

Design and Implementation of Baggage Tracking System Using Arduino Uno

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Abstract

Missing baggage, luggage theft, and damage to traveller's belongings are persistent challenges in the aviation and transportation industries worldwide. In response, an IoT-based baggage tracking system has been designed and implemented to address these issues. The system integrates a GSM/GPS module for continuous connectivity and an Arduino microcontroller for data processing. It enables real-time tracking of luggage location on a map, facilitated by the GPS (Global positioning system) module retrieving coordinates and sending them to the microcontroller. The processed information is then transmitted via SMS (short message service) through the GSM (Global system for mobile communication) module, allowing passengers to monitor their baggage's whereabouts remotely. Implementation of this system promises to alleviate stress for both passengers and the aviation industry by reducing incidents of lost, misplaced, or stolen luggage.

Keywords: Baggage Tracking, IoT, Arduino Uno, Map, GSM/GPS Module

1. Introduction

The Internet of Things (IoT) has revolutionized connectivity by enabling the networking of physical objects equipped with embedded electronics to communicate and interact with their environment. IoT applications span various sectors, from smart homes to health management and smart cities, enhancing efficiency and convenience. This project focuses on leveraging IoT technology to develop a smart, connected device for tracking missing baggage, addressing the persistent challenge of luggage mishandling, theft in the travel sector. Luggage loss or theft is a major problem, it leads to more damage to the travellers, not only lost their baggage but also their mental strength will be upset, and time will be wasted.

The fact that every year more than 1.7 travellers are registered in cases of baggage lost. In the airline industry most of the baggage is mishandled and lost while transporting to their destinations, about 30 million passengers and 35 million bags have not been reached to their respective destinations. The travellers who lost their bags will be getting their bags after several days through tracing and identifying at highly paid. Even though I don't know after recovering the bags the things in the bag will be as before, it may be stolen.

To solve this problem, we are going to implement a project that will help to trace the bags immediately when it is lost by using the smart baggage trackers through IOT technology which will be already inserted in the bag that will send the bag location like their coordinates to user will identify in google maps as the real time data.

2. Background

The rate of loss of bags will be reduced in some rate but not fully so, it's an important thing that tracing systems will be implemented so that bags will be traced and respond accordingly in that saturation. The development of intelligent baggage tracking systems, utilizing technologies such as RFID and IoT, has shown promise in mitigating these issues. IoT, with its ability to connect devices globally, offers a solution to improve baggage management and reduce mishandling incidents.

3. Literature Review

The evolution of IoT has contributed to the development of smart systems across various domains like medical, education, household accessories, industries including baggage tracking in the aviation industry. In the aviation industries the baggage management is a major task to the management to send the correct baggage to the correct destination, if any misleading will be happening the baggage may be in wrong destinations will create a big problem and returning the bags will again be cost effective and time waste to the passengers.

One of the solutions will be RFID technology. It has been extensively used in baggage tracking systems. However, RFID-based systems have limitations, which IoT integration aims to address, enhancing efficiency, flexibility, and communication capabilities. Communication between the real world and the virtual world is an important thing that will be possible by smart IOT technology. Through this a lot of information will be shared to different sectors according to the use.

3.1 Internet of things (IoT)

Internet of things technology is a gift to the humans to execute their works in an easy manner. The IoT will provide safe and easy communication between the devices and the applications. By using these IoT technologies everything will be connected and controlled by human beings through a central network on the internet.

We are going to access real-world data communication through different IoT components like gadgets, sensor devices, computer units, communication networks and processing units that will change the real-world data into virtual data. The data which will be collected by the sensors will be managed in the Arduino uno board with the help of the processor unit through a set of instructions and the logical codes which are inserted into the memory.

3.2 The Problem

Some general possibilities of baggage lost or mishandled in the airports while managing the luggage are, the baggage's left in the origin, wrong flight packaging and a wrong destination will be dispatching.

The loss or mishandling of luggage poses significant challenges in the aviation and transportation sectors, leading to passenger dissatisfaction and financial losses. This project aims to address these challenges by providing passengers with real-time luggage tracking capabilities, thereby preventing loss, theft, or mishandling of baggage.

