

IoT based Baggage Tracking System

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Abstract—People who travel often or people on vacations would always expect their vacation to be filled with good memories but this travel can be a traumatic memory too when the baggage which has all the essential items of the travelers is lost. As the baggage is the most essential item for a traveler it is important to ensure its safety to prevent the loss or theft of the same. Therefore, the IoT Based Baggage Tracking System proposes an enhanced technology through which an IoT based device is built and the same is installed in the baggage of the passengers and giving real time access to the location of the baggage to its users throughout the travel. The device achieves this possibility of getting the location of the baggage through the GPS Module that is installed in the device. The Motion detector used in the device ensures to notify or alert the user about the movement of the baggage far from the user along with the location to prevent theft if someone tries to steal the baggage. The device proposed to be built comes into use in various locations such as the airports, railway stations, bus stops, cruise ships and other public places too. The device also integrates the BEACON technology to ensure the user could access the location of the baggage even when the baggage is passed through the conveyor belt. As this challenged the previous existing system the above-mentioned drawback is also solved through this proposed technology.

Keywords-Global system for mobile communications (GSM), Global positioning system (GPS), Internet of things (IoT), Radio-frequency identification Efficiency (RFID).

I. INTRODUCTION

There are times where the majority of traveling individuals would have encountered baggage loss and the experience would have been nothing less than a traumatic experience. Places like airports provide facilities for tracking the passengers' baggage but the traditional method that airports follow for tracking the baggage's location leaves us uncertain. The IoT Based Baggage Tracking System provides a special technology that serves as a solution for the existing problem related to the loss or theft of baggage in

various places including places like the airports, bus stops, railway stations etc. Thus, providing a hassle-free traveling experience to the people using this technology. Previous applications face difficulty of carrying the devices and are prone to physical damages. Some has less GPS signal accuracy and possess complex technicalities. Some has drawbacks of using RFID Tags which require frequent change of tags and has limited signal range. While some uses Biometrics that raise false alert messages and also cannot function without internet connection. High possibility of damage using QR-code. Application using GSM does not provide real time tracking and other limitations of power and sensor are present. Airline baggage tracking application fails to integrate airline baggage tracking with RFID. These drawbacks are accounted and overcome by using the proposed mode The referred articles for luggage tracking systems, includes, RFID tags, QR code, Biometrics. Research gaps exist even with the inclusion of these technologies. Where the drawbacks include unavailability of real time tracking, limited signal coverage, frequent changing of RFID tags. Therefore, further exploring the project is essential to overcome the mentioned limitations. The main aim of this proposed project is to provide a hassle-free traveling experience for its users. Therefore, the idea is based on the simple fact that the travelers might forget headsets, toothbrush but never their phones. Therefore, this IoT based tracking device for baggage would expect the users only to have mobile phones. Through which user could have access to the baggage location.

II. LITERATURE REVIEW

In recent times, many solutions have been provided for Baggage tracking system but with some drawbacks that have been overcome by this proposed model.

A. Challenges and concerns:

Applications for tracking luggage that are currently in use have faced a number of difficulties, such as the inconvenience of carrying devices that are vulnerable to physical harm, poor GPS signal accuracy, and intricate technicalities. Limited signal range and the need for frequent tag replacements are problems for some RFID-based applications. Concerns regarding false alerts and reliance on constant internet connectivity are raised by Biometrics-based systems. Applications with QR codes are prone to malfunction, and those that rely on GSM technology don't offer real-time tracking, which causes delays and possible security issues. Furthermore, it's common for airline baggage tracking applications to have trouble integrating RFID technology with ease. Due to these limitations, a more reliable solution is required, and the suggested model attempts to fully address these shortcomings. The suggested model makes use of cutting-edge technology, including the Uno Arduino board and IoT concepts. reduces the need for external gadgets while guaranteeing robustness and preventing physical harm. Improved GPS signal accuracy, streamlined tracking procedures, and resolution of RFID tag, false alert, and internet dependency issues are all brought about by it. All things considered, the suggested model is a major development in luggage tracking technology, providing a thorough and effective resolution to the issues that current applications are unable to address.

B. Research Gaps:

The body of research on luggage tracking systems that is currently available covers a range of technologies, including biometrics, QR codes, and RFID tags. Even with these technologies included, there are still a lot of unanswered questions, which emphasizes the need for more study in this area. The shortcomings of these technologies that have been found add to the gaps in the literature that already exist. One significant drawback is that some systems do not offer real-time tracking, which presents difficulties for users who need to know their luggage's location instantly. Limited signal coverage is another frequent problem. This is particularly common with RFID-based solutions, where the tracking range may be limited. Moreover, the tracking process becomes more complicated and expensive due to the frequent need to replace RFID tags, which reduces the overall

effectiveness of these systems. To overcome these particular constraints, it is necessary to conduct additional research and development on luggage tracking systems. Potential solutions to these problems could involve researching new technologies or improving ones that already exist. Particularly in the context of RFID tags, the research gaps highlight the significance of investigating novel solutions that can offer real-time tracking capabilities, expand signal coverage, and lessen the need for frequent maintenance. It is possible to create a more reliable and effective luggage tracking system that satisfies users' changing needs and successfully addresses the shortcomings noted in the body of existing literature by conducting more research in this area.

