IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 5, May 2020

IOT Based Luggage Security System

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Abstract: The luggage tracking system is designed to track the luggage and bags which get lost or theft from the public and other areas. The luggage tracking system works on a buzzer basis where a buzzer is set up with the Arduino, GSM module and a GPS module. Also, the buzzer is turned on as soon as the bag is theft and goes outside a particular range. Furthermore, the flash message of device location is generated by which we can track the location of the bag through the Google map. In this, the IOT components are being used like a GSM module and a GPS module to track the bag and a frontend or mobile application is created to monitor.

Keywords: GSM module, GPS Module, Luggage tracking, map, IOT, Arduino Board, Bluetooth

I. INTRODUCTION

Loss of luggage can happen with anyone irrespective of the circumstances and conditions. Luggage and bags with important documents or precious things can be lost or theft with which people can lose their important material. Generally, it is seen that people get robbed in public areas like railway stations, bus stands, and other public and private areas. Also, people can even forget their luggage and bags which can have important and necessary things. Thus it becomes very necessary to track down the bags in case of loss and theft. The Internet of Things (IOT) is a network of objects like buildings, vehicles, etc which are embedded with sensors, electronics, and other network-related things that help these objects to collect and exchange information. IOT allows the objects to be sensed and controlled from a remote access point, which does the integration of computers with the physical world which improves financial benefit, accuracy and efficiency.

In the proposed system, a luggage security system is designed to track the bags which are lost. The proposed system uses the technique of Internet of Things in order to track the bags. In this hardware is mounted inside the bag which would be having the basic arduino board with a GPS module and an buzzer being connected to it. A map has been created which would be synchronized in order to track the location of the bag. Furthermore, the map has the features that as soon as the bag gets lost or theft and it moves away from the owner and goes out of a particular range, the buzzer would start ringing so that the owner gets notified where exactly the bag is. Also it would help the owner to track down the location of the bag which could be seen on the map as the markers would be dropped which gives us the location of the bag as it moves away from the owner. Moreover, the owner would also be notified with the flag messages when the bag moves out of a particular range like 10m, 20m and30m.

II. LITERATURE REVIEW

In recent years not much has been done in order to track the lost bags, instead video monitoring is a way through which the areas are monitored by human beings and the suspicious bags or robbed activities are monitored. Also some of the bag monitoring techniques has been implemented in order to check the things which are present inside the bag so that they don't pose a threat to the security. To fulfill the objectives of our project work we have reviewed the following research papers majorly being related to the technology which we have used in our project work " IOT Based Luggage Security System" apart from books and websites.

- **Wireless Voice Transmission using Wi-Fi and Bluetooth on Android Platform[1] :** In this paper a Smartphone-based hearing assistive system is discussed to facilitate speech recognition for various target users,

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who could benefit from enhanced listening clarity in the classroom. The system consists of transmitter and receiver devices (e.g., smart phones and Bluetooth headset) for voice transmission and an Android mobile application that controls and connects the different devices via Bluetooth or Wi-Fi technology**.**

- **A Modern Study of Bluetooth Wireless Technology [3] :** A Bluetooth ad hoc network can be formed by interconnecting piconets into scattering nets. The constraints and properties of Bluetooth scatter nets present special challenges in forming an ad hoc network efficiently. Bluetooth is a networking technology aimed at low-powered, short-range applications. It was initially developed by Ericsson, but is governed as an open specification by the Bluetooth Special Interest Group Bluetooth is a recently proposed standard for short-range, low power wireless communication.
- **IEEE Antennas and Propagation Magazine[4] :** This paper presents a homogeneous survey of relevant methodologies for the design of UHF passive tag antennas. Radio-frequency identification technology, based on the reader/tag paradigm, is quickly permeating several aspects of everyday life. The electromagnetic research mainly concerns the design of tag antennas having high efficiency and small size, and suited to complex impedance matching to the embedded electronics.

