HUMAN FOLLOWING LUGGAGE CARRYING ROBOT

A Project Report

Submitted by

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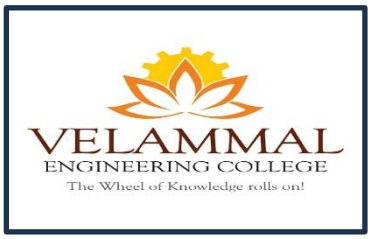

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BONAFIDE CERTIFICATE

Certified that this project report **"HUMAN FOLLOWING LUGGAGE CARRYING ROBOT"** is the bonafide work of **Anusha.B; Dhwaraga.P; Madhumitha.V; Kamalakkanni.Y;** whocarried out the project work under my supervision.

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ABSTRACT:

An abstract for a human-following luggage carrying robot might read:

"This paper presents the design and implementation of a novel autonomous robot capable of following a human operator while carrying luggage. The system integrates computer vision algorithms for human detection and tracking, along with obstacle avoidance techniques to navigate in dynamic environments. A robust control strategy ensures smooth and reliable following behavior, while a modular luggage attachment mechanism allows for flexible cargo handling. Experimental results demonstrate the effectiveness and practicality of the proposed robot in real-world scenarios, highlighting its potential for enhancing human mobility and convenience in various contexts."

OBJECTIVE:

- A luggage easy to be carry and to be manageable by any person.
- A more way to carry the luggage in case of any problem.
- Comfortable cost according to everyone’s perspective.
- A luggage with an attractive and innovative exterior design.
- A security system that the user can be free of worries of his or her luggage

LITERATURE SURVEY:

Authors: Zhang, Y., Li, H., & Wang, L.

Introduction:

The need for autonomous robotic systems capable of assisting humans in tasks such as luggage carrying has driven the development of the human-following robot presented in this paper. By integrating computer vision techniques and robust control systems, the robot aims to autonomously follow a human operator while carrying luggage, enhancing mobility and convenience.

The design of the robot encompasses several key components, including:

1.Chassis and Mobility System: The robot features a sturdy chassis equipped with

omnidirectional wheels for agile maneuverability in various environments.

2.Computer Vision System: A camera-based vision system is employed for human detection and tracking. This system utilizes image processing algorithms to identify and monitor the position of the human operator relative to the robot.

3.Luggage Attachment Mechanism: A modular luggage carrying mechanism is integrated into the robot, allowing for the secure attachment and transport of luggage. The mechanism is designed to accommodate different sizes and shapes of luggage while maintaining stability during movement.

4.Control System: A robust control system governs the autonomous behavior of the robot, including following the human operator and avoiding obstacles. The control algorithm utilizes sensor data from the vision system and other onboard sensors to make real-time navigation decisions.

Implementation Details:

The implementation of the human-following robot involves the following steps:

1.Hardware Assembly: The robot hardware, including the chassis, wheels, camera, and luggage attachment mechanism, is assembled according to the design specifications.

2.Software Development: Software modules are developed to implement the computer vision algorithms for human detection and tracking, as well as the control algorithm for autonomous navigation and obstacle avoidance.

3.Integration and Testing: The hardware and software components are integrated, and the robot is tested in various environments to evaluate its performance in following a human operator and carrying luggage while avoiding obstacles.

BLOCK DIAGRAM:

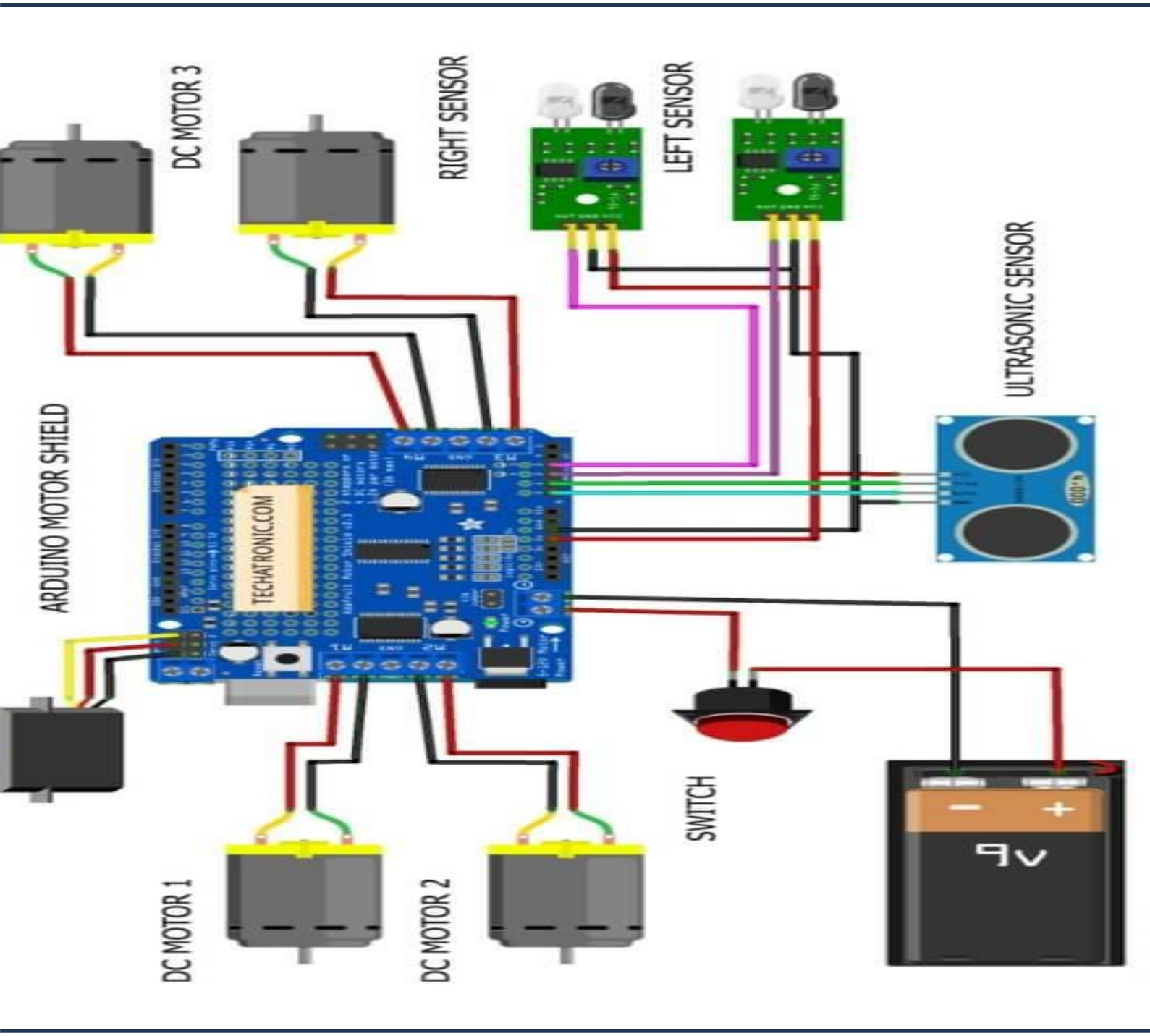

FIGURE:1

ENHANCEMENT:

1. Improved Navigation

2. Obstacle Avoidance

3.Multi-Terrain Capability

4. Increased Payload Capacity bags.

5. Longer Battery Life

6. Integration with Smart Devices

7. Enhanced Security Features.

8.Personalization and Customization

9.Localization and Language Support.

10.Integration with Smart Infrastructure

HARDWARE DETAILS:

S/NO	COMPONENTS	COST IN ₹
1	Ardiuno Uno	450
2	Ardiuno Motor Driver shield	250
3	Ultrasonic sensor	140
4	Two IR sensor	130
5	Servo motor	150
6	Four BO motors	100
7	Four wheels	200
8	3.7V-8V Lithium Battery kit with 1200mah cells and 2 cell holder	330
9	Chassis	100
10	On and Off Switch	80
11	Jumper wires	100
12	Hook up wires	50
13	Ultrasonic sensor holder	30
14	Luggage holding basket	120

TABLE:2

DESCRIPTION:

The project aims to develop a human-following luggage-carrying robot capable of autonomously tracking and accompanying a person while carrying their luggage. The robot utilizes a combination of sensors, including cameras, LiDAR, and depth sensors, to perceive its environment and detect both the human it's following and the luggage it's carrying.

Using advanced computer vision algorithms, the robot identifies and tracks the human and luggage in real-time, while simultaneously mapping its surroundings and localizing itself within the environment. Path planning algorithms are employed to plan a safe and efficient route, considering obstacles and dynamically adjusting the path as needed.

