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Theoretical Study on Smart Tracking System

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ABSTRACT

An application based on the Internet of Things will be created that can locate the location of your bag or vehicle in real-time and show that location on a Google Map. On a web portal that is deployed on the cloud platform (Microsoft Azure/AWS), the end-user will be able to see the real-time position of his or her lost or stolen bag or stolen vehicle. We have also developed an Android-based app that will show the same real-time position of bag or vehicle on their smartphone, making it simple to use.

I. INTRRODUCTION

We are developing a real-time GPS tracking system to address the issue of lost or stolen belongings, such as bags or vehicles. Our system utilizes a GSM module to upload data to an open-source cloud via GPRS and a GPS module to determine the precise location. The information is then sent to Google Maps using cloud API services and displayed on our app or web portal. With our tracker placed in the user's bag or car, the location can be accurately determined and viewed through our tracking platform. Additionally, our app/web portal includes a direction feature, providing the shortest route to the lost or stolen item. Our research extends beyond vehicles and baggage and can be applied to various scenarios, including locating lost pets or young children.

II. OBJECTIVES

Objective A: Gathering the Real Time Tracking System's components.
Objective B: Building the device is goal.
Objective C: Writing business logic using the Arduino IDE is goal.
Objective D: Creation of an Android application and a web portal.
Objective E: Testing the Device.
Objective F: Deploying of Web Portal on Microsoft Azure/AWS

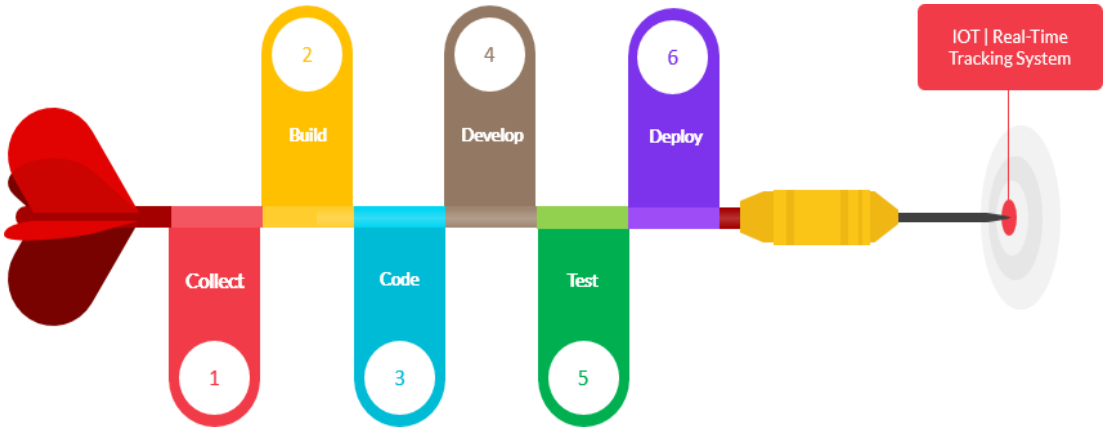

Fig 1. Methodology to build the System.

III. LITERATURE SURVEY/BACKGROUND

Real-time GPS tracking systems for prosecution of lost or stolen goods has been the subject of intense interest and research made possible by Internet of Things (IoT) technology and the integration of GPS, GSM and cloud computing has been pursuing sophisticated solutions.

1. Developing GPS tracking systems:

The development of GPS tracking devices begins with the development of GPS technology by the United States Department of Defense. Originally used for the military, GPS technology has since been adapted for civilian applications, including vehicle tracking, asset management and personal device tracking Advances in GPS technology have over the years has increased the accuracy, reliability and efficiency of GPS tracking devices It will become more accessible and affordable for consumers.

2. Connecting GPS to GSM and GPRS:

The integration of GPS technology into GSM and GPRS modules has changed the landscape of real-time route tracking. GSM (Global System for Mobile Communications) enables communication between devices using cellular networks, while GPRS (General Packet Radio Service) facilitates data transmission over mobile networks GPS, GSM and GPRS technologies the integration enables GPS tracking devices to transmit location information to remote servers and cloud platforms Users can track the location of their assets in real time.

