

IoT Based Smart & Secure Personal Luggage System

Prof S. V. Kalbande, Prof R. M. Hushangabade, Prof S. D. Thakur

Prof S. V. Kalbande, Assistant Professor, Department of Computer Science & Engineering, Prof Ram Meghe Institute of Technology & Research, Badnera

(E-Mail:svkalbande@mitra.ac.in).

Prof R. M. Hushangabade, Assistant Professor, Department of Information Technology, Prof Ram Meghe Institute of Technology & Research, Badnera

(E-Mail:rmhushangabade@mitra.ac.in).

Prof S. D. Thakur, Assistant Professor, Department of Information Technology, Prof Ram Meghe Institute of Technology & Research, Badnera
(E-Mail:sdthakur@mitra.ac.in).

Abstract- The main Idea of the project is to develop a briefcase that is user friendly. The project is more of a briefcase less of a robot. There are a lot of applications to the briefcase but all of them are not controlled from the normal briefcase instead the commands are sent from the mobile phone to the briefcase via Machine to machine communication. The mobile phone has a pre-installed application software with pre-installed set of instructions. They wait for the user to send the commands. After the microcontroller embedded inside the briefcase receives instruction form the user it acts accordingly. This can either be for tracking its location or send it to user. A GPS module is used to track the location of the briefcase and also follow the user but can be activated upon user's commands only. The smart briefcase can be the new trend for people as they can be used to deal with some long-distance travel problem like luggage theft. The smart briefcase will follow the user wherever he goes, via Bluetooth or through the GPS. The proposed system will also detect for the object to which the briefcase can collide, the system will detect the collision and accordingly decide the path. The briefcase will also provide the anti-theft protection to the user. If the bag went away from the user to specified distance, then it will buzz the alarm so that the theft prevention can be achieved. The special feature of these systems is, the briefcase will come to the user when he/she will fire a command through the application. This will be achieved if and only if the briefcase is present within the specified range. With a GPS device, owners can quickly get the location of a stolen case and recover it immediately. The smart briefcase will ensure its safety and builds security for its user. From built-in scales to GPS tracking and mobile apps, these bags won't make hauling stuff any lighter, but they could make the experience less harrowing.

Keywords- Smart briefcase module, GPS module, Ultrasonic sensors, Raspberry Pi, Motor, Motor Driver, GSM module, Battery, Security module.

I. INTRODUCTION

Where ever the people travel they used to carry the luggage especially through the airports, railway platforms, etc. all of

them are dragging out their heavy luggage. Perhaps trailing of the bag is very difficult task specially for the old people. The people suffer a lot due to heavy luggage while travelling. The system is that, if the bag follows a human by utilizing human following concept, then entire problem gets vanished.

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The smart briefcase can be the new trend for people as they can be used to deal with some long-distance travel problem like luggage theft. The smart briefcase will follow the user wherever he goes, via Bluetooth or through the GPS. The proposed system will also detect for the object to which the briefcase can collide, the system will detect the collision and accordingly decide the path. The briefcase will also provide the anti-theft protection to the user. If the bag went away from the user to specified distance, then it will buzz the alarm so that the theft prevention can be achieved. The special feature of these system is, the briefcase will come to the user when he/she will fire a command through the application. This will be achieved if and only if the briefcase is present within the specified range.

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1.1 What is IOT?

III. PROPOSED SYSTEM

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 which 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. When IOT is connected with sensors, it encompasses technologies such as smart homes.

The IOT has provided a fair opportunity to build significant industrial systems and applications. An authorized person can monitor the existing location and movement of vehicle in an intelligent transportation system. The authorized person can also predict its future location and road traffic. In earlier days, the IOT was used to identify unique objects with RFID. Latterly, the researchers relate the term IOT with sensors, Global Positioning System (GPS) devices, mobile devices, and actuators. Acceptance and services of new IOT technologies mainly depend upon the privacy of data as well as security of information. Traditional networks is a less critical issue as compared to privacy network because numbers of attacks on IOT are very high[4].

II. LITERATURE SURVEY

Many researchers have proposed the use of cutting edge technologies to serve the target of the briefcase tracking. The research paper called "Electronic luggage follower" is taken as the reference for these proposed systems. These papers describe the working of the electronic bag where various batteries and motors are used. RFID technology is used in this technology. The proposed system will have the integrated circuit and use IOT (internet of things).

Another paper referred is "BLUETOOTH BASED SMART SUITCASE" by Suraj Mishra, Tushar Patil, Pritesh Kumar Singh. These papers describe the system which will implement the Bluetooth for connectivity and follow the user.