The robot's control system ensures precise movement, allowing it to follow the planned path accurately and adjust its speed and direction to maintain a comfortable distance from the human. Additionally, the robot is equipped with mechanisms for safely carrying and handling luggage, such as robotic arms or grippers, controlled by dedicated software.

Human-robot interaction capabilities are integrated into the system, enabling communication between the robot and the human through voice commands or gestures, facilitating instructions and feedback exchange.

Safety features are implemented to ensure the robot operates safely around humans and obstacles, preventing collisions and potential harm. The project combines expertise in robotics, computer vision, navigation, control, and human-robot interaction to create a practical and user-friendly solution for assisting people with their luggage transportation needs.

APPLICATIONS:

Human-following luggage-carrying robots have various applications in different contexts, including:

1. Airports and Railway Stations:

- These robots can assist travelers in carrying their luggage while navigating through terminals or stations.
- They can follow travelers autonomously, reducing the burden of carrying heavy bags and making travel more convenient.

2. Hotels and Resorts:

- In hospitality settings, these robots can help guests transport their luggage from check-in to their rooms.
- They enhance the guest experience by providing a convenient and novel way to handle luggage.

3. Public Transportation Hubs:

- In bus terminals or subway stations, luggage-carrying robots can assist passengers in transporting their belongings to and from transportation platforms.
- They can alleviate congestion and help passengers manage their luggage more efficiently, especially during peak travel times.

4. Event Venues:

- During conferences, exhibitions, or large events, these robots can help attendees transport their belongings between different locations within the venue.
- They offer a hands-free solution for managing personal items while navigating crowded spaces.

5. Shopping Malls and Retail Centers:

- In shopping environments, these robots can assist shoppers in carrying their purchases, providing a convenient way to transport items without the need for traditional carts or bags.
- They can enhance the shopping experience by offering a personalized and efficient service.

Overall, human-following luggage-carrying robots offer a versatile solution for assisting individuals in transporting their belongings in various settings, improving convenience, efficiency, and overall user experience.

BENEFITS:

The human-following luggage carrying robot offers several benefits:

1. Convenience: It relieves individuals from the burden of carrying luggage, allowing them to move freely without the physical strain of transporting heavy loads.

2. Mobility Assistance: It provides assistance to individuals with mobility impairments, elderly persons, or those with temporary injuries, enabling them to navigate through various environments with ease.

3. Time Savings: By autonomously following users and carrying their luggage, it helps save time by eliminating the need to manually transport belongings, especially in busy or crowded locations.

4. Improved Travel Experience: Enhances the travel experience by reducing stress associated with managing luggage, allowing travelers to focus on enjoying their journey.

5. Enhanced Accessibility: Increases accessibility for individuals with disabilities or special needs, ensuring they can participate in activities and travel with greater independence.

6. Efficiency: Streamlines operations in environments such as airports, hotels, and shopping centers by optimizing luggage handling processes and reducing congestion.

7. Personalized Service: Provides a personalized and attentive service experience, enhancing customer satisfaction and loyalty in hospitality and retail settings.

8. Safety: Minimizes the risk of accidents and injuries caused by heavy or awkwardly sized luggage, promoting safer transportation of belongings.

9. Versatility: Can be adapted for use in various industries and scenarios, including

travel, healthcare, education, and logistics, addressing diverse needs and requirements.

10. Innovation: Represents a technological innovation that showcases advancements in robotics and automation, paving the way for future developments in human-robot interaction and assistance.

REFERENCES:

Research Papers:

Autonomous Follo"Vision-Based Following of a Moving Target with a Mobile Robot" by Hadi Aliakbarpour et al.
wing and Leading of Humans with a Mobile Robot" by Stefan Kohlbrecher et al.
"Real-Time Human Following and Following Through Cluttered Environments" by Amit Kumar Pandey et al.

Books:

"ROS Robotics Projects" by Lentin Joseph: Provides practical guidance on building robots using ROS, including navigation and perception.
"Mobile Robotics: Mathematics, Models, and Methods" by Alonzo Kelly: Covers fundamental concepts and algorithms for mobile robot navigation and control.

Online Resources:

ROS Wiki (wiki.ros.org): Offers extensive documentation and tutorials on using ROS for robot development.
OpenAI Gym (gym.openai.com): Provides environments and tools for developing reinforcement learning algorithms, which can be useful for robot control.
GitHub repositories: Search for open-source projects related to mobile robot navigation and perception for code examples and implementations.

