LOCASENSE: INTELLIGENT TRACKING WITH LOW ENERGY BLUETOOTH

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ABSTRACT

This project presents LocaSense, a Bluetooth-based personal tracking system designed to help users find lost items. The system works by pairing a small device with a user's account, attaching it to personal belongings like keys or bags. When an item is lost, the device broadcasts a unique ID upon detecting nearby Bluetooth signals, allowing other devices to relay the location back to a central server. The server then updates the user's account with the item's location. This prototype demonstrates the core functions of pairing, location detection, and data transmission while addressing challenges such as power consumption and security. Future developments aim to improve accuracy, security, and integration with mapping services.

1 INTRODUCTION

The increasing number of lost personal belongings has led to a demand for effective tracking solutions. LocaSense is a personal tracking system that leverages Bluetooth technology to help users recover misplaced items. This system provides a simple, yet efficient, method for tracking belongings by attaching a small, low-power Bluetooth device to items such as keys, bags, or phones. When a user misplaces an item, the device broadcasts a unique identifier to nearby Bluetooth-enabled devices. These devices then relay the location information to a central server, which updates the user's account with the item's whereabouts. This project focuses on creating a prototype of LocaSense, demonstrating essential features such as device pairing, ID generation, location detection, and data transmission. The project aims to explore the feasibility of this solution while addressing challenges like power consumption, Bluetooth range, and data security. Ultimately, LocaSense has the potential to evolve into a comprehensive tracking system that could offer enhanced security, more accurate location detection, and seamless integration with mapping services for easier navigation.

II LITERATURE REVIEW

The need for effective tracking systems has led to several innovative solutions aimed at minimizing luggage misplacement, theft, and other related issues, particularly in public spaces like airports and train stations. One approach discussed in the article "Smart Bag with Theft Prevention and Real-Time Tracking" focuses on using GPS and GSM technology to track luggage in real-time. This system ensures that a bag can only be activated by its owner, enhancing security while allowing location tracking via GPS. The integration of these technologies provides a smart solution for preventing theft and ensuring the bag's safety during travel.Another article, "Using RGB-D Sensors for the Detection of Abandoned Luggage," explores a system that uses both RGB and Depth sensors to monitor luggage in dynamic environments. The RGB sensor helps identify discarded or misplaced luggage, while the Depth sensor assists in distinguishing between luggage and people, thereby improving the accuracy of detecting abandoned items. This approach enhances the ability to track and secure luggage in

busy areas like airports or stations.In the realm of luggage tracking within the aviation industry, the article "Smart Luggage Tracker" proposes a system track luggage more accurately. The RFID tag data is stored on a cloud server, enabling passengers to track the real-time location of their luggage. The system also provides detailed information such as the weight of the luggage before and after loading, offering an added layer of security for both passengers and airlines. The article "Luggage Tracking System Using IoT" presents a system built on the Internet of Things (IoT), utilizing an Arduino Uno board and a GPS module. The system triggers an alarm if the luggage goes beyond a defined range, signaling potential theft. Additionally, a map interface is provided to monitor the exact location of the luggage, making it easier for travelers to track their belongings. This method represents a simple yet effective approach to luggage tracking with the help of IoT components.

III EXISTING SYSTEM

Existing luggage tracking systems utilize various technologies to address theft, misplacement, and real-time monitoring. GPS and GSM-based systems, like the "Smart Bag with Theft Prevention," allow real-time tracking and prevent unauthorized access. RFID-based systems, such as the "Smart Luggage Tracker," use RFID tags to provide precise tracking and store data in a cloud server. Sensor-based solutions, like those using RGB and depth sensors, help detect misplaced or abandoned luggage in crowded areas by distinguishing between luggage and people. Additionally, IoT-based systems, like the "Luggage Tracking System Using IoT," use devices like Arduino boards and GPS modules to trigger alarms if luggage moves out of range, providing real-time location tracking. These systems offer various advantages, including enhanced security and convenience, but still face challenges such as range, battery life, and integration.

1V DISADVANTAGES

1. **Limited Range and Connectivity:** Many existing systems, especially those relying on GPS or RFID, are limited by range or require a continuous connection to function effectively.

