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ROBOCASE HUMAN FOLLOWING SUITCASE

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ABSTRACT

The Robo-Case is an innovative, technology-driven solution designed to enhance the travel experience by transforming conventional luggage into a smart and autonomous companion. This suitcase integrates cutting-edge technologies, including an Arduino Uno Wi-Fi, ultrasonic sensor, and GPS tracking system, to create a self-navigating, human-following suitcase.

The heart of Robo-Case is an Arduino Uno Wi-Fi microcontroller, which serves as the central control unit. It allows the suitcase to establish a secure and reliable connection with a mobile device, enabling real-time communication and control. The ultrasonic sensor incorporated into the Robo-Case serves as its eyes, enabling obstacle detection and avoidance by providing precise distance measurements. This feature ensures that the suitcase can navigate through crowded airports, train stations, and other high-traffic environments with ease.

The GPS tracking system adds an additional layer of convenience and security, making it possible to locate the suitcase at any time during the journey. Travelers can track their luggage's precise location through a mobile app, providing peace of mind and helping to prevent loss or theft. The Robo-Case is designed to adapt to various travel scenarios and can be programmed to follow a designated user or to operate autonomously while avoiding obstacles and maintaining a safe distance.

This abstract presents a glimpse into the Robo-Case, an intelligent luggage solution that combines the power of Arduino Uno Wi-Fi, ultrasonic sensor technology, and GPS tracking to create a suitcase that not only carries your belongings but also follows you and ensures its safety throughout your journey. This innovation promises to revolutionize the travel industry, making travel more comfortable and secure for individuals on the move.

Keywords: Arduino UNO, Wi-Fi, DC Motor 12V 150Rpm, Ultrasonic Sensor, GPS.

I. INTRODUCTION

Introducing the Future of Travel: Robo-Case

In a world where technology continues to reshape the way we live and interact with our surroundings, innovation knows no bounds. The Robo-Case, a ground breaking travel companion, represents a remarkable fusion of cutting-edge technology and the practical needs of modern travelers. Developed using the Arduino Uno Wi-Fi, ultrasonic sensor, and GPS tracking, this smart suitcase is set to redefine the travel experience.

Imagine a suitcase that's not just a container for your belongings, but a true travel partner that anticipates your needs and offers seamless assistance throughout your journey. Robo-Case is the embodiment of this vision, harnessing the power of IoT (Internet of Things) and intelligent design to make your travels smoother, more secure, and genuinely enjoyable.

Equipped with an Arduino Uno Wi-Fi, Robo-Case connects effortlessly to your smartphone or tablet, giving you complete control over its features. The ultrasonic sensor allows it to navigate autonomously, avoiding obstacles and providing the convenience of hands-free operation, all while ensuring the safety of your valuables within. Additionally, the built-in GPS tracking ensures that you can keep a real-time eye on your suitcase's location, minimizing the risk of loss or theft.

In this era of rapid technological advancement, Robo-Case sets a new standard for travel convenience. It's not just a suitcase; it's a smart, intuitive, and secure companion that brings peace of mind to your voyages. So, as

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you prepare for your next adventure, let Robo-Case take the load off your shoulders and redefine the way you travel. Welcome to the future of travel – welcome to Robo-Case.

II. LITERATURE REVIEW

The concept of smart luggage systems has emerged as a solution to address the difficulties faced by travellers while carrying their luggage. This literature reviews aims to explore the existing research and developments in the field of smart luggage systems, focusing on the integration of various technologies such as IR sensors, ultrasonic sensors, node MCU, and mobile control. Smart luggage systems have gained popularity due to their ability to enhance the travel experience by providing innovative features and functionalities. These systems incorporate advanced technologies to automate decision-making processes IR sensors, such as the HW-201, are commonly used in smart luggage systems for various purposes. These sensors can detect the presence of objects or obstacles and provide input to control or trigger specifications. Ultrasonic sensors, like the HC-SR04, are widely utilized in smart luggage systems for distance measurement. These sensors use sound waves to calculate the distance between the luggage and surrounding objects. It provides functionalities such as Wi-Fi connectivity, analogue and digital pin support, and serial communication protocols He integration of mobile control in smart luggage systems allows travellers to remotely operate and control their luggage using mobile applications. Motor driver modules, such as the L298N, are essential components in smart luggage systems. These modules enable the control and direction of DC motors, which are responsible for the movement of the luggage. The literature review highlights the advancements in smart luggage systems and the integration of various technologies to enhance the travel experience.

