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Smart Trolley - Human Following Trolley

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Abstract: ***This abstract provides an overview of a novel IoT-based system designed to enhance the shopping experience by introducing a "Human-Following Shopping Trolley" Traditional shopping trolleys have remained relatively unchanged for decades, but this innovation leverages IoT technology and a mobile app to bring convenience and efficiency to the shopping process. The system comprises a smart shopping trolley equipped with sensors and actuators, allowing it to autonomously follow a shopper as they navigate the store. This eliminates the need for physical pushing and pulling, making shopping more accessible, especially for the elderly and those with mobility issues. The trolley communicates with a mobile app installed on the shopper's smartphone or device.***

Keywords: ***Internet of things, android application,Arduino UNO, smart trolley, travel partner, mobile app.***

I. INTRODUCTION

The shopping experience has evolved significantly over the years, with technology playing a central role in enhancing accommodation and efficiency for consumers. One innovative concept that has emerged is the "Human-Following Shopping Trolley System," which leverages the Internet of Things (IoT) and a mobile app to transform the traditional shopping experience. This system offers a promising solution to the mundane inconveniences associated with grocery shopping and aims to provide a more relishable, accessible, and data-driven approach to retail.

Traditional shopping trolleys have optically discerned little vicissitude in design and functionality for decenniums. Shoppers still rely on manually pushing or pulling heftily ponderous cartsthrough crowded aisles, often facing challenges such as finding items in astronomically immense stores, long queues at checkout counters, and physical strain, especially for those with mobility issues. The Human-Following Shopping Trolley System addresses these issues by introducing an incipient caliber of automation and personalization. This innovative system consists of a perspicacious shopping trolley equipped with advanced sensors, actuators, and connectivity features that enable it tofollow shoppers autonomously. It additionally integrates with a mobile app, which shoppers use tointeract with the trolley and manage their shopping journey. The fusion of IoT technology and mobile applications in the retail environment promises a shopping experience that is not only more convenient but withal tailored to individual predilections.

A. Problem Statement

Shopping with a traditional shopping trolley can beplagued with several challenges that impact the overall shopping experience, engendering inconveniences and frustrations for consumers. The following issues highlight the quandaries faced while shopping with a trolley:

Physical Strain: Pushing or pulling a loadedshopping trolley through a store can be physically injunctively authorizing, especially for the elderly, individuals with mobility issues, or parents with puerile children. This can daunt some individuals from engaging in in-store shopping altogether.

Navigation and Crowded Aisles: Navigating through crowded store aisles with a trolley is often a cumbersome task. Shoppers may find themselves stuck in congested areas or unable to access the products they require, leading to delays and frustration.

Addressing these quandaries is essential to ameliorate the overall shopping experience, enhance accessibility, and make the process more efficient and environmentally sustainable. Innovative solutions, such as the Human-Following Shopping Trolley System utilizing IoT and a mobile app, aim to mitigate these issues by introducing automation, personalization, and data-driven insights into the shopping journey, offering a more convenient and delectable retail experience for consumers while withal benefiting retailers in their operational and sustainability efforts**.**

II. LITERATURE SURVEY

(S Ramya, Parvathy R Krishna, Senthil Navagam, et al. 1), this paper discusses an IoT-predicated perspicacious cane, which shares homogeneous attributes in terms of mobility assistance and sensor integration. It may provide insights into sensor cull and integration for availingindividuals with disabilities.

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(Dr Mahdi H. Miraz , Peter Excell, RichPicking, et al. 1), this review paper gives an overview of IoT technologies, protocols, and applications across different domains. Understanding IoT fundamentals can provide a solid substructure for implementing IoT in a concrete project like an HFT.

(Maryam AI Shabibi, Kesavan Manic Suresh, etal. 1), this research paper discusses the development of an IoT-predicated astute wheelchair system, which shares homogeneous attributes in terms of mobility assistance. It may offer insights into sensor integration, utilizer interfaces, and communication protocols.

(Mobeen Shahroz, Muhammad Faheem Mushtaq, Maqsood Ahmad, Dr Saleem Ullah, et al. 1), this paper explores a kindred application of keenly intellective trolleys in shopping malls, utilizing RFID and IoT technologies. While not directly cognate to human-following, it may offer insights into sensor integration and IoT communication. Which is an embedded system-predicated application solution has low operating costs and expeditious deployment.

(Sayali N Joshi, Vaishnavi K Patki, Priyanka S Dixit, Husain K Bhaldar, et al. 1), this paper represents the human following a trolley utilizing a Raspberry Pi. A trolley automatically eschews an impediment, and to interact and communicate with the person trolley should follow that particular person. To achieve this target the goal of our work is to design and fabricate a robot that not only tracks the target but additionally move towards by evading obstacles while tracking.