3. Using cloud platforms:

Cloud computing platforms such as Microsoft Azure and AWS provide a scalable and reliable infrastructure for storing, processing and analyzing large amounts of data generated by GPS tracking devices Leverage cloud services to store, real-time analysis, visualize historical tracking data from GPS tracking systems , for more efficient and capable with third-party services such as Google Maps Cloud platforms also offer features such as security, scalability and accessibility, making them ideal for GPS tracking solutions that they will be used.

4. Google Maps API integration:

The Google Maps API gives developers access to a wide range of mapping services, including geocoding, routing, and real-time location tracking. When integrated with the Google Maps API, it allows the GPS tracking system to visualize the real-time location of tracking assets on interactive maps, allowing users to track their belongings from device any online Additionally, the Google Maps API supports Street View, It provides features such as satellite imagery and traffic information, enhancing the user experience of GPS tracking applications.

5. Activity beyond vehicles and equipment:

Although GPS tracking systems are typically associated with vehicles and objects, their application extends to a variety of situations including asset tracking, personal tracking, and fleet management GPS tracking devices in various locations, e.g. logistics. Transportation, healthcare, and agriculture, can be used to track asset location and position in real-time the versatility of GPS tracking technology enables flexibility across applications, providing solutions for the needs it consumes tracking and trailing across industries and domains.

IV. METHODOLOGY

The accomplishment of these six goals is necessary for the development of a real-time tracking system. which enables us to locate a bag or vehicle in real- time and display its location on a Google Map.

On a web portal that will be deployed on the cloud pl at form (Microsoft Azure/AWS), the end-user will be able to see the real-time location of his or her bag or vehicle. We will also develop an Android app that will show the same real-time location on their smart phone, making it simple to use.

1. Collecting the components for Real- Time Tracking System:

Hardware modules and sensors are necessary for the development of a real-time tracking system in order to obtain the current position. We will be requiring Arduino Uno Board (either 3.3V or 5V), GPS Module Sim 28M, GSM Module Sim 900A, Battery (12V | 1A), Power Bank, Antenna, GPS Receiver, Jumper Wires, Thing Speak API's and Microsoft Azure/AWS subscription. Therefore, gathering or purchasing these parts or subscriptions must come first before moving on to the next stage.

2. Building the Device:

In order to track the device's location in real-time and use it for analytics, mapping, or directions, we will put the device inside a bag or car. We will track the bag or car using Thing Speak Cloud Apis. We will be using a GPS module to get the precise location of the bag or car. The latitude and longitude coordinates will be sent via GPRS to the Thing Speak channel using the

GSM module. Jumper wires will be used to connect each component to the others.

Writing Business Logic using Arduino Software (IDE):
Writing the code or business logic (using Arduino programming) for the device using GPS will provide us with the precise position of the travel bag or vehicle, and GSM will send it over GPRS to the Thing Speak server. To communicate with the GPS and GSM module, we will upload the code to the Arduino Uno.

3. Using API:
In order to show the location on a map and the quickest route to the stolen/lost travel bag or stolen vehicle, we will be using Google Map APIs and Google Map Direction Services.

4. Development of Web Portal & An Android Application:
We will create a web portal with two frames, one of which will use Google Map APIs to display the current location of any stolen or lost luggage or vehicles. A nother frame will display the Google Direction Services' route to the bag or vehicle. We will use H TML, CSS, JavaScript, PHP, and Python to code the web portal.
We will also create an Android application with the same functionality as the web portal application to go along with it.
For user convenience, we will release the Android ap plication on the Google Play Market.

5. Testing the Device:
We will test the Real-Time Tracking System after it has been developed. We will subject the device to a variety of tests to deter mine how effective, reliable, and accurate it is.