Another paper referred is "LUGGAGE TRACKING SYSTEM USING IOT" by Sudha Senthil Kumar, Brindha.K, Rathi R. Charanya. R, Mayank Jain. In this paper luggage tracking system is designed to track the luggage and bags which gets lost or theft from public and other areas. As people travel, there is always a risk of theft of the luggage and bags which is where the proposed system comes into account. The luggage tracking system works on an alarm basis where an alarm is set up with the Arduino no board and a GPS module. Communication, GPS, Remote Control, Server Systems and others are used. Based on the total design of the system, the hardware and software designed. This includes two parts that are monitoring center and the remote monitoring system. The monitoring centers consist of a computer and communication module of the GSM. The software monitoring center and the remote monitoring center implemented by using VB. The result of this demonstration shows that the system can watch and control the communication between the monitoring and remote monitoring center[1].

The proposed system uses the technique of internet of things in order to make the bag follow the user. In this the hardware would be created and installed which would be having the raspberry pi with a GPS module and an alarm being connected to it. A map has been created which would be synchronized in order to track the location of the bag. The furthermore, map has 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 alarm would start ringing so that the owner gets notified where exactly the bag is located. Also, it would help the owner to track the location of bag which would be seen on the map as the markers would be dropped which gives us the location as it moves away from the user. The user gets flag messages when the bag moves out of the range of 10m[2].

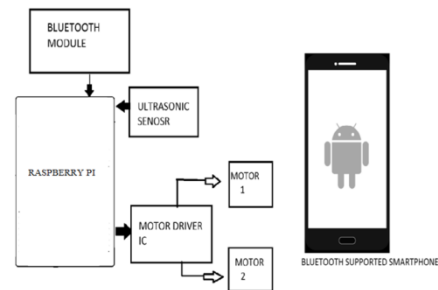


Figure 1: Smart Briefcase Module

There are a lot of applications to the luggage but all of them are not controlled from the luggage instead the commands are sent from the mobile phone to the luggage via Machine to machine communication. The mobile phone has a pre-installed application software with a pre-installed set of instructions. They wait for the user to send the commands. After the raspberry-pi embedded inside the luggage receives instruction from the user it acts accordingly. This can either be for tracking its location or send it to the user.

The user will be provided with an application for getting connected to the bag via Bluetooth. There will be two possibilities either he will get connected or not. If no- he will be notified with the text message "try again". If he/she gets connected then the raspberry pi will be ON and the Ultrasonic sensors used in the system will detect the object and calculate the distance between the object and the user.

After detecting the user, the motor drivers will start the wheel and bag will start following the user. There will be two motors: one for moving in forward and reverse direction and another for left and right turn. When the bag is following the user if the obstacle is detected the bag will be stopped there and the user will be notified with the message.

3.1 Hardware Description

3.1.1 Ultrasonic Sensors

Ultrasonic sensors are used to measure the distance by using ultrasonic waves. It is based on the properties of acoustic waves with frequency above human audible range. The sensor emits an ultrasonic wave and receives the wave reflected back from the target. There are two main parts in the sensor: transmitter-to transmit waves and receiver-to receive.

The distance can be calculated using the following Formula:
 Distance $L = \frac{1}{2} * T * C$

Where L is the distance, T is the time between emission and reception and C is the sonic speed, this value is multiplied by $\frac{1}{2}$ because T is the time for go- and-return distance.

Following are some features of Ultrasonic Sensors:

- Transparent object detectable.
- Resistant to mist and dirt.
- Complex shaped objects detectable.



Figure 2: Ultrasonic Sensors

3.1.2 GPS

The Global positioning system (GPS) is a space-based radio navigating system made up of at least 24 satellites. It is a global navigation satellites system that provides geo-location and the time information to a GPS receiver anywhere on or near the earth where there is an unobstructed line of that can be seen to four or more GPS satellites. To calculate 2-D position (latitude and longitude) and track the movement, a GPS receiver must be locked on to the system of at least 3 satellites.

The system does not require the manual command to transmit any data, and it operates independently of any wireless or internet reception, though these technologies can increase the usefulness of the GPS positioning information.



Figure 3: GPS Module with Raspberry Pi

3.1.3 Raspberry Pi

Raspberry pi is a series of small single board computers developed in the United Kingdom by the raspberry pi foundation to promote the teaching of the basic computer science. It does not include peripherals (such as mouse, keyboards, etc.). It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop pc does, like spreadsheet, word processing, browsing the internet and even to play games.

The following are some operating systems which run on the raspberry pi

- a) Raspbian
- b) Windows 10 IOT core
- c) Moebius
- d) Retro pie

Bluetooth module is inbuilt in raspberry pi 3 it is wireless technology standard for exchanging data over short distances from fixed and mobile devices, and building personal area networks. The range of Bluetooth is 10 m maximum. Bluetooth module is used for the connectivity of the briefcase to the mobile phones. Using these connectivity locations of the user as well as the bag can be tracked [3].