(B Honnaraju, H Hemanth Bharath Bhushan, L Hemanth, T C Kishore, V Likhith, et al. 1), in today's world, the trolleys are utilized in most places like a shopping mall, hospitals, colleges, etc., and everything is manually operated utilizing their physical vigor. This paper proposes an automated human following trolley utilizing the image and video processing. The HSV value of the image taken from the camera will be calculated. Ifit matches the valid sticker's value, then the trolley will follow that person who has a concrete sticker by maintaining a constant distance from that person. The distance estimation technique is utilized to calculate the distance between the utilizer and the trolley.

III. METHODOLOGY

Key components of the Human-Following Methodology for Implementing aHuman-Following Shopping Trolley Utilizing Arduino and Navigation Through a Mobile Application. Designing a Human-Following Shopping Trolley system utilizing Arduino and mobile app integration involves several key steps and components. The following methodology outlines how to implement this innovative solution:

A. Hardware Integration

1) Smart Trolley Construction: Build the smart trolleyby equipping it with sensors and actuators. Key components may include cameras, ultrasonic sensors, infrared sensors, and wheels with motor controllers.
2) Arduino Integration: Install an Arduino board (e.g., Arduino Uno or Arduino Mega) on the trolley to control the sensors and actuators. Connect sensors to the Arduino board to capture data, and connect motor controllers to control the trolley's movement.
3) Power Supply: Ensure a stable power supply for theArduino and sensors. Depending on the components used, consider using batteries or a rechargeable power source.

B. Sensor Calibration and Data Amassment:

1) Ultrasonic and Infrared Sensors: Configure ultrasonic and infrared sensors to detect obstacles and quantify distances accurately.
2) Data Accumulation: Amass data from sensors to track the position and kineticism of the shopper anddetect obstacles in the trolley's path.

C. Arduino Programming:

1) Sensor Data Processing: Develop Arduino code to process data from the sensors, including object detection, distance quantification, and tracking the shopper's position.
2) Motor Control: Indite code to control the trolley's kineticism predicated on the sensor data. Implement algorithms to calculate the optimal path to follow the shopper.

D. Mobile App Development:

1) App Interface Design: Design a utilizer-cordial mobile app interface that sanctions shoppers to interact with the trolley.

2) IoT Integration: Implement IoT connectivity in the app to communicate with the Arduino on the trolley. Establish a secure connection to transmit data, such as the utilizer's location.

3) Navigation and Control: Engender features for shoppers to control the trolley's kineticism through the app. Provide options for starting, ceasing, and adjusting the trolley's deportment.

E. Data Exchange and Communication:

Bluetooth or Wi-Fi Communication: Establish areliable communication channel between the mobile app and the Arduino on the trolley, utilizingtechnologies like Bluetooth or Wi-Fi.

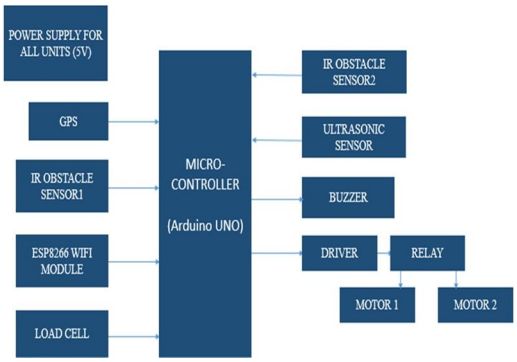

Fig. 3.1 Block Diagram

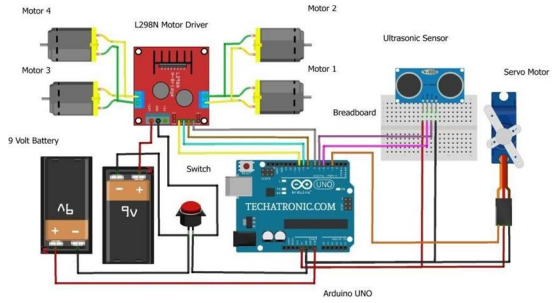

Fig. 3.2 Circuit Diagram

IV. RESULT

Fig. 4.1 Human Following Trolley

V. CONCLUSION

The development and implementation of a Human-Following Trolley system utilizing IoT technology represent a paramount step forward in redefining the traditional shopping experience. Thisinnovative system leverages the puissance of IoT toengender a more convenient, accessible, and data-driven retail environment, benefiting both shoppers and retailers.