2. **Battery Life Issues:** GPS-based tracking systems typically consume a significant amount of power, requiring frequent recharging or limited operational time.

3. **Complex Setup:** Systems using RFID or GPS often require intricate setup and maintenance processes, including scanning devices or frequent updates to the cloud. In contrast,

4. **Cost and Accessibility:** Advanced tracking systems, such as those using RFID or specialized sensors, can be expensive, limiting accessibility for many users.

5. **Lack of Real-Time Detection in Crowded Environments:** Many sensor-based systems struggle to track luggage accurately in crowded or dynamic environments, leading to false detections or missed items.

6. **Security Risks:** RFID and GSM systems, while secure, are susceptible to hacking or signal interception, posing potential risks to user privacy.

7. **External Device Dependence:** Existing systems, especially those that require RFID or GSM connectivity, often depend on external infrastructure, such as specialized scanning stations or mobile apps.

8. **No Automatic Location Updates:** Many tracking systems lack continuous location updates and only provide information when the item is within a specific range. This leads to gaps in tracking, especially if the item moves beyond the initial detection zone.

V BLOCK DIAGRAM

The **ESP32 Devkit V1** serves as the central processing unit, connecting and managing all components of the system. It communicates with the **DLI3000 UWB** via Universal Asynchronous Receiver Transmitter (UART) Protocol **(UART)**, where the Transmit **(TX)** pin of the UWB is connected to the Receive **(RX)** pin of the ESP32 and vice versa. This allows the ESP32 to receive location data from the UWB module. The **MPU6050 Accelerometer** is connected through **I2C**, with its **SDA** and **SCL** pins linked to the ESP32's corresponding pins. The accelerometer provides motion and orientation data, while the **PN532 NFC Module** also connects via **I2C** to enable NFC communication for user authentication or interaction with other devices. All components are powered by **LiPo Battery**, connected to the **Power Supply(3.3V)** and **Ground (GND)** pins of the ESP32. The **TP4056 LiPo Charger Module** manages battery charging, with the **B+ve** and **B-ve** pins connected to the Li-Po battery, and **OUT+** and **OUT-** pins connected to the Power Supply(**3.3V)** and Ground (**GND)** pins of the ESP32. This ensures the battery(bt) remains charged and ready to strat the system. Jumper cables are used to interconnect all components, which are mounted on a **breadboard** for easy prototyping and testing. The following Block Diagram shows the Device Connection's.