III. PROPOSED SYSTEM

By fusing Next-Generation Microcontroller Technology with IoT concepts in a seamless manner, the proposed luggage tracking system—which makes use of the Uno Arduino board—stands at the forefront of travel technology. Fundamentally, the Uno Arduino board functions as an advanced microcontroller, coordinating the incorporation of perceptive sensors into travel bags. Real-time communication with multiple applications is made possible by this potent combination, which provides a tracking solution that is both unique and affordable compared to conventional methods. Through mobile applications or terminals, users can easily keep an eye on their luggage, greatly lowering the chance of loss. The versatility of the system and its compatibility with different sensors allow for uses beyond basic location tracking. It makes luggage condition monitoring easier by accounting for variables like temperature and humidity. Reliability of the system is enhanced by the Uno Arduino board's processing power, which guarantees effective data handling. This novel approach not only enhances the overall travel experience but also improves travel infrastructure by reducing operational challenges related to mishandled luggage. With its promise of enhanced security, ease of use, and seamless travel experiences, the proposed luggage tracking system represents a paradigm shift in travel technology. The system architecture's all-encompassing methodology is shown in Figure 1. The methodology makes use of Baggage Handling System (BHS) technology, which is especially important in

airport applications where traditional tracking may be hampered by conveyor belts, Beacon technology for precise location information, and GPS technology for real-time location tracking. In order to predict the location of the baggage based on patterns discovered from previous events, the project primarily uses data analytic and predictive algorithms. In summary, the suggested luggage tracking system paves the way for a revolutionary development while also addressing present travel technology shortcomings. The technology provides a strong and intelligent solution that has the potential to completely transform the travel industry and guarantee a future of improved security, convenience, and seamless travel experiences by fusing cutting-edge hardware, predictive analytic, and a comprehensive approach to luggage tracking.

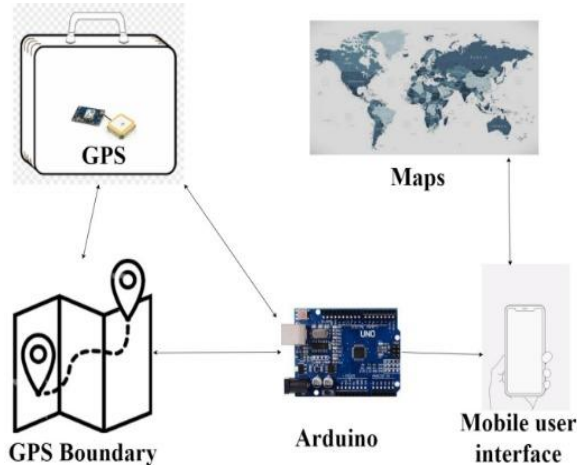


Fig 1 : System Architecture

IV. METHODOLOGY

The Proposed Project involves GPS technology to provide real-time tracking of the location of the baggage. BEACON technology is used for providing the correct specific location of the baggage. The Baggage Handling System (BHS) technology is majorly used for airport applications where location tracking would not be possible when the baggage is passed through the conveyor belts to overcome this limitation the BHS technology is used. The Proposed Project is majorly based on the Data Analytics and Predictive Algorithm where the location of the baggage is predicted based on previous similar occurring event's data.

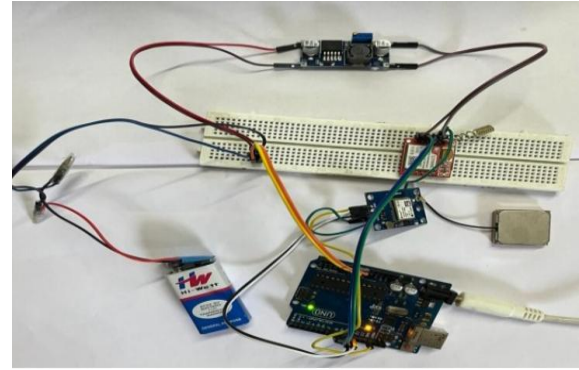


Fig 2: Methodology

A. Feature enhancement:

The proposed project is only limited to SMS communication where the location is obtained by sending a text through SMS from the users' mobile. But there arises a possibility where the user might run out of battery. Feature enhancement shall be made to get location from more than one device. Upgrades shall be made to increase the battery life of the device to tackle the situation where users travel for more than 24 hours.