4. System Description

The smart baggage tracker system will be installed by some devices like Arduino Uno board, GSM/GPS modules will be powered by a power source unit, and User interface. After the completion of initialising the GPS/GSM modules are ready to send and receive the commands from the user through the internet. The GSM module will be sent the location details of the baggage to the user when a correct command receives from the user through a SMS and then GPS module will be send the location

coordinates to the Microprocessor for processing the data, then data will be send to the GSM module and GSM module will be responsible for transferring the real time location data to the User interface(mobile phone) in the form of short messaging service and then the user may be asses the data and knows the actual location of the bag. The process is shown in the below figure. 1:

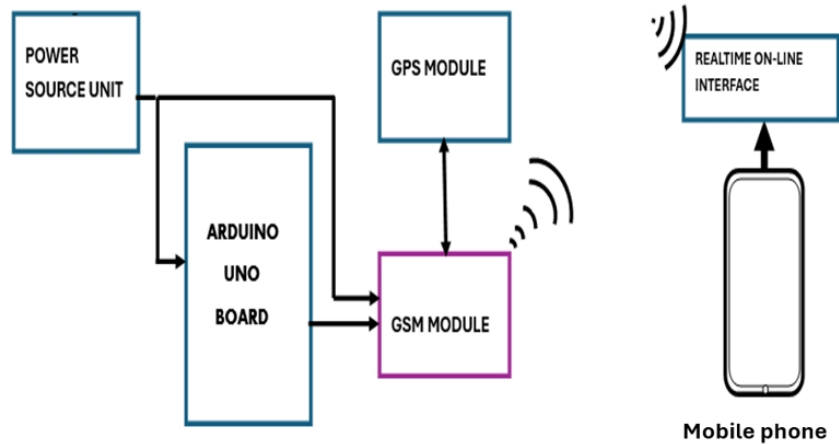


Fig (1): System Process

5. Circuit Design and Simulation

We are going to integrate the smart baggage tracker into the bags. It is a good idea to protect them from theft. The baggage trackers are needed to operate continuously without any power interruption so we are going to install a battery of 9V which will be powered by all devices in the circuit. The Arduino Uno board which is the heart of the whole device will need 5V so its pins Vin and GND are connected to the battery terminals.

There is a LM2596 regulator that is used to supply suitable voltages to the GSM/GPS Module from the battery voltages. The SIM800L GPRS GSM module is used to transmit and receive the data from the user interface for that it has a slot for holding a sim card. The output voltage 3.7v terminals of regulator are connected to the GSM module pins Vcc and GND and the remaining pins (TXD and RXD) are connected to the Arduino Uno pins (9 and 8) and the NEO-6M GPS Module is used to get the location coordinates of the bag. The NEO-6M GPS module Vcc pin is connected to the regulator output 3.7v +ve terminal and TX, RX, GND pins are connected to the Arduino Uno pins 11, 10, GND respectively. The circuit diagram will be shown below figure. 2:

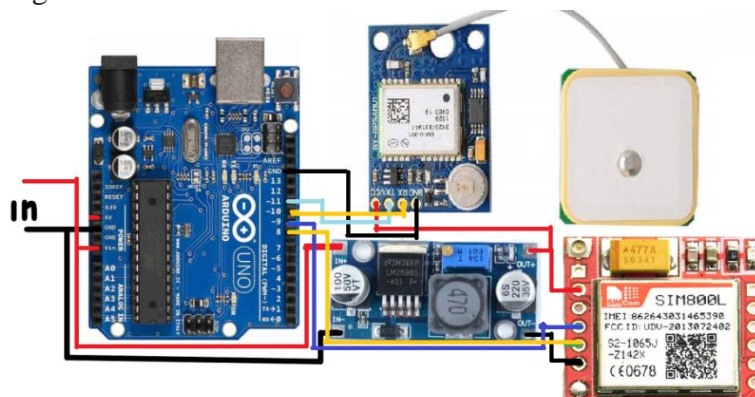


Fig (2): Smart Baggage Tracker Circuit Diagram

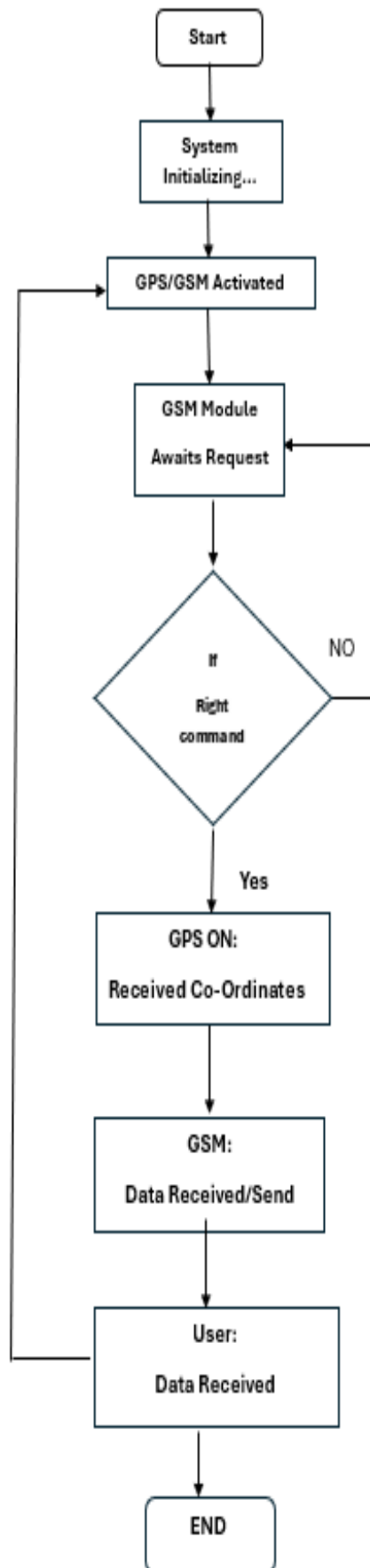


Fig (3): Flow chart

The simulation works were carried out after proper connections of the circuit in the proteus 8 software. During the simulation we observed that the GPS module shows the location coordinates of the bag and then virtual map will be displayed in Google maps shown below in figure.6:

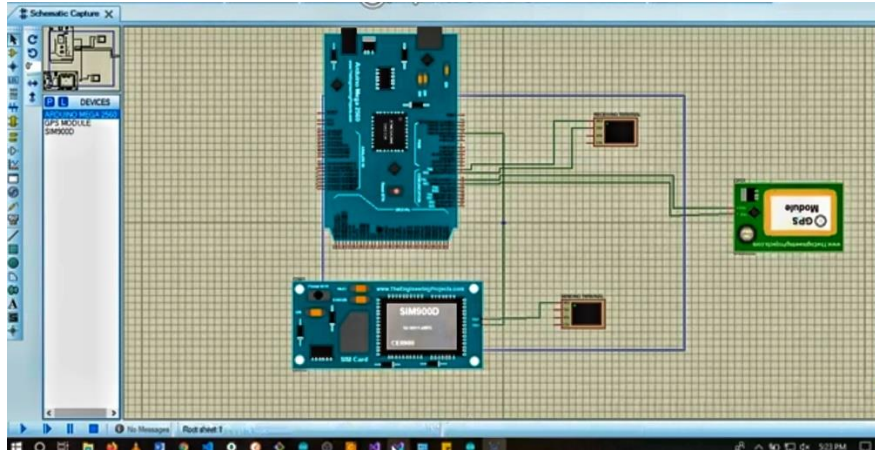


Fig (4): Smart baggage tracker simulation diagram

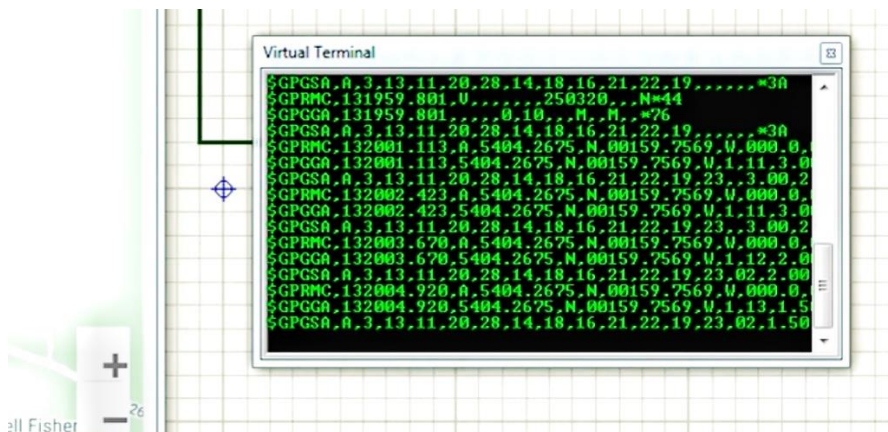


Fig (5): GPS location generated results during simulation

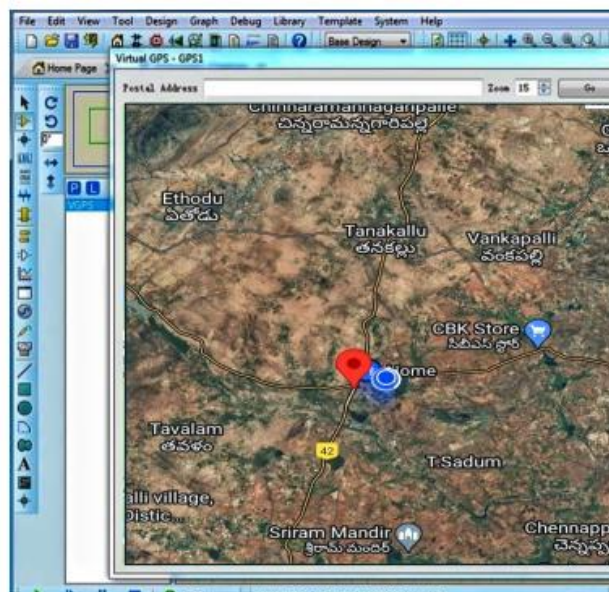


Fig (6): GPS location during simulation

6. Results and Discussion

The smart baggage tracker system is constructed successfully, and we get the accurate outputs that we are observed on the google maps in our mobile phone. After turning on the circuit switch the GPS/GSM modules are being initialized by the Arduino Uno.