III. SYSTEM ARCHITECTURES

In the proposed system there are two major gadgets first is powered communication beacon with a location device which is kept inside the luggage or bag and the second one is the phone. An android app is developed to perform the detection task. This app is always connected with the device and device always communicates it with a data pulse. If anyone moves the bag/luggage a little bit i.e. the phone or the luggage goes away from each other out of a specified distance then the communication link breaks and the alarms (in both device and phone) start ringing. The system uses Arduino Mega, which is a microcontroller board, as the main control unit. The control unit will integrate all the modules used in the system and depending on the information being received by different modules it controls them. The system architectures of powered communication beacon is shown in Fig.1, which includes the following modules:

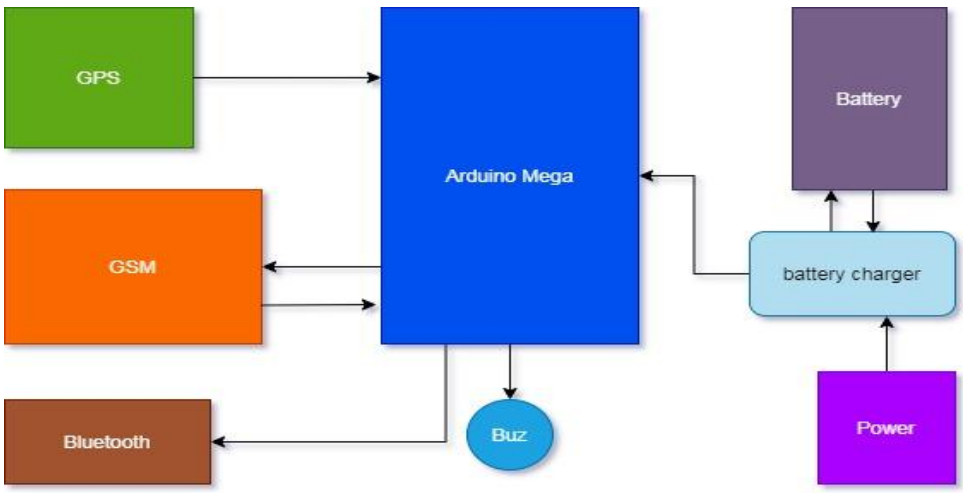

Fig.1. System architectures of powered communication beacon

- GPS is known as the Global Positioning System used to trace the location of luggage. A GPS framework computes its position by accurately timing the signal sent by GPS satellites high over the Earth.GPS Receiver gets the location information from satellites. It consists of internal RTC back up and can be directly connected to USART of the microcontroller. The current date, time, longitude, altitude, speed, and travel direction/ heading among other data are provided by the module.
- GSM is known as Global System for Mobile Communication and is used for communication purposes. GSM module is used here for receiving calls and for sending confirmation messages. It is used for transmitting mobile voice and data services. It contains everything needed to support the microcontroller.

IJARCCE
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- A HC-05 module of Bluetooth is used in the proposed system design which is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with a complete 2.4GHz radio transceiver and baseband.
- A CE8301 Series for battery charger is being used in the system which is a CMOS PFM-control step-up switching DC/DC converter that mainly consists of a reference voltage source, an oscillator, and a comparator. The PFM controller allows the duty ratio to be automatically switched according to the load (light load: 50%, high output current: 75%), enabling products with a low ripple over a wide range, high efficiency, and high output current.
- The lithium battery is a protection module for 3 serial-cell lithium-ion / lithium polymer rechargeable batteries and includes a high-accuracy voltage detector and delay circuit. Automatically cancel protection after fault conditions removed. It have inbuilt protection function of overcharge, over-discharge, short circuit, and over-current protection. Suitable for a lithium battery pack of 11.1V, 12V & 12.6V. Low voltage operation: Startup at 0.9 Vmin. (I_{OUT} = 1 mA).
- The Arduino Mega 2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.
- The buzzer had internal drive circuit with sealed structure.

