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# Smart Luggage Carrier

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***Abstract*: This paper, outlines the development and innovation of a 4-in-1 luggage carrier. It highlights the biometric lock, the GPS (Global Positioning System) tracker, built-in emergency power bank, Auto-drive. As per our research, we have developed and designed a goods carriers to be reliable while transporting or during any occasion where we use luggage carriers and also helps them go green. While providing convenience to the goods carriers, the prototype also features a security of the luggage through the biometrics. The fingerprint scanner is used to access and open the luggage bag, whereas the GPS device is used to track the luggage bag which has a built-in power bank that makes the luggage bag a charging station for gadgets. It can follow the owner and ease of communication.**

***Keywords*: GPS, Biometric.**

## 1. Introduction

Bags have always been an integral part of travel life whether it is a travel bag or a plastic bag or even a luggage bag. Every bag has its own importance and carries different functions and utility. Dragging the luggage all over the place has been done since the golden ages. Thinking of a luggage which tracks its location, which follows the user automatically or manually, by the touch of the present technology to the old baggage it may bring out its true potential. This has motivated us to do the research all along so that it is user-friendly, eco-friendly and could be operated by a Smartphone. This paper, outlines the development and innovation of a 4-in-1 luggage currier. It highlights the biometric lock, the GPS (Global Positioning System) tracker, built-in emergency power bank, Auto-drive. As per our research, we have developed and designed a goods carrier to be reliable while transporting or during any occasion where we use luggage carriers and also helps them go green. While providing convenience to the goods carriers, the prototype also features a security of the luggage through the biometrics. The fingerprint scanner is used to access and open the luggage bag, whereas the GPS device is used to track the luggage bag which has a built-in power bank that makes the luggage bag a charging station for gadgets.

## 2. Proposed System

There are a lot of applications to the luggage but all of them are not controlled from the luggage instead the commands are sent from the mobile phone to the luggage via Machine to machine communication. The mobile phone has a pre-installed application software with a pre-installed set of instructions. They wait for the user to send the commands. After the microcontroller embedded inside the luggage receives instruction from the user it acts accordingly. This can either be for tracking its location and send it to the user or send the luggage weight also the charge of the batteries.

## 3. Literature Survey

### *A. Smart Bag using Solar and RFID Technology*

In this paper they have used method used here is solar cell and Radio Frequency Identification (RFID). The solar cell is attached to the front part of the bag, it charges the rechargeable battery. Using which the phones can be charged. It has a Liquid Crystalized Display (LCD) display, which displays the timetable for the users. It has an alert system, which tells the user if any additional books are kept in the bag. Tracking using Radio Frequency Identification (RFID) is very tedious job hence not preferred. It is mainly useful for day scholars of schools and colleges. As the bag is connected to a Bluetooth module it is not widely used. The advantages are useful for tracking the people who are kidnapped, it also has an alert system. The disadvantage is solar cells won't be useful all the time.

### *B. Luggage Tracking System using IoT*

The method used here is a Global Positioning System (GPS) module, alarm and an Arduino board to which all other components are connected. A map is created and is synchronized, to track the location of the bag if lost. The alarm notifies the user that the bad has passed beyond the range of its owner. The advantage is the alarm would help the owner of the bag to identify the bag and track it down. The disadvantage is that the bags cannot be tracked if it goes beyond the map area fed into the server. As Arduino is used so it is difficult to interact with an application. As it uses Arduino so it will be very ridged system that is, it is not easily upgradable.

### *C. Multifunctional Bag Monitoring System*

The proposed method, uses an android based remote bag system, which will provide elective, real-time bag location. Using which the bag can be tracked down easily. The advantage here is the bag can located, if it is lost, as it sends a message to the owner about its location. As the Global System for Mobile

Communication (GSM) module is in this system so it is independent. The disadvantage is that if there is any problem with the satellite connections, then it won't be easier to track the bag. It is too expensive due to the usage of satellite communication. As Short Message Service (SMS) is used for interaction so it will be one way communication.

### *D. Smart Travelling Bag using IOT*

In this paper Raspberry Pi 3 is used as microprocessor. It has antitheft sensors. The bag uses local host to communicate with the mobile application. It communicates with the webpage. It is independent as it has an inbuilt Global System for Mobile Communication (GSM) module. It even has an inbuilt power supply using the power-banks. The antitheft sensors detects whether the bag is open or closed so as to give an alert to the owner. It has a web application which connected to the bag through the Wi-Fi module.