6. Deployment of Web Portal on Microsoft Azure/AWS:
The real time Tracking System will be tested before the web portal is deployed on a cloud platform, which may be Amazon Web Service or Microsoft Azure App Service.
By moving our web portal application to cloud computing, which offers a pay-per-use business model, it will cost us much less and be simple to use.

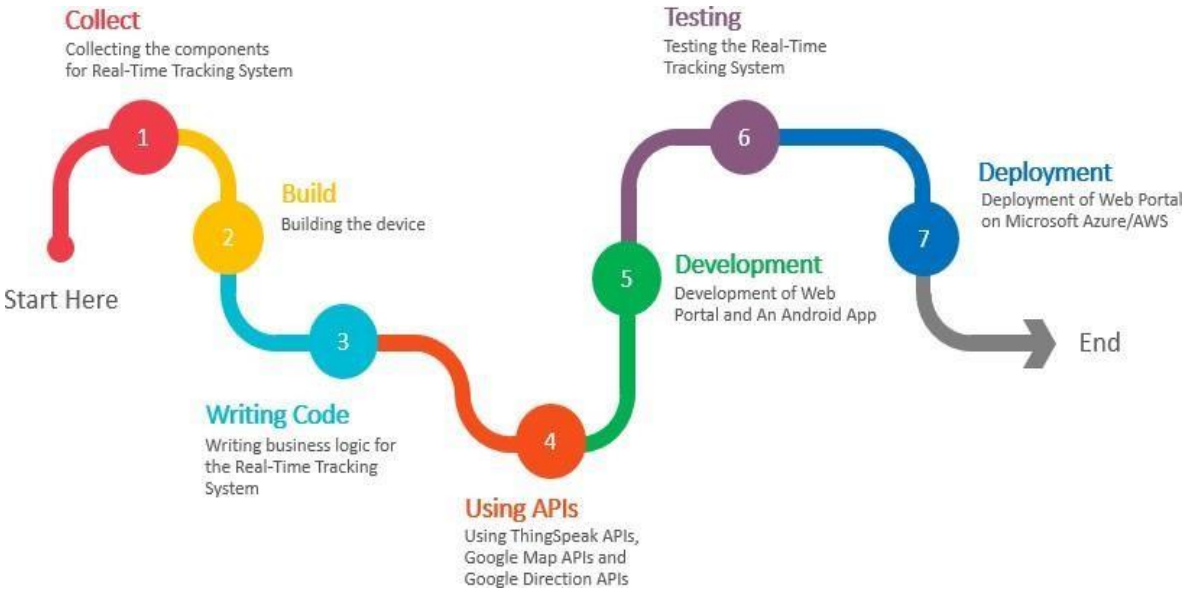

Fig 2. Flow of Development

V. IMPLEMENTATION LEVELS

- Hardware module and sensors are necessary for the Real Time Tracking System's development in order to obtain the real-time position.
  We need the following components: an Arduino Uno board (3.3V or 5V), a battery (12V | 2A), a power bank, an antenna, jumper wires, the Thing Speak APIs, and a Microsoft Azure/AWS subscription. Thus, the first step is to assemble/purchase

these elements/subscriptions, then move on to the next phase.

- We must write the code or business logic (using Arduino programming) for the device using GPS, which will give us the precise position of the bag or vehicle, and GSM will send it over GPRS to the Thing Speak server in order to obtain the current location of a travel bag or vehicle. To communicate with the GPS and G SM module, we will upload the code to the Arduino Uno. We can show the location on a map and the quickest route to get to a stolen/lost travel bag or stolen vehicle by using Google Map APIs and Google Map Di rection Services.

- We will create an Android application and a web portal with two frames, one of which will use Google Map.