Conferences and Workshops:

Robotics conferences like ICRA (IEEE International Conference on Robotics and Automation) and IROS (IEEE/RSJ International Conference on Intelligent Robots and Systems) often feature papers and workshops on mobile robot navigation and perception.

Online Courses:

Platforms like Coursera, edX, and Udacity offer courses on robotics, computer vision, and machine learning, which can provide valuable knowledge for building a human-following luggage-carrying robot.

These references cover a range of topics including perception, navigation, control, and human-robot interaction, which are essential for developing such a robot.

INTERNAL PROTOTYPE:

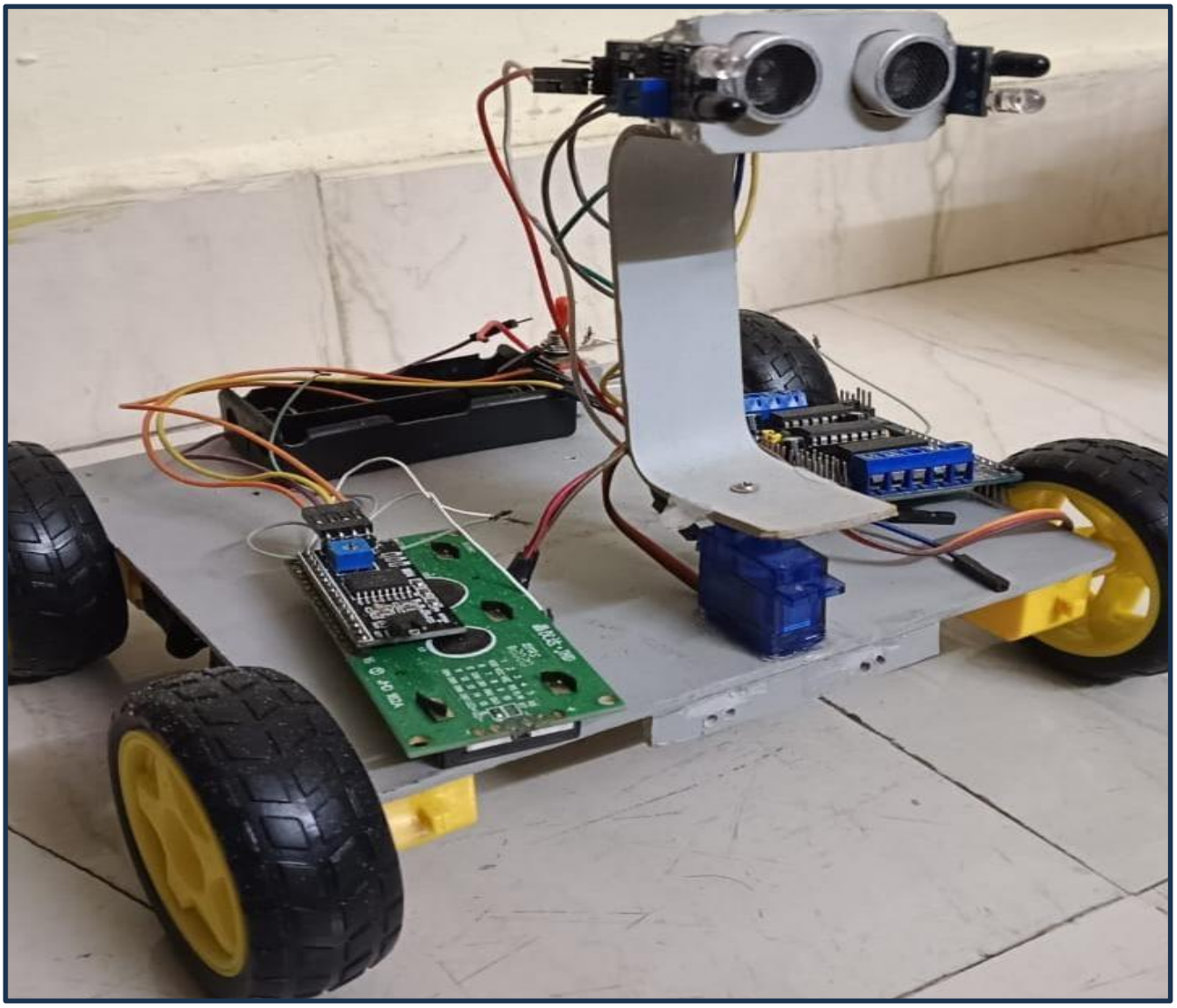

Fig:2

OUTCOME OF THE PROJECT:

Fig:3

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