IV. SYSTEM WORKING

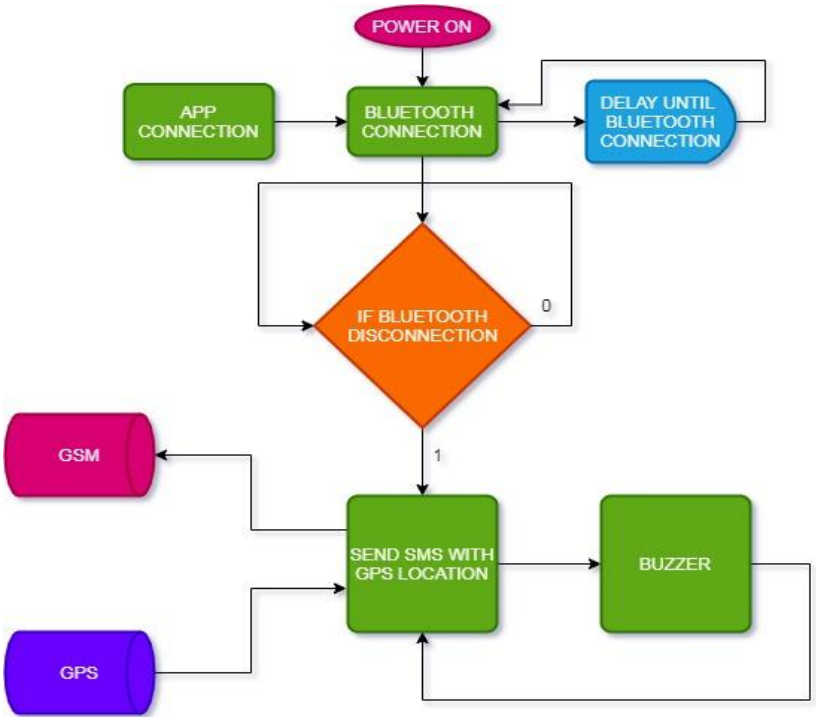

Fig. 2. Flow diagram of the proposed system

In the proposed system a bag/luggage security system is designed in order to track the bags which are lost. In this, the bag/luggage would contain the hardware of the tracking system or the tracking device through which we would be able to track the bag is mounted inside the bag/luggage. A buzzer is connected to the device which would ring whenever the bags get away from the close proximity with the owner or out of a particular range. For this purpose a map is being created using Google geo location application, in which the area has been set and predefined through which we can track the bag once it gets away from the owner.

IJARCCE

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Apart from the hardware placed inside the bag/luggage, an android app named as " SAFEBAG" is also developed to establish connection between the hardware and the user mobile via Bluetooth. During the close proximity of the user and the bag/luggage the RED LED will be blinking fast (say at a rate of every second). And the system starts beeping it means our device is fully connected, to show the connectivity one LED in the device is always ON once the connection is made by the app. Further working is divided into two modes i.e. Alert mode & Buzzer mode

- **Alert mode:** In alert mode, the device (mounted inside the bag) takes coordinate from GPS and gsm it sends a message on our mobile or on that phone no. which one is register in Arduino and buzzer is on continuously. This all situation in also done when the device goes 30 meters away to the owner mobile or device disconnect accidentally
- **Buzzer mode:** The buzzer mode is basically for the testing purpose that the device is connected or not.

Advantages of having :

- **Buzzer i.e. Alarm :** This would be useful as a notification when it rings in order to notify that the bag has by passed a particular range from the owner.

- **Map :** The map would be synchronized in a way that it gives us the location of the bag and would also notify the owner through message flags which would help the owner to identify what is the distance between the owner and the luggage bag. This can be achieved my dropping the markers as the bag moves away from the owner which would also give us a route of where the bag is moving.

V. ANDROID APP - " SAFEBAG "

In the proposed work an android app named as " SAFEBAG" is also developed and with the help of this app in the user mobile, precious luggage is like in his pocket like a mobile phone. Following steps has to be followed to use SAFEBAG app.

