IOT BASED SMART LUGGAGE TRACKING AND ALERTING SYSTEM FOR ANTITHEFT SECURITY PURPOSES

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1. Abstract:

The IoT based smart luggage tracking and alerting system is a technological solution that aims to ensure the safety and security of luggage during travel. The system incorporates a tracking device that is integrated with the luggage and utilizes the IoT technology to enable real-time tracking of the luggage location. The system is also equipped with an alerting system that sends notifications to the user's mobile phone or email in case the luggage is tampered with or moves beyond a designated boundary. The system provides convenience and peace of mind to travellers as it reduces the risk of luggage loss or theft, improves luggage handling and tracking, and facilitates easy luggage identification. Overall, the IoT based smart luggage tracking and alerting system is a reliable and efficient solution for luggage tracking, which can benefit both travellers and the transportation industry. The baggage tracking system is premeditated to trail the luggage along with bags which are misplaced at public places. There is also a theft of baggage robbery at certain public places. This system works as an alarming device which works when the luggage goes away out of certain range from its owner. IoT equipment are used to keep track of the bag along with a mobile application is developed in order to check.
Keywords: Baggage/Luggage Tracking, RFID, GPS, IoT, Mobile App.

2. Introduction:

Anyone can misplace their luggage at any circumstances and conditions. Mostly people get robbed in public areas (Railways, Banks, Bus Stations, Airports). Sometimes they even forget their important luggage which contains their necessary items. It's very important to trail down the bags in case of any loss or theft. IoT devices can be controlled remotely which defines the integration of computers with physical world. They are economically feasible, accurate and efficient. A technology embedded with IoT develops smart devices and objects. An IoT based

smart luggage tracking and alerting system is a system that uses IoT technology to track luggage and provide alerts to the user in real-time. The system includes a set of sensors, a microcontroller, and a cloud-based platform for data processing and storage.

The sensors in the system are used to collect information about the location and status of the luggage. For example, GPS sensors (U blox) to track the location of the luggage. The microcontroller in the system is responsible for processing the data gathered by the sensors and communicating it to the cloud-based platform. The microcontroller also has Wi-Fi technology to enable communication with the cloud-based platform. The cloud-based platform is used to accumulate and process the data collected by the sensors. It includes features such as finger print module for authorization purpose. Any unauthorized person can be detected in real-time alerts systems and analytics to help users track and manage their luggage. The smart luggage tracking and alerting system can provide several benefits to users. For example, it can help users keep track of their luggage during travel and prevent loss or theft. It can also provide alerts if the luggage is mishandled .Moreover, an IoT based smart luggage tracking and alerting system can provide a reliable and convenient way for users to monitor and manage their luggage, making travel safer and more enjoyable.

3. Literature Survey:

RFID Card and the IoT have a tremendous potential to improve the aviation industry (IoT). vanished bags, misplaced bags, are the most frequent flaws in the aviation industry's hand baggage managing procedures [1]. The author describes an based on IoT tracking system that makes it simple to locate a youngster, an aged person, or any sort of luggage. The IoT gadget and the Android app have completed the tracking functionality for each of these things on this system. With this technology, anything can be tracked whether it is done manually or automatically [2].in addition to Passengers still do not have access to an airline baggage monitoring service, and they must wait a long time to locate their luggage. The author has a suggestion for an IoT-based system that can track passengers' luggage in real time for improved efficiency [3]. The purpose of the luggage tracking system is to locate lost or stolen bags that are connected from public and other areas. Travellers are always at risk of having their bags and luggage stolen, for this the projected system ultimately comes into play. A GPS module and the Arduino's Uno board are used to set an alarm in the luggage tracking system, which operates on an identifiable alarm basis [4]. Baggage trucking was created to prevent luggage mishandling or loss, which can stress out travellers. The suggested system comprises of an AVR based Microcontroller that is attached to the luggage through a GPS and sends position information. Each user is given a user ID and password before the data is processed and stored in the cloud [5]. In this work author suggest a clever method that makes use of smart watches and mobile applications for real-time tracking of airport luggage [6]. The inter-image elimination along with position detection methods are used in an infrared tracking dimension system to complete the purpose of automatic confine,edge tracking are related goals of habitual tracking, and these methods have been tested with positive marks in actual use, providing procedural guidance for the creation and make use of of infrared tracking extent systems[7].

3. Baggage Tracking System:

This system is a positioning system that can locate location of the luggage to its destination in Real time. The baggage tag which is attached contains the information of the

passenger. If the baggage is lost the user can notify and then trace the baggage using frontend mobile applications. Here we have designed a RFID tag system based on the principles of Real Time Locating System. This system is widely used which can reduce losing of baggage, cost efficient, improves customer user friendly and effective in baggage management.