There is a small LED light on the GSM module was blinks when we on the circuit switch that shows that the circuit is functioned.

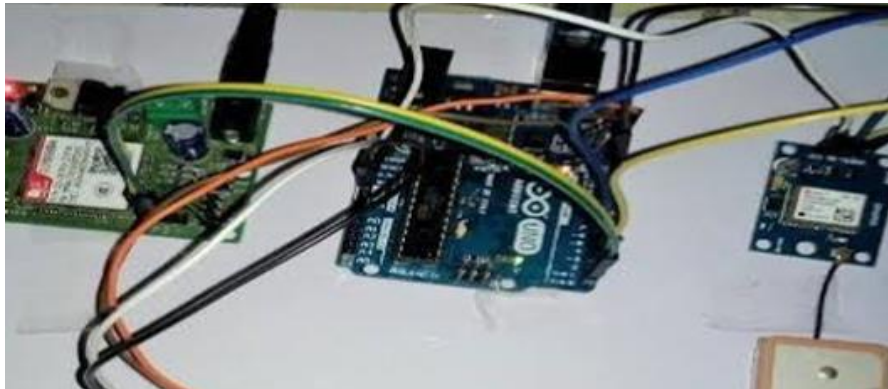


Fig (7): Smart baggage tracker during testing

The system is ready to receive an instruction from the user in the form of SMS, the message will be received by the GSM module to Arduino, after this Arduino sends the instructions to GPS module and the GPS module will send the location of the baggage to the Microcontroller.

The Microcontroller will process the data and sends to the GSM module that will send the information to the User Mobile phone number as a message which will contains the location links can be accessed by the google maps will be observed in the figure.8:

The current location of the bag is displayed on the google maps will be shown in the figure.9:



Fig (8): GSM module sent baggage location link to User through SMS

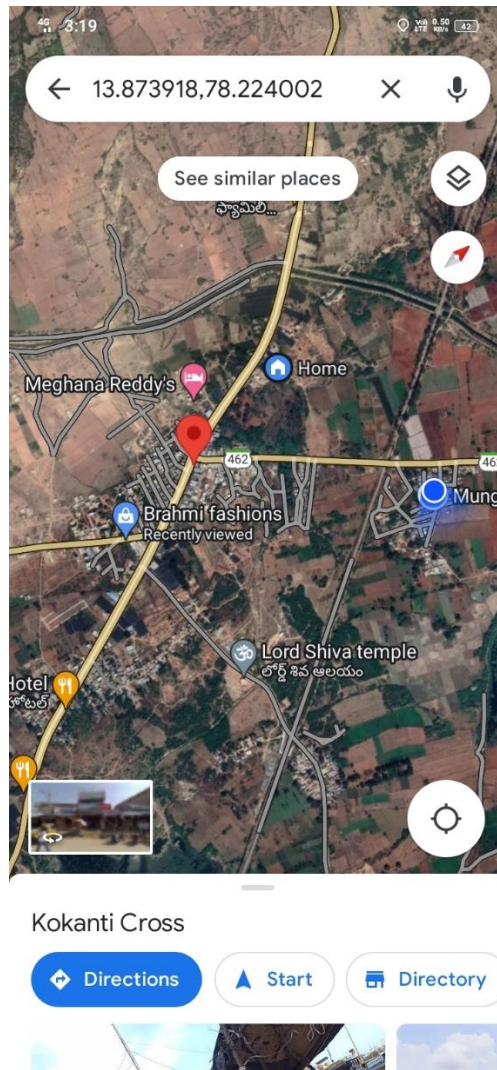


Fig (9): Bag and user's location shown on the google maps.

7. Conclusion

The implementation of an IoT-based luggage tracking system offers a promising solution to the persistent challenges faced by the aviation and transportation industries. By leveraging GSM/GPS modules and Arduino microcontrollers, the system enables real-time tracking of baggage, providing passengers with peace of mind and reducing stress for both travellers and industry stakeholders. Strategic deployment of this system at airports can significantly improve baggage management efficiency and enhance the overall travel experience.

In conclusion, the IoT-based baggage tracking system represents a significant advancement in addressing the longstanding issues of luggage mishandling, loss, and theft in the travel sector. With continuous technological innovation and implementation, such systems hold the potential to revolutionize baggage management practices and improve the overall travel experience for passengers worldwide.

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