### *E. Improved Baggage Tracking, Security and Customer Service with RFID in Airline Industry*

In this paper the Radio Frequency Identification (RFID) is used for identification of the Baggage and the Customers. The Radio Frequency Identification (RFID) is attached as tags on luggage and in the tickets of passengers. The Radio Frequency Identification (RFID) readers keep track of the luggage of the customers. It has three level of testing here, they are unit testing for giving an error-free system, system testing is used to check whether the work is compatible and is harmonious to each other and acceptance testing is the final testing process and is then suggested for the users and stakeholders. It can be implemented only in the airports. It can be implemented for all destinations in the airlines network.

### *F. Smart Bag with Theft Prevention and real-time Tracking (with ultrasonic sensors and IR sensors)*

This paper consists of Global System for Mobile Communication (GSM) and Global Positioning System (GPS), which are used for Tracking of smart bag. It has a fingerprint locking System. Ultra-Sonic sensors are used to detect the objects, such that the bags do not collide with it. The bag has two IR sensors, which is used to follow the owner, that is human detection is possible here. The distance detection is done using Bluetooth. All the sensors and hardware is embedded in the luggage itself. It does not have any web applications. If the range of the Bluetooth is lost, then it is difficult to detect the bag.

### *G. Smart Bag (it can follow you)*

The method used in this paper is ultrasonic sensors, Global Positioning System (GPS), Global System for Mobile Communication (GSM), Bluetooth module, mobile application and power bank. It even has a fingerprint locking system. It does not have a theft protection system. It has a Bluetooth module which is connected to the user phone and the bag. Power bank is provided to charge up their respective gadgets. Due to the usage of only ultrasonic sensors there is no guarantee that the bag will follow the owner only. It may even follow another human too. Global System for Mobile Communication (GSM) and GPS are to get the location of the bag if it is lost, but within the Bluetooth range only.

### *H. Automated Luggage Carrying System*

In this paper the methods used are Radio Frequency Identification (RFID), smart cards, synchronous rotation of motors and ultrasonic sensors. It has locomotion function that is, the wheels can move forward, backward, if three wheels rotate right the other three wheels rotate left and vice versa. The smart card includes an embedded integrated circuit that is either a microcontroller or a memory chip. Due to the presence of ultrasonic sensors the bag can detect the obstacles. It does not have a mobile application. RFID for long distance if costly and if the short range Radio Frequency Identification (RFID) is used, finding the bag will be tedious work.

## 4. Working

Figure 1 shows the system architecture of Smart Luggage Carrier. We have provided a mobile application to operate the bot. The bot will be connected to your mobile device in which you have installed the application via Bluetooth and Wi-Fi. Using which a new network will be created using NodeJS. A private network is created and this system is deployed into the private network, now we have a server. The request and response to and from the application is sent and received from the server. The request n response will be in one word, the interpretation of the word is already inbuilt in the system, and the bot will function accordingly.

The user can select the favourable option from the interface provided in the mobile app. The different options are automated following that is the bot will follow the user automatically, manual following that is the user can manually operate the bot and GPS. The module will wait for the input and act accordingly. Based on the choice selected, the automatic module or the manual module or GPS module will start. And the Module will either follow or execute the command.

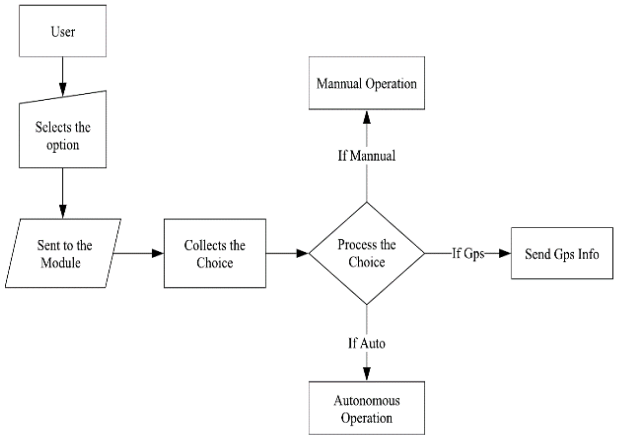


Fig. 1. System architecture of smart luggage carrier

When the user needs to take the luggage, he have to first confirm his identity using the biometric lock, it checks whether the figure print matches that of the owner of the luggage or not, and if not then an alarm will set off immediately and a message is sent to the owner giving the details of the theft and the location of the luggage.