VI. FUTURE SCOPE

The future scope for Human-Following Trolley systems utilizing IoT is promising and can lead to a range of advancements and innovations in the retail and technology sectors. Here are some key areas of future development and magnification for this technology:

Augmented Authenticity (AR) and Virtual Authenticity (VR) Integration: AR and VR technologies can be integrated into the mobile app, sanctioning shoppers to access digital store maps, product information, and virtual shopping auxiliaries, making the shopping experience even more interactive and informative.

Sustainability Initiatives: Human-Following Trolley systems can be designed to align with sustainability goals. The trolleys could be made from recyclable materials, and the system can inspirit the utilization of reusable shopping bags or containers, abbreviating plastic waste.

Elderly and Incapacitated Assistance: Future iterations can be designed to categorically cater to the desiderata of elderly and incapacitated shoppers, providing them with even more preponderant assistance and making shopping moreaccessible.

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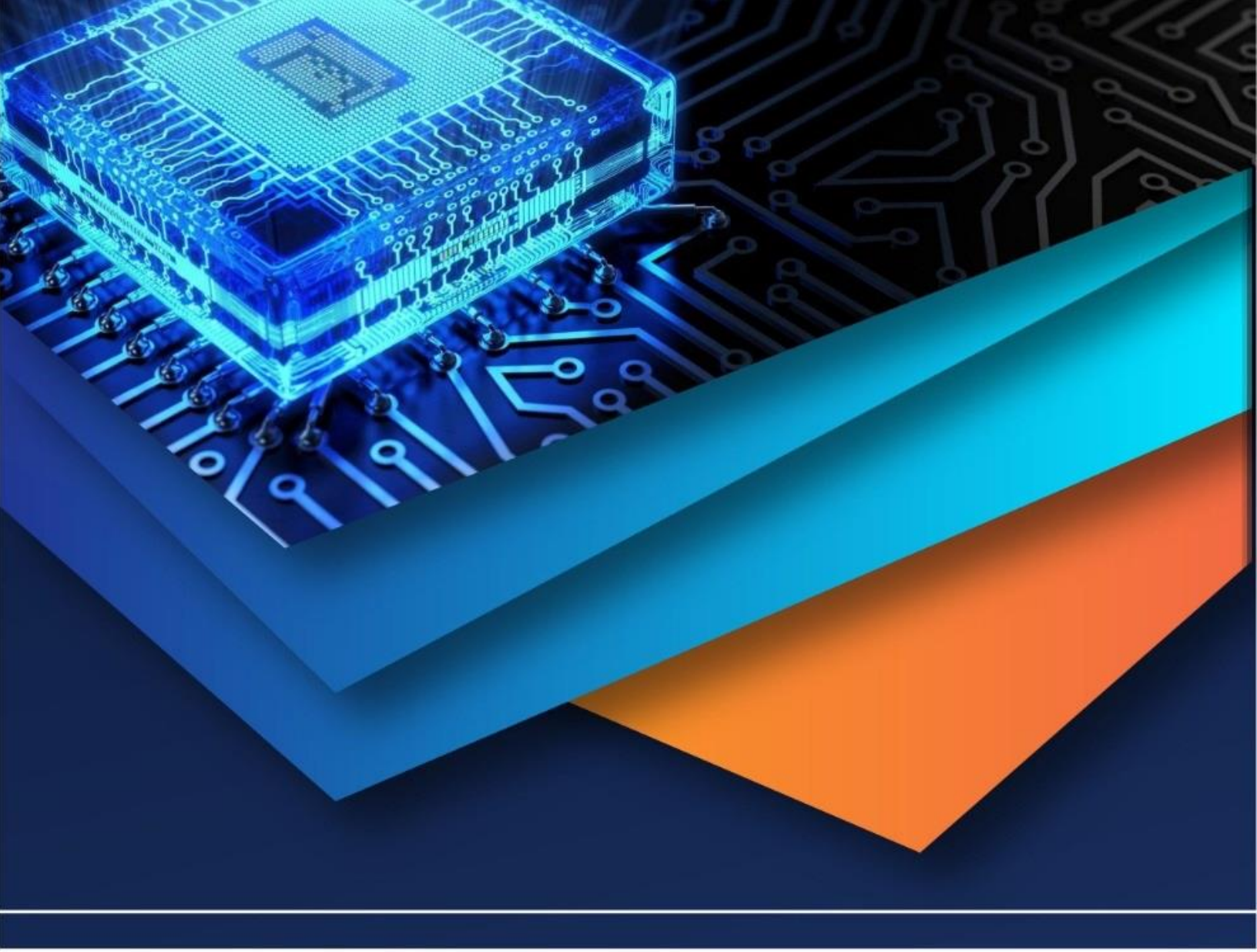

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