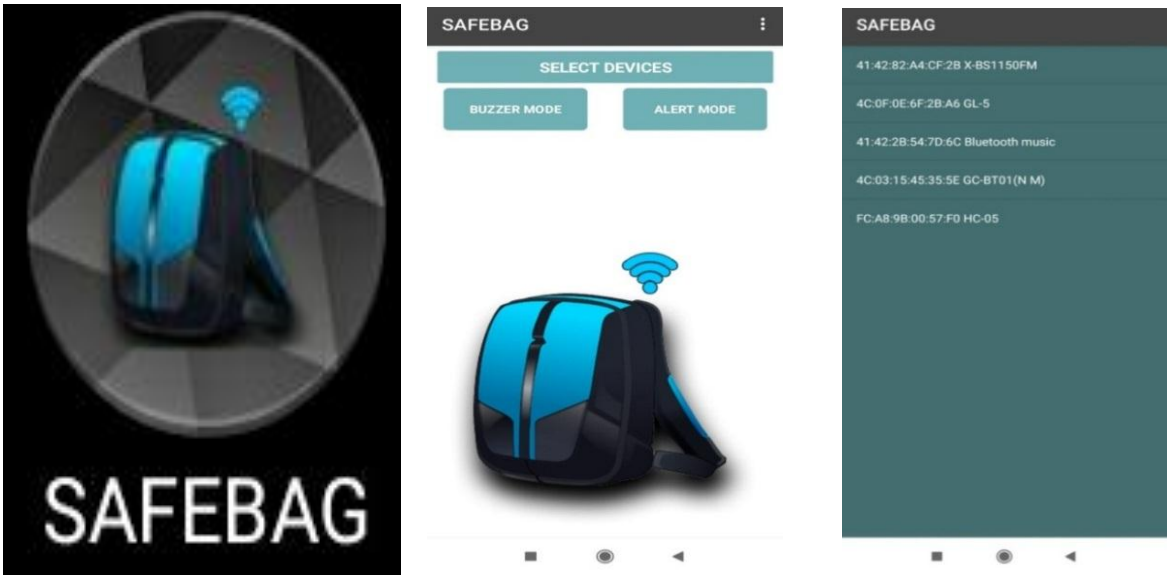

Fig.3. Connection of device with the app SAFEBAG

- First, to connect the device we have to open the app then click on" select device" then we select "HC-05" as shown in Fig.3. The system, in the beginning, takes around 1 minute to set GPS in a working condition and read out all the units which are connected with it. As the GPS comes in working condition the LED turn on for showing the connection between device and app.

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➢ If somehow the luggage gets stolen, the device takes coordinate from GPS and GSM and sends a message on our mobile or on that phone number being register in Arduino simultaneously buzzer becomes continuously on.

➢ To know the exact location of the device on Google map owner has to click on the Google map link which is available in the message. The exact location of the vehicle will be displayed on mobile as shown in the second picture of Fig.5.

VI. RESULT & OBSERVATIONS

As people travel, there is always a risk of theft of their luggage and bags, here the proposed system in this article come very handy and give peace of mind. Following are the outcomes of our project work :

- ❖ The buzzer is turned on as soon as the bag/luggage is theft and goes outside a particular range.
- ❖ The buzzer would help the owner to identify from where the sound is coming and it would become easy for the owner to track down the bag as the range which has been set is less.
- ❖ The bag/luggage communicates with us through a message when it lost.
- ❖ In the proposed work an android app named as " SAFEBAG" has also been developed and with the help of this app in the user mobile, precious luggage is like in his pocket, like a mobile phone.
- ❖ The bag owner can easily trace the location of a bag from anywhere with the help of map and the markers which would help the owner to track down the exact location of the bag using GPS.
- ❖ In alert mode, if it disconnects or if the device is 30 meters away from us, it automatically sends a flash message to mobile app every 1:15 minutes, in that message a location of the bag/luggage in which our device is place. The message takes us to the Google map.
- ❖ The flags in the map would help the owner to check how far the bag is from the owner.
- ❖ The device has a good battery system with good backup like android phones.