- To track the device's location in real-time and use it for analytics, mapping, or directions, we will put the device in a bag or a car. We will track the bag or car using Thing Speak Cloud APIs.
  We will be using a GPS module to get the precise locate on of the bag or car. The latitude and longitude coordinates will be sent via GPRS to the Thing Speak channel using the GSM module. Map APIs to display the current location of a stolen or lost travel bag or stolen vehicle. Another frame will display the Google Direction Service's shortest route to the bag or vehicle.
- We tested the Real-Time Tracking System after it was developed. We have given the device various test cases that let us know how much our gadget is reliable, dependable, and accurate.
  After that, we will run the service on a virtual machine before deploying the web portal on Microsoft Azure or Amazon Web Service.

VI. HARDWARE USED

- Arduino Uno
- GSM SIM 900A
- GPS SIM 28M & GPS Receiver
- Real-Time Tracking System Using GPS

VII. RESULT AND DISCUSSION

Real-time tracking efficiency and accuracy: The developed smart tracking system proved to be more efficient and accurate in detecting lost or stolen items such as bags or cars. Combining GPS, GSM and cloud computing technologies, the system provided real-time tracking capabilities, enabling users to quickly and accurately locate their belongings The strength of the system was reflected in location data access to cloud sessions and simple Android app and web browsers

User experience and usefulness: Feedback from users and usability testing showed positive feedback about the Android app and web browser interface. The intuitive design and functionality of both platforms enhanced the overall user experience, making it simple and easy for individuals to track their products in real time Using features such as Google Maps integration will show the location and guidance function further enhanced the effectiveness of the system

Scalability and adaptability: The smart tracking system demonstrated scalability and adaptability, with potential applications extending beyond cars and bags. Its modular design allowed flexibility for other integration activities, such as tracking lost pets or young children. In addition, the use of cloud computing platforms such as Microsoft Azure or AWS provided the scalability to process large amounts of data and accommodate future expansions or improvements to the tracking system

Security and reliability: Security measures in the system ensured that sensitive location information transferred from tracking devices to cloud servers was protected Encryption protocols and authentication mechanisms guaranteed data integrity protect and prevent unauthorized access. Furthermore, the reliability of the system was confirmed through rigorous testing, which confirmed its consistent performance under various conditions.

VIII. FUTURE WORK

It would likely be a novel idea to incorporate an accelerometer into the Real-Time Tracking System in the Airline Travel Sector so that it could detect when an airplane accelerates or decelerates and use that information to automatically stop and resume reporting its position. This will enable the GSM SIM 900A device to be turned off and the Arduino Uno to be put to sleep, making the
Real Time Tracking System an even more energy-efficient solution. Another feature that can be added is the ability to further reduce the size and bulk of our device. So that our tracking device can be carried easily in any small objects, such as handbags, pet belts, etc.
When that happens, it will no longer be restricted to the travel industry and could be used anywhere there is a need to find

something. The Real- Time Tracking System will become even more reliable, adaptable, and precise as a result.

IX. CONCLUSION

This work is necessary because there has never been a system or tool that can track a lost or stolen bag or a stolen vehicle. In the event that someone's bag or vehicle were stolen, and they were unable to locate the m due to the lack of a system to track them, they would have to rely on civilian police to locate their belongings. Finding the bag or vehicle was also challenging for civilian police. By conducting this research, we have gained knowledge about how to develop an IoT-based application for the travel industry that will enable users to locate stolen cars and lost or stolen bags.

This research will make a significant contribution to the world and the Internet of Things community, enabling future researchers to build even more secure, effective, and robust modules and devices that will greatly benefit consumers.

Having our research or device installed in their bag or vehicle will be a nightmare for bag or vehicle thieves. Because having the device installed enables users to locate their stolen car, lost bag, or both using an Android app and a web port al.

We can learn how to use an open-source Internet of Things platform to maintain the latitude and longitude coordinates of a lost or stolen bag or stolen vehicle by conducting this research. A widely used public cloud computing platform is Microsoft Azure. It offers a range of cloud computing solutions, including computing, data analytics, storage resources, and network resources. A technology known as cloud computing allow s clients to request computing resources on demand. This web application will be accessible 24/7.

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