The utilization of IR sensors, ultrasonic sensors, node MCU, mobile control, and motor driver modules have enabled the development of intelligent luggage systems capable of obstacle avoidance, automated decision-making, and remote control. Further research and development in this field are expected to bring more innovative features and functionalities to smart luggage systems, making travel more comfortable for users.[1]

The proposed system aims to provide a cost-effective and user-friendly solution for frequent travellers by introducing an automated suitcase. This suitcase utilizes various components such as an Arduino microcontroller board with the suitcase through based on the user's commands. To ensure accuracy and efficiency, the smartphone utilizes accelerometer and magnetometer sensors to compute the user's movements and speed. This eliminates the need for expensive GPS systems or image processing, which may not always be reliable, especially in indoor environments. The proposed system has been tested and validated for various real-life scenarios. The paper also discusses the growing demand for comfort and convenience in the current technologically advanced era. It highlights the impact of technological advancements in the travel industry and the need for automated suitcases to provide assistance to physically challenged, children, and elderly individuals who travel alone. These automated suitcases can alleviate the dependency on human assistance and enhance travellers self-esteem.

The paper acknowledges the availability of autonomous and automated suitcases in the market that utilize GPS or image processing for tracking the owner's position. However, these systems often come with high costs or operational expenses and may not be suitable for indoor environments. To address these limitations, the proposed system focuses on estimating the user's speed and movement directions using the smartphone's accelerometer and magnetometer sensors. This enables the suitcase to follow its bearer with no additional operational expenses. The system architecture consists of two major modules: the automated suitcase and the smartphone application. The automated suitcase comprises an Arduino Nano, H-bridge motor controller, DC motors, ultrasonic sensor, and Bluetooth module. The smartphone application uses the accelerometer and magnetometer sensors to monitor the user's movement and speed. The communication between the smartphone and the suitcase is established through Bluetooth technology.

Overall, the proposed system offers a cost-effective, user-friendly, and environment-independent solution for automated suitcases. It aims to enhance the comfort and convenience of travellers by providing a hassle-free experience. The paper concludes by summarizing the methodology, presenting the obtained results, and highlighting the potential benefits of the proposed system.[2]

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The study focuses on using Microsoft Kinect and 2D lidar data to enable a mobile robot to detect and follow moving targets, specifically people carrying objects, in shared indoor environments. By utilizing the Kinect sensor, the robot can identify standing humans with suitcases and consider them as potential dynamic targets. The 2D lidar on the mobile platform further aids in tracking and following the target while maintaining a specific angle and distance. This research showcases the robot's ability to navigate and adapt in multi-agent formations. It's an intriguing study that highlights the potential of autonomous service robots.

By adding a GPS tracking system to the human-following suitcase robot would enhance its capabilities. With GPS, the robot can have precise location information and can be operated remotely through mobile phones. This would provide even more flexibility and control over the robot's movements. It's an excellent approach to consider for improving the functionality of the robot.[3]