4. Technical Specifications:

A. IoT Module (Raspberry Pi):

Processor	Cortex-A72 (ARM v8) quad-core, 64-bit Broadcom BCM2711 SoC, 1.5GHz
Memory	1, 2, or 4 GB LPDDR4 (depending on model)
Connectivity.	wireless LAN operating at 2.4 and 5.0 GHz, ,Bluetooth 5.0
GPIO	40- GPIO pins
Video	Micro HDMI ports and CSI camera Composite video port with audio
SD card	Slot ,r inserting a Micro SD to store data and load the operating system
Input power	via a USB-C connector and 5V DC (minimum 3A1) through the GPIO header, 5V DC (minimum 3A1
Environment	range: 0 to 50 oC

B. GPS Module: (Standalone GPS receiver)

UART Interface	SPI, USB along with I2C output pins
frequency for navigation:	5Hz
standard baud rate	9600-bps
Sensitivity:	-160dBm
GPS, Voltage operated	3.6V
DC current	10mA
Operation restraints:	Velocity-500m/s
Temperature range for operation	-40ºC TO 85°C

C. RFID module:

Range of frequencies	13.56 MHz

Host Interface:	SPI ,I2C or UART
Logic Inputs:	5V Tolerant
Operating current maximum :	13-26mA
Lowest Current (Power Off	10µA
Operational voltage	2.5 Volt to 3.3 Volt
Suitable Read Range	5 cm

5. Baggage Tracking System Architecture

The luggage tracking device in the system design uses a diminutive hardware circuitry to track the real-time location of a bag. This electronics includes a Raspberry Pi, a fingerprint reader, RFID tags, and a GPS module to track luggage. The Raspberry Pi will be interfaced with a GPS module, RFID Tag, and finger print sensor. From side to side GPS, we will transmit GPRS data containing a live spot to a server installed on the PC. The user's Android app will receive the server's location. The user of that Android app can track their luggage in real time .This device's operation involves keeping it inside luggage so that users can track their luggage's whereabouts in real time. Location information is sent to the server via the Android application on the user's phone, where it is then sent via SMS or message to the server and utilized to inspection the location on a map. User may now locate their luggage.
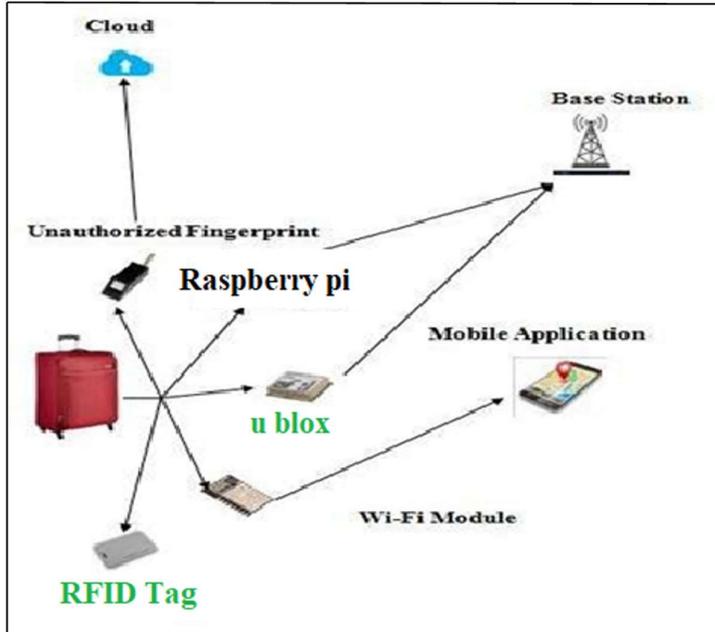
FEATURES:-

Raspberry pi

Finger print Module

Ublox Module

RFID Tag

PC elevation server

Android Application

solitary Luggage

Hardware Requirement:

1. Raspberry pi .
2. GPS module

3. Finger Print Module

4. RFID Tag

5. U-Blox

6. Battery -9Volt

Software prerequisite

1. Raspberry pi programming

2. python

3. Android programming concept

4. Server part- HTML

6. Block Diagram:
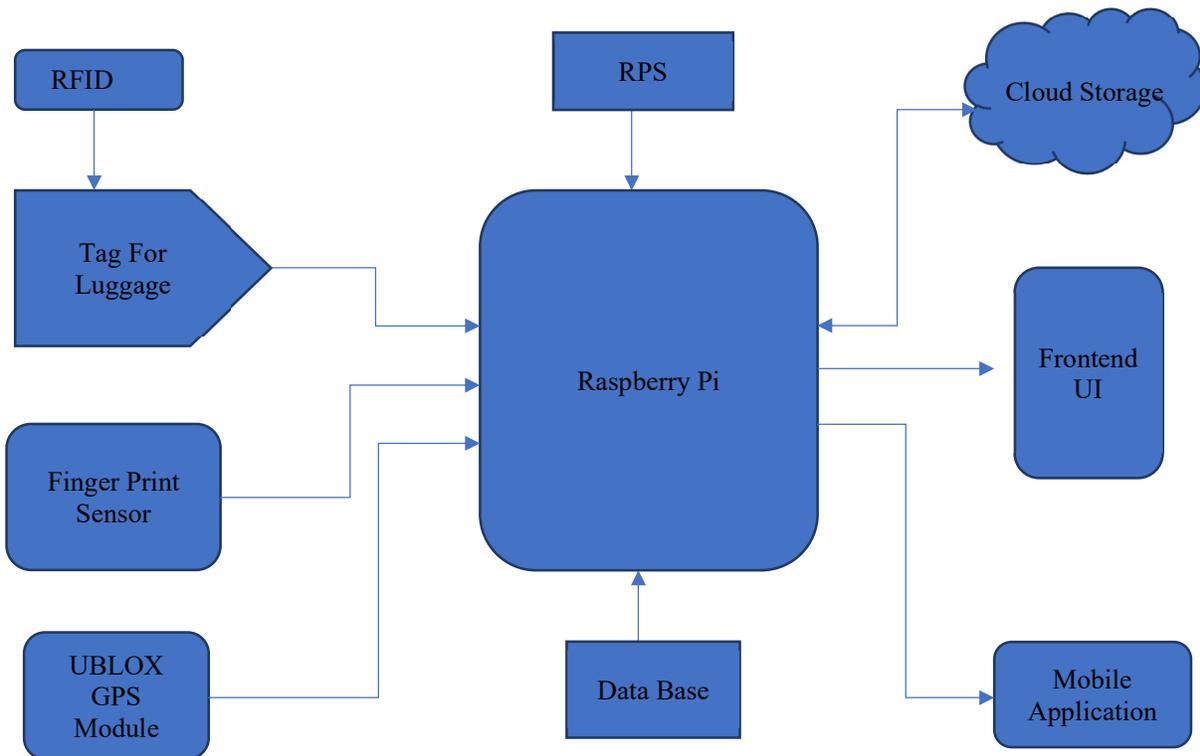
Fig 1 block diagram of IoT Based Smart Luggage Tracking and Alerting System

7. Working Model:

- The Raspberry Pi microprocessor controls the input and output of different electronic and IoT equipment.
- The fingerprint sensor is used to unlock the luggage and keep it safe to avoid any theft.
- If unauthorised person gets access to the luggage, then it will send the location to the owner through its mobile device also we can track by GPS module.

- The WIFI enable Raspberry Pi Module will let the owner/authorized person to open the luggage. The IoT cloud and the Database will keep a record of every location of the luggage.
- The owner can keep the actual time track record of the location and status of the luggage.
- The RFID tag stores the information magnetically and further helps is validation.

Experimental results

The Raspberry Pi may easily be configured to run Raspbian window . The Raspbian OS will installed to a micro SD card. The Raspberry Pi will then boot from the micro SD card.A 8 GB micro SD at least required for this prototype develop, along with a Raspberry Pi and some basic accessories like LCD screen a mouse, keyboard, Regulated Power source. For creating user friendly mobile app we used NodeRED .
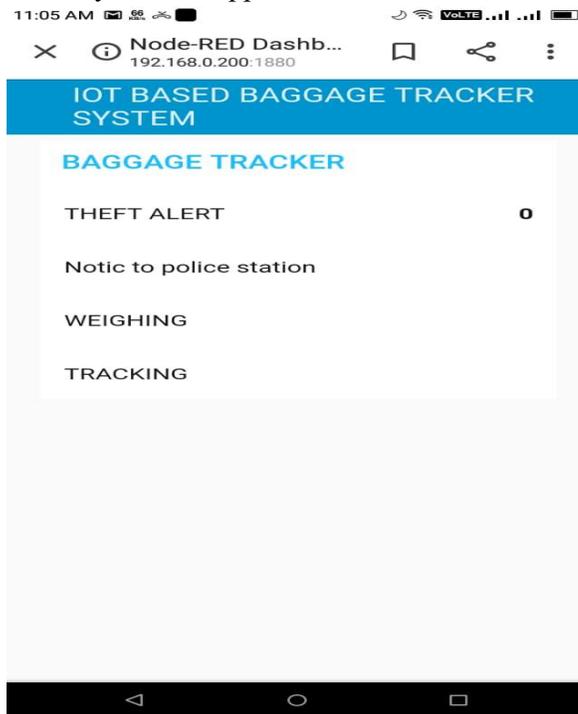
8. Conclusion:

The IoT-based smart luggage tracking and alerting system is a useful solution for enhancing the security of luggage during travel. The system uses various sensors, GPS, and communication technologies to track the luggage's location, monitor its movement, and send alerts to the user in case of theft or mishandling. The system's key features include real-time tracking, automated alerts, and remote control of luggage. It enables the user to monitor their luggage's location and status from their smart phone, tablet, or computer. The system also alerts the user if the luggage is moved or opened without authorization. The benefits of this system are numerous. It helps to reduce the incidence of luggage theft, loss, or mishandling, which is a common occurrence in airports and other travel-related places. It also provides peace of mind to the user by keeping them informed about their luggage's whereabouts. moreover, the IoT-

based smart luggage tracking and alerting system is a valuable solution for anyone who travels frequently and wants to ensure the safety and security of their belongings.

9. References:

[1] Tripathy, S.K., Mondal, S.R., Nayak, M.R. *et al.* Experimental studies on electronic smart device for automobiles application. *Opt Quant Electron* **55**, 550 (2023). https://doi.org/10.1007/s11082-023-04789-7

[2] Tripathy, S.K., Mondal, S. R., Palai. G (2022). SMART and reliable HELMET devices For Automobile Applications. *Computer Integrated Manufacturing Systems*, *28*(12), 999–1005. Retrieved from http://cims-journal.com/index.php/CN/article/view/484

[3] Singh, A., Meshram, S., Gujar, T., & Wankhede, P. R. (2016, December). Baggage tracing and handling system using RFID and IoT for airports. In 2016 International Conference on Computing, Analytics and Security Trends (CAST) (pp. 466-470). IEEE.

[4] Kabir, A. T., Saha, P. K., Kibria, G., Ta-sin, A. J., & Zishan, M. S. R. (2020, November). A Comprehensive Smart IoT Tracker for the Children, Elder, and Luggage With the Assistance of Mobile App. In 2020 International Conference on ICT for Smart Society (ICISS) (pp. 1-5). IEEE.

[5] Ye-Won, L., & Yong-Lak, C. (2015, November). Proposal for air-baggage tracing system based on IoT. In 2015 9th International Conference on Future Generation Communication and Networking (FGCN) (pp. 25-28). IEEE.

[6] Senthilkumar, S., & Jain, M. (2017). Luggage tracking system using IoT. Int. J. Pure Appl. Math, 117(17), 49-55.

[7] Karthick, S., Joel, J., Balaji, S., & Anish, T. P. (2020). Smart luggage tracking and alert system using arduino. International Research Journal of Modernization in Engineering, Technology and Science, 2(05).

[8] Ghazal, M., Ali, S., Haneefa, F., &Sweleh, A. (2016, March). Towards smart wearable real-time airport luggage tracking. In 2016 International Conference on Industrial Informatics and Computer Systems (CIICS) (pp. 1-6). IEEE.

[9] Wei, Q. (2017, August). Research on automatic target acquisition and tracking in an infrared tracking system. In 2017 16th International Conference on Optical Communications and Networks (ICOCN) (pp. 1-3). IEEE.

[10] Sharma, H. K., Choudhury, T., Kandwal, A., Mor, A., Sharma, P., Ahmed, M., & Ahlawat, P. (2022). Real-Time Tracking System for Object Tracking Using Internet of Things (IoT). In Cyber Intelligence and Information Retrieval (pp. 497-505). Springer, Singapore.

[11] Chaturvedi, R., Darji, K., Mahajan, A., & Varghese, M. (2018, January). Real Time Airport Luggage Tracking System. In 2018 International Conference on Smart City and Emerging Technology (ICSCET) (pp. 1-5). IEEE.

[12] Gupta, V., Kumar, R., Mishra, R. G., Semwal, A., &Siwach, S. (2017). Design and optimization of luggage tracking system on airport. In Proceeding of International Conference on Intelligent Communication, Control and Devices (pp. 833-838). Springer, Singapore.

[13]   Tripathy, S.K. , Biswal, P.K. (2020). <u>IoT-Based Baby Swing Monitoring, Alerting `</u>
            <u>and   Security   System</u> . in Advances in Intelligent Computing and
Communication,

[14]   Pani ,P.K., Tripathy, S.K., Tripathy ,A., Tripathy,M., Palai ,G., <u>Security Aspect of IoT</u>
            <u>Based Wearable Device For Women Safety</u> Journal of Data Acquisition and
Processing,   2023, **38** (3):

[15]   Tripathy, S.K., Mondal, S. R., Palai. G (2022). "Detection of Black   Fungus in
            Covid19 Patients Using Machine Learning", *Computer Integrated Manufacturing
            Systems,* , vol. 28, no. 12, pp. 798–998, Dec. 2022.