The ultrasonic sensor (middle) and the two IR sensors (one at the right end and other at the left end) that are fixed on the side of the carrier that is faced towards the user are used to detect obstacles and the distance between the user or the obstacle and the carrier. When an obstacle is found the module checks for the position of the obstacle and the carrier moves accordingly to the left or right side. The 2 IR sensors attached to the right and left corners of the carrier help in doing so. If the IR sensor at the right detects an obstacle and there is no obstacle on the left side then the carrier turns right and this procedure is repeated until the user reaches his destination. The IR sensors and the Ultrasonic sensor checks the distance between the carrier and the owner frequently, and if the owner is at a certain distance from the carrier, that is if the owner if little too far away from the carrier, the bot will speed up to catch up with the owner, and when the owner is closer to the bot the bot will slow down and stop. The user can check the location of the carrier in the mobile application anytime, hence in case where the luggage carrier is lost, the user can find it easily. The user can also charge their mobile phones anytime anywhere using the emergency power back provided.

## 5. Result

We have prepared an application and a website that will help the user to control the bot and will be able to receive the notification from the bot via the application. The output of this application is as shown below (the website is converted into an application).


Fig. 2. Connection page

Figure 2 shows the connection page of the application, here the user has to turn on the Wi-Fi and Bluetooth. Once Bluetooth and Wi-Fi is turned on the user's mobile device is connected to the bot. Once the bot is connected to the mobile device, the user is directed to the Options page in the application, which is shown in figure 3.


Fig. 3. Options Page

Figure 4 shows the page where the different modes to control the bot is displayed. The modes are automation, manual and location. If the user wants the bot to simply follow the, then the user can select Automation mode that is figure 5. If the user wants the bot to follow the rules of the user, then the user can choose Manual mode that is figure 6. If the user wants to know the location of the bot, then the user can choose the Location mode that is figure 7.


Fig. 4.

Figure 5 shows the automation page, where the user two options Start and Stop. The Start button to make the bot follow the user, and Stop to stop the bot from following. Once the user reaches their destination, then they can stop the bot.


Fig. 5.

Figure 5 shows the manual mode page, where the user has 5 options. They are Forward, Backward, Left, Right and Stop buttons. If the user doesn't want the bot to simply follow, they can choose this mode. Depending on the instructions given, the bot moves Forward/Backward/ Left/ Right. After the user reaches their destination they can stop the bot using the stop button.

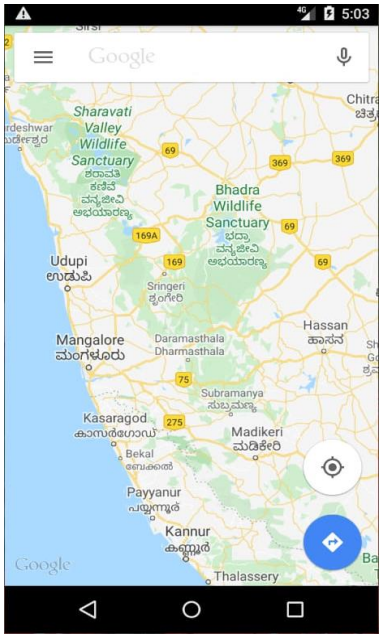


Fig. 6.

Figure 6 shows the Location Page, which leads to the Google Maps. It shows where the bot is present in case the bot is lost or stolen.

We have used private network type for communication between the bot and the application or website, since it is more reliable and has less traffic, whereas local network is non-reliable and will have heavy traffic. Also private network is secure than that of the local network. We have provided both website and mobile application hence the user can operate the bot using mobile or laptop according to their convenience. Also we can control multiple bots using or website.

The bot is affordable, since we are using the regular pi board components. Also we have optimized the code as much as possible, hence the bot will be faster and more efficient. Since we have used Python programming language for the code, it can be easily upgraded as and when needed.

## 6. Conclusion

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which things may occupy every place. The proposed system highlights the GPS (Global Positioning System) tracker, Auto-drive and Manual drive. This project was designed and made for the goods carriers to be reliable while transporting or during any occasion where we carry our luggage. While providing convenience to the goods carriers, the prototype also features a security of the luggage through proximity details. The GPS device is used to track the luggage carrier. The application helps in communication between the user and the carrier and controls the carrier manually.

Though this project is done keeping a single user in mind, in the future this project can be developed for a small as well as large sale industries too. We could send notification to the user through the app if the carrier has lost track of the user. Many bots can be controlled by the single user along with the proper security required. This same system can be deployed to a hospital, construction or any of the place where there is a lifting and moving of different objects. For this the frame structure and the power input and the power out has to be changed for much better performance.

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