B. Testing and evaluation:

The luggage tracking system undergoes rigorous testing to ensure its functionality and reliability in various scenarios. GPS testing is conducted to verify the accuracy of real-time location information, assessing the device's performance in different environments like airports, bus stops, and railway stations. Battery life testing involves simulating diverse usage scenarios to determine the battery's lifespan, preventing frequent replacements and ensuring user convenience. Durability testing assesses the device's ability to stay attached to the baggage, even under challenging conditions such as being thrown on conveyor belts or exposure to humid/rainy weather, ensuring the system's robustness and longevity. These tests collectively guarantee the system's effectiveness and durability in real-world applications.

C. Comparison of Existing and Proposed System:

The existing system uses an unreliable technology of RFID barcode tags that makes real-time tracking difficult as the tags become wrinkled, dirty and unreadable which makes the whole performance rate drop. The manufacturing cost of RFID tags is often

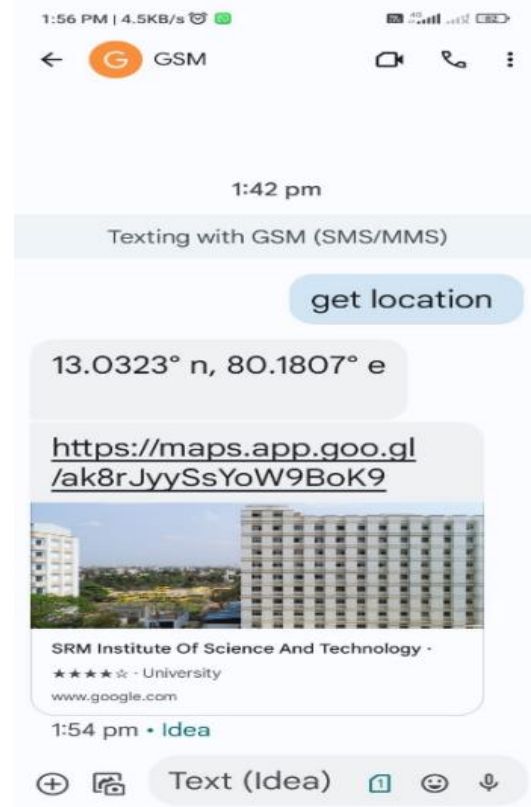
considered relatively high the proposed system uses Beacon technology for providing the correct specific location of the baggage. The system uses the Uno Arduino board which appears to offer advantages in terms of technology, user-friendliness, adaptability, and potentially cost-effectiveness. It aims to address the limitations of existing systems, especially with regard to accuracy and reliability in challenging conditions.

Features	Accuracy	Time	Location	Motion Detection	UI
Barcode	10-15%	10-36Hours	No Location	No	Not Available
QR-Tags	25-40%	5-24Hours	Flight Location	No	Third Party Website
RFID Tags	45-65%	5-10Hours	Less Accurate Location	No	Third Party Website
GPS	80-90%	10-15Minutes	Accurate Location	No	Corporate Dependent Application
Proposed Gsm-GPS	80-95%	5-10Minutes	Real-Time Tracking	Yes	SMS

V. RESULTS AND DISCUSSIONS

A. EFFICIENCY OF THE PROPOSED SYSTEM

The goal of this project is to create a user-friendly application to provide precise real-time location and status information of luggage throughout the journey in a hassle-free manner with the help of the Uno Arduino board that integrates Next-Generation Microcontroller Technology with IoT principles. The objective of this system is to enhance travel infrastructure, improve the passenger experience and introduce opportunities for seamless travel. Arduino boards are typically designed for energy efficiency. Assuming efficient power management and low-power sensor designs, the system may have good battery life, contributing to its overall efficiency.



VI. CONCLUSION

Henceforth, the project is concluded by deploying various IoT techniques the proposed idea of baggage tracking system can be implemented successfully. This system acts as a smart solution that overcomes the drawback of traditional luggage tracking system which works on the concept of RFID tags, QR-Based tags, Biometric locks. It involves frequent changing of RFID tags and problems involving loss of QR tags and its inability to provide real-time tracking market is still new and has potential to accept the new face of Baggage.

The baggage tracking system hence simplifies the process of tracking the location of the baggage. It provides the user the facility to access location on a real time basis. Ensuring the safety of the luggage to prevent the loss or theft of baggage.

VII. FUTURE ENHANCEMENT

Upgrades shall be introduced to enhance the baggage tracking system. These upgrades would include the integration of Block chain technology. Using AI

powered components for building the tracking device. Collaboration shall be made with travel ticket booking application to make the tracking process easier. AR Technology can be incorporated to get a live movement of the baggage.

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