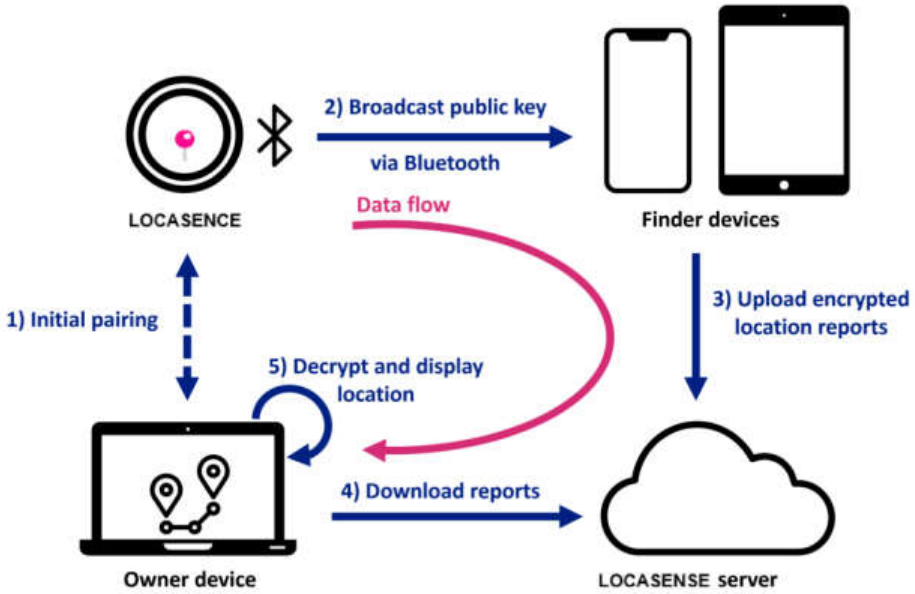

Fig.1: Basic Block Diagram of Locasense Intelligent Tracking with LEB

PROPOSED METHODOLOGY

The proposed system, **LocaSense**, is an innovative personal tracking solution aimed at helping users recover lost items efficiently. Utilizing low-energy **Bluetooth technology**, LocaSense provides a simple yet effective way to locate misplaced belongings. Each user pairs a compact LocaSense device with their account, generating a unique identifier. This device can be attached to personal items such as bags, keys, or phones, and in case of loss, the device broadcasts the user's ID when it detects nearby Bluetooth signals. Once another Bluetooth-enabled device connects, the item's location and user ID are sent to a central server, which then relays this data to the user's account, enabling real-time tracking. This Device is designed with a focus on ease to use, less power consumption, and continuous data transmission. The prototype demonstrates key features like device pairing, Bluetooth-based location detection, and server communication. By addressing challenges such as range limitations and security concerns, the system lays a foundation for future enhancements, such as improved location accuracy, enhanced security features, and integration with mapping services for better user experience.

VII ADVANTAGES

1. **Low Power Consumption**: LocaSense uses low-energy Bluetooth technology, making it highly energy-efficient and extending the battery life of the device, unlike many other tracking systems that consume significant power.
2. **Compact and Portable**: The system is designed with a small, lightweight device that can be easily attached to various personal items such as keys, bags, or phones, making it more practical and convenient than bulkier alternatives.
3. **Real-Time Location Tracking**: LocaSense provides real-time location updates when a Bluetooth-enabled device comes into range, ensuring quick recovery of lost items, unlike systems that rely on periodic updates or limited tracking.
4. **Bluetooth Connectivity**: Utilizing Bluetooth technology allows for widespread compatibility with most modern smartphones and other Bluetooth-enabled devices, providing broader accessibility and ease of use.
5. **User-Friendly Interface**: The system integrates seamlessly with the user’s account, offering an intuitive way to track lost belongings through a simple application interface, enhancing user experience.
6. **Scalable Solution**: The system is scalable and can easily be expanded to accommodate multiple devices or users, offering flexibility for both personal and larger-scale use cases, unlike more rigid systems.
7. **Low Cost**: Compared to alternatives that rely on expensive GPS modules or complex hardware, the Bluetooth-based approach makes LocaSense a more affordable solution for the average user.
8. **Enhanced Security**: Each device is paired with a unique user ID, ensuring that only the rightful owner can track the item. This adds an extra layer of Protection compared to systems with low robust authentication.
9. **Wide Compatibility**: Since the system works on Bluetooth, it can be integrated with a variety of existing devices, including smartphones, making it versatile and easy to adopt without requiring additional hardware.

VIII APPLICATION

1. **Lost Personal Items Recovery**: LocaSense can be used to recover lost items such as keys, wallets, bags, or even pets, offering a highly effective and easy-to-use solution for everyday personal belongings.
2. **Travel and Luggage Tracking**: While traveling, LocaSense can help travelers track their luggage, preventing loss or misplacement in airports, bus stations, or hotels, providing real-time location updates.
3. **Elderly or Child Monitoring**: LocaSense can be used to monitor the whereabouts of elderly family members or children who may wander or get lost, providing a way to keep track of their location for safety.
4. **Museum and Art Gallery Object Tracking**: LocaSense can be used in museums or galleries to track valuable exhibits or artworks, ensuring the items are securely placed and easily recoverable if moved or misplaced.
5. **Pet Tracking**: By attaching a LocaSense device to a pet's collar, pet owners can track their pets' location, making it easier to locate them if they wander off or get lost.
6. **Vehicle Monitoring**: The system can be attached to a vehicle for tracking purposes, allowing vehicle owners to monitor their car’s location and ensure its security from theft or unauthorized movement.
7. **Asset Protection in Workplaces**: In offices or warehouses, LocaSense can be used to track company-owned devices, ensuring that laptops, mobile phones, or sensitive equipment are safely accounted for, preventing loss or theft.
8. **Shipping Container Tracking**: The system can be used by shipping companies to track the location of shipping containers, ensuring that valuable goods are securely monitored throughout their journey, preventing theft or loss.