The concept of a human-following suitcase is an innovative development in the field of robotics and luggage technology. It aims to revolutionize the way people travel by alleviating the burden of pulling or carrying heavy luggage. This concept utilizes intelligent sensors, GPS capabilities, and advanced navigation systems to enable the suitcase to autonomously follow its owner without manual control. The term "smart" in this context refers to the integration of various technologies and features in the suitcase to enhance its functionality. The idea of a smart bag is built upon the use of Wi-Fi technology (Node MCU ESP-8266) interfaced with a controlling unit, GPS module, MPU-9250, ultrasonic sensors, power bank, and solar cells. This combination of technologies allows for features such as location tracking, digital locking, and the bag being able to convert energy from light into electricity. The functionality of the smart bag is controlled through a smartphone, which communicates with the suitcase through Wi-Fi technology. This allows travellers to easily track the location of their bag and lock it digitally for added security. Additionally, the use of GPS technology ensures accurate tracking and location information. The integration of a power bank and solar cells in the smart bag turns it into a power station. This means that the bag can generate its own electricity through the photovoltaic effect, which converts light directly into electricity. This feature is beneficial for travellers as it allows them to charge their electronic devices on the go, without the need for external power sources. By utilizing intelligent sensors, GPS capabilities, and advanced navigation systems, the suitcase can autonomously follow its owner without manual control. The integration of various technologies and features, such as digital locking, location tracking, and the ability to convert light into electricity, make the smart bag an exciting and revolutionary development in the field of luggage technology.[4]

III. MODELING AND ANALYSIS

Components :

The human following robot has the following main components are:

Hardware:

1)Ardino UNO Board

2) ultrasonic sensor

3) L298 N motor driver

4) GPS

5) DC motor 12 volt 150Rpm

6) DC motor wheel

7) Lithium-ion Battery

8) Battery holder

9) Switch

10) Web cam esp 32

11) Accelerometer sensor

12) Electromagnetic

13) Node MCU 8266 wifi model

14) Connecting Wire jumper

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15) LCD display

16) Transmitter and receiver

Software:

1) Arduino IDE

2) Embedded C Programming

3) Text Editor

4) Android Studio

5) Java

6) XML

1. Arduino Uno

Fig 1: Arduino Uno

2. L298 N motor driver

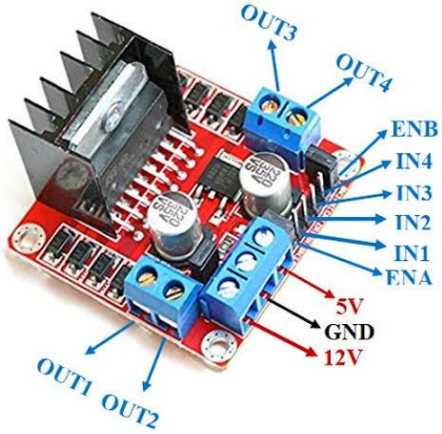

Fig 2: L298 N Motor driver

3. Ultrasonic Sensor

Fig 3: Ultrasonic Sensor

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4. DC Motor 12V

Fig 4: DC Motors

5. Wheel

Fig 5: DC Motor Wheels

6. Lithium-ion Battery

Fig 6: Lithium-ion Battery

7. Switch

Fig 7: Switch

8. Global Positing System-GPS

Fig 8: GPS

9. Node MCU 8266 Wi-fi model

Fig 9: Node MCU 8266 Wi-fi model

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Tools Needed

Some tools names are given below:

1. Soldering Iron
2. Glue gun
3. Cutter
4. Knife
5. Screwdriver
6. Buzzer
7. Wire Jumper
8. Steel case
9. Battery holder

IV. CONCLUSION

In conclusion, the Robo Case is a unique smart suitcase that can be controlled remotely via a mobile app. It also features sensors and a GPS tracker, making it a convenient solution for traveller's. It addresses the common problem of managing luggage during trips and offers security features to prevent theft or loss. In the future, we plan to add more features like headphone and USB ports, Wi-Fi connectivity, and a fingerprint system for added security. Our aim is to make it affordable and easy to use. This system combines auto and manual driving capabilities to provide a reliable and smart solution for transporting luggage.

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