has drawn a lot of attention lately is humanoid robots. In the twenty-first century and beyond, robotics research will continue to play asignificant role in numerous electronic applications. Robots that can interact and coexist with humans, like "A Human Following Robot," are necessary in this fast-paced society. It can assist us and carry out our commands. Additionally, it aids in a variety of vocations, including industry, subterranean work, construction, space exploration, and medical and military uses.

II. LITERATURE SURVEY

Kumeresan, Ng, Yen Leng, Cheng Siong Lim "Smart shopping system with automated human-guided shopping trolley. The primary problem that needs to be addressed when discussing human-following robots is the robot's direction finding. The robot should only follow the assigned subject and not stray from its course thanks to the direction finding. and the development of technology has led to the creation of numerous approaches that seek to address this problem as precisely as possible. A similar goal is pursued by the suggested application, a person following shopping cart. To obtain a comprehensive understanding of the diverse direction-finding techniques applicable to this application, we examined multiple research articles that have employed analogous principles.

Human-following mobile robot in a distributed intelligent sensor network, K. Morioka, J-H. Lee, and H. Hashimoto, Additional investigation was also carried out. In this sense, Calisi employed depth imaging, and the goal was attained by creating a unique algorithm. Their work on object tracking and detection was extensive. The primary

benefit of their approach was that their algorithm functioned effectively in intricate settings.

The researchers are developing various algorithms for the purpose of detection, as demonstrated by the works of J. H. Lee, T. Tsubouchi, K. Yamamoto, and S. Egawa, "People Tracking Using a Robot in Motion with Laser Range Finder," and M. Lindstrom and J. O. Eklundh, "Detecting and tracking moving objects from a mobile platform using a laser range scanner." In one study, a laser was utilized to determine the movement pattern of the legs, and a camera was employed to identify objects or individuals. The researchers also utilized a basic method. The person employed distance sensors on both the robot and them-selves in this manner. The sensors on the individual being followed picked up the radio waves these sensors released. The robot followed the necessary goal in this manner.

Afterwards, Leo Louis informs us that Arduino is an open- source microcontroller that is simple to program, erase, and reprogramme at any moment in his paper, "Working Principle of Arduino and using it as a tool for study and research." IR Vision Snake Robot-Arduino, Arduino Fire Detector & Extinguisher Bot, and Arduino Auto Billing Shopping Trolley are some of the other cutting-edge applications of Arduino that are currently in use.

Aguirre, M. García-Silvente, E. Munoz-Salinas, and Stereo Vision and Colour: A Method for Tracking and Detecting People He was able to effectively peruse the required target thanks to this strategy. R. Munoz also used a variety of sensors in conjunction. obtain the target's details to be tracked. To obtain precise information, he employed stereo vision in addition to several sensors. The task was completed much more easily thanks to the combination of sensor data and camera information

III. Block Diagram

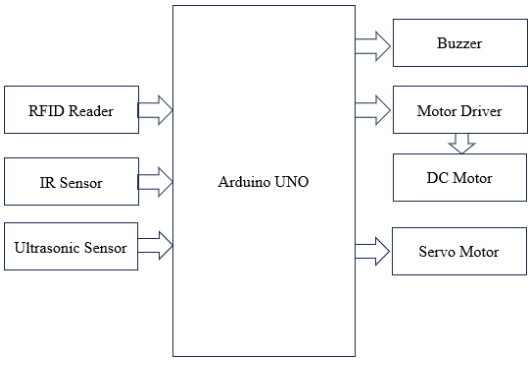

Fig 1 Block Diagram of Proposed System

The suggested system is depicted in Figure. An Arduino UNO, an ultrasonic sensor, and a motor shield are used to build the human-following robot. This Arduino UNO interfaces with a motor shield and an ultrasonic sensor.

When the power supply is turned on, three sensors identify the presence of a human and determine how far away they are from each other. If the distance is less than 25 cm or more than 8 cm, the robot follows the human. If an interruption occurs, the robot stops and then resumes its follow-through. The robot will remain in an operational state until the user disconnects the power source. IDE stands for Arduino Open-Source Platform. The board interfaces with the IDE when it is linked to a computer using USB. The code is written in the IDE and uploaded to the microcontroller, which interfaces with inputs and outputs to execute the code.

IV. Hardware Specifications

- **Arduino UNO:**

The open-source Arduino microcontroller board, created by Arduino.cc, is based on the Microchip ATmega328P microprocessor. A few expansion boards and other circuits can be interfaced to the board's digital and analog input/output pins. The vehicle's movement is managed by a microcontroller that receives the embedded C program.