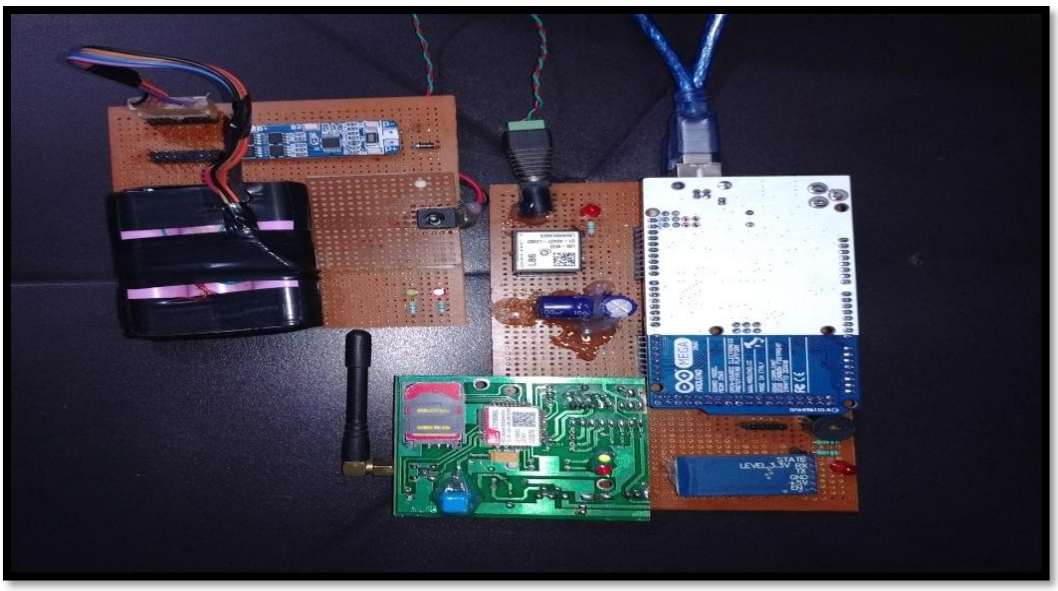

Fig.4. Final hardware of the proposed system

IJARCCE

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ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

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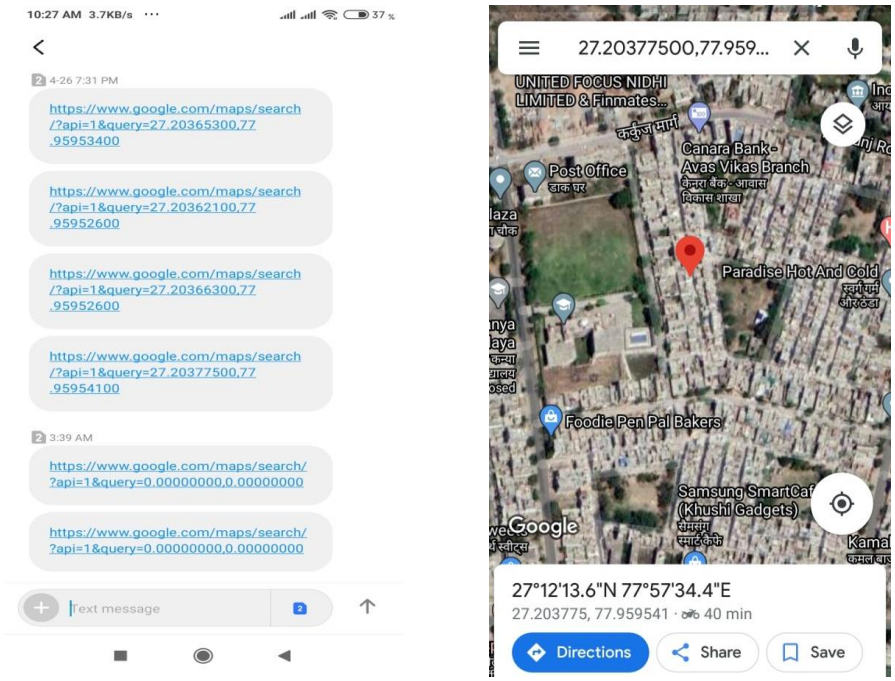

Fig.5. Sending the Location with Coordinates as well as google map link in Mobile. The second picture shows the location of the device on Google Maps.

Finally, we can say that the objectives of designing a much better and précised anti-theft cum tracking system i.e. a fully secured system for bags/luggage has been successfully designed by us.

VII. CONCLUSION

This article shows the implementation of tracking the bags which are either lost or stolen using IOT. Certain procedures and techniques have been made and proposed in order to achieve the same. Experimentation has been done and maps have been created in order to track the location of the bags which are misplaced and lost. Experiment results further concludes that the bags can be easily tracked based upon the hardware installed in them and then by tracking that hardware and tracking the route, directions and location of the bag with the help of a map.

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