IX RESULT AND CONCLUSION

The **LocaSense** system has been successfully implemented as a prototype, demonstrating its potential as an effective personal tracking solution. The system was tested under various conditions, and its Bluetooth-based location tracking mechanism proved to be reliable in detecting nearby Bluetooth-enabled devices and providing accurate location information. The pairing process, ID generation, and Bluetooth communication were executed seamlessly, ensuring that the LocaSense device successfully transmitted the location data to the central server upon detection of a nearby device. The integration of components such as the ESP32, UWB module, accelerometer, and NFC module showed strong interoperability, confirming the system's ability to track personal belongings in real-time. Additionally, the low power consumption of the system ensured extended battery life, further enhancing its practicality for everyday use.

In conclusion, the **LocaSense** system presents a promising solution for personal item tracking, offering a simple yet efficient way to recover lost belongings. By leveraging Bluetooth technology, it enables real-time tracking with minimal power consumption and broad compatibility with Bluetooth-enabled devices. The system's prototype successfully demonstrated key functionalities, including device pairing, location detection, and data transmission, while addressing challenges such as range limitations and security concerns. Although still in the initial phase of development, LocaSense offers a foundation for future improvements, such as enhanced location accuracy, better security features, and integration with mapping services. The system has the potential to be a versatile tool, applicable across

various domains such as personal use, travel, logistics, and asset management, positioning it as a valuable and adaptable solution for modern-day tracking needs.

IX FUTURE SCOPE

The future scope of the **LocaSense** system is vast, with several areas for enhancement and expansion. One key improvement will be **enhanced location accuracy**, incorporating additional technologies such as **GPS** or **RFID** to improve the precision of tracking, especially in large or complex environments. **Security features** will also be a priority, including **encryption** and **multi-factor authentication** to protect sensitive data and prevent unauthorized access. Another avenue for development is the **integration with mapping services** like Google Maps or custom navigation platforms, allowing users to visualize the exact location of their lost belongings on a map. Expanding the system's **range capabilities** through advanced Bluetooth protocols or alternative location-tracking technologies could broaden its application for larger areas. Additionally, **cloud storage integration** would allow for better data management and historical tracking of items. Finally, future versions of LocaSense could be tailored for specific industries, such as **healthcare**, **logistics**, and **security**, to meet their unique tracking needs. Moreover, the system could also support **mobile app development** for real-time notifications, enabling users to be alerted immediately when their belongings are found or located.

X REFERENCES

1. Swedberg, C. Reusable Electronic Baggage Tag Powered by RFID. Available.online: **http://www.rfidjournal.com/articles/view?7928/** (accessed on 10 April 2014).
2. Medeiros, C.R.; Costa, J.R.; Fernandes, C.A. Passive UHF-RFID tag for airport suitcase tracking. IEEE Antennas Wirel. Propag. Lett. **2011**, 10, 123–126. [**Google Scholar**] [**CrossRef**]
3. Gupta, V.; Kumar, R.; Mishra, R.G.; Semwal, A.; Siwach, S. Design and optimization of luggage tracking system on airport. [**Google Scholar**]
4. Berrada, A.; Salih-Alj, Y. An Efficient RFID-Based Tracking System for Airport-Luggage.-Available/-online: **http://elvedit.com/journals/IJACSIT/wp-content/uploads/2015/11/IJACSIT-Paper-Format.pdf** (assessed on 10 December 2016).
5. Peterson,B.S.Available-online: **http://www.cntraveler.com/travel-tips/flying/2012/07/airlines-baggage-luggage-checked-fees-missing-bags** (accessed on 10 April 2014).
6. Mohammed Ghazal, Samir Ali, FasilaHaneefa, Ahmed Sweleh, “Towards smart wearable real-time airport luggage tracking”, 2016 International Conference on Industrial Informatics and Computer Systems