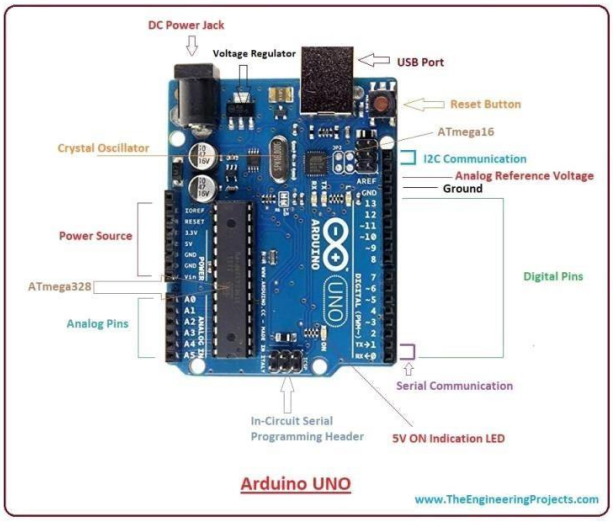

Fig 2 Arduino UNO

- **Ultrasonic sensor:**

The excellent non-contact range detection with high precision and steady results provided by the HC-SR04 ultrasonic range sensor is based on the premise of using sonar to estimate the distance to an item. The microcontroller and sensor are connected. Because an ultrasonic sensor emits sound waves rather than light waves like an infrared (IR) sensor does, it is deemed suitable for outdoor applications despite sunlight intensity.

Fig 3 Ultrasonic Sensor

- **Motor Driver:**

The vehicle is driven by an L293D dual H-bridge motor driver, which regulates its direction and speed. A DC motor with a voltage between 5 and 35 volts and a peak current of up to 2 amps can be driven by the module. The microcontroller and DC motor (wheels) are connected by a motor driver. It regulates wheel motion in accordance with the microcontroller's instructions.

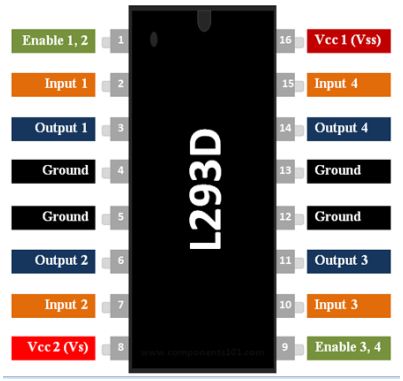

Fig 4 L293D motor driver IC

- **DC Motor:**

Typically, a gear box is linked to a DC motor to facilitate wheel spinning. The wheel is assisted in rotating gently to cover the grass to be chopped by a DCmotor running at 30 rpm. For the four wheels, we used two DC gear motors. The 5 mm DC motor shaft has a 3mm drilled hole in it. It is then put into the holes in the chassis and secured with threads. We made shafts strongenough to support the chassis weight.

Fig 5 DC Motor

V. Circuit Diagram

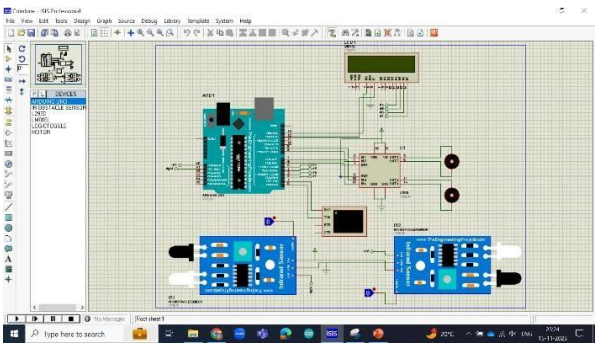

Fig 6 Circuit Diagram

VI. CONCLUSIONS:

This study shows how to install an RFID-based human-following load carrier successfully. This robot can follow and track objects in addition to being able to identify them. The tag is used to identify the owner, and the robot moves in accordance with that identification. Thepurpose of the robot's numerous sensors was to increase detection precision. Furthermore, the "following" skills of the robot were supposed to be optimized for maximumefficiency. The experiments were run under a variety of conditions to find and fix algorithmic errors.

VII. REFERENCES:

1. Muhammad Sarmad Hassan, Mafaz Wali Khan, "Design and Development of Human Following Robot", Student Research Paper Conference., vol. 2, no. 15, July 2015.

2. Qian Ma, Xia Li, Guanyu Li, Bo Ning, Mei Bai and Xite Wang, "Mobile RFID-Based Localization for Indoor Human Tracking", MDPI (Multidisciplinary Digital Publishing Institute)., March 2020.

3. Ileni Abhinav Theja, Gudur Chandrakanth, Ravvula Akhil, Shaik Areef, "Human Following Robot", International Journal of Advance Research, Ideas and Innovations in Technology., vol. 7

4. Ashutosh Gujar, Kalyanee Jadhav, "Bluetooth Based and GPS Based Follow Me Robot", International Research Journal of Engineering and Technology (IRJET), April 2021

5. W. W. Tai, B. Ilias, S.A. Abdul Shukor, N. Abdul Rahim, "A Study of Ultrasonic Sensor Capability in Human Following Robot System", IOP Conference Series

6. Kim, Myungsik, Chong, Nak Young, Ahn, Hyo-Sung, Yu, Wonpil, "RFID-enabled Target Tracking and Following with a Mobile Robot Using Direction Finding Antennas", IEEE International Conference on Automation Science and Engineering., 2007.

7. Thennavarajan Subramanian, Rahul Madbhavi, Shreepad Potadar, Sylvester Jerome D'souza, K V Gangadharan, "Object Follower and Barrier Escaping Robot Using Image Processing", International Journal of Innovative Research in Science, Engineering and Technology., July 2015.

8. Muhammad B. Akbar, David G. Taylor, Gregory D. Durgin, "Two-Dimensional Position and Orientation Estimation Using a 5.8 GHz RFID System", IEEE Xplore., December 2020.