Figure 4: Raspberry Pi

3.1.4 Motors

The most common electric motors used are the DC motors. The dc motors provide the high torque and has a high efficiency. These motors are characterized by the speed and torque curve. A Dc motor is any of a class of rotating electrical machines that converts electrical energy into mechanical energy. The most common type rely is on the forces produced by the magnetic fields. The speed of the motor can be controlled by the varying the supply of the voltage or by changing current into winding field. The circuit use the 100RPM 12 v DC motor with gearbox,6mm shaft diameter with internal whole, 125 gm. Weight, stall torque=1.5kgcm.



Figure 5: Motor

3.1.5 Motor Drivers

Motor driver module L298n with raspberry pi will allow us to control a dc motor in fact, you can control two dc motors. When I say control a dc motor, I mean you can start a motor, stop it, and make it rotate in forward direction, backward directions, increase the speed of rotation and also decrease the speed.

Motor Driver IC or Motor Driver Circuits: They are basically current amplifiers which accept the low current signal from the controller and convert it into a high current signal which helps to drive the motor.



Figure 6: Motor Driver

3.1.6 GSM Module

GSM is a standard developed to describe second generation digital cellular protocols used by mobile phones. It is TDMA based network technology. The Global System for Mobile has an ability to carry 64 kbps to 120 mbps of data rates. One key feature of GSM is the subscriber identity module commonly known as a SIM card. It operates at 850 MHz, 900 MHz, and 1800 MHz frequency bands.

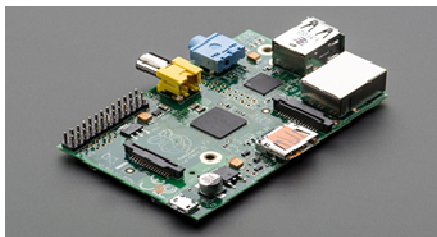


Figure 7: GSM Module

3.1.7 Battery

A large-sized rechargeable battery pack for your Raspberry pi or Arduino, or Propeller that uses 5V of power. This pack is intended for providing a lot of power to a GPS, cell phone, tablet, etc. But we found it helps powering other miniature computers and micro controllers. These batteries are used for the purpose of providing a power supply to the kit.



Figure 8: Battery

IV. WORKING DESCRIPTION

4.1 Object detection using ultrasonic sensor

The briefcase can be activated by sending SMS from the mobile device. Two ultrasonic sensors are used to detect the human presence and is connected in such a way that the transmitter section of each sensors is placed in middle and receiver section is placed on two sides. The transmitter section continuously emits sound waves through the air and would return when it strikes the obstacles on the way. [2] The algorithm compares the reading from two sensors and decides whether to turn left (if the left sensors return maximum signal), right or to forward (if the output of the two sensors is similar). If the range drops or the distance between the bag and human is less than a predefined value, the bag stops. Antitheft feature is equipped within the bag by using GSM and GPS. The present location of the bag can be accessed by sending SMS through GSM. The following fig shows the block diagram of smart briefcase.

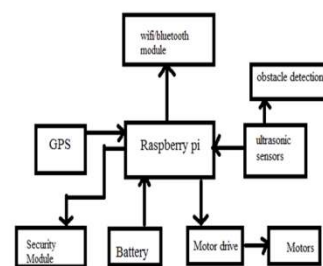


Figure 9: Smart Briefcase Module

4.2 Security Module

The following block diagram shows the working of the security module in the system. The google map are used to current location in the system. For these the GPS system is

used. Cell tower data.

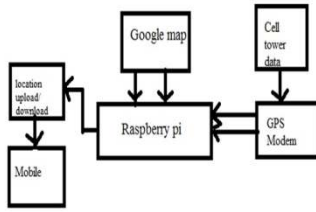


Figure 10: Security Module

We present a solution on how to protect the briefcase with affordable cost. Here, we tried to develop a system based on raspberry pi technology. With this system, when someone is trying to steal the briefcase, it alerts the briefcase owner when he is at nearest distance as well as when he is far away from the briefcase. But with this alarm, it is not possible to alert the briefcase owner who is unable to hear that alarm. So, in that case, we can use GSM network to send the notification message to the briefcase owner at his phone. In addition to this the briefcase owner will get to know the about his/her briefcase protection from theft is also very important. Prevention of briefcase theft can be done remotely by an authorized person. The location of the briefcase can be found by using GPS and GSM Controlled.

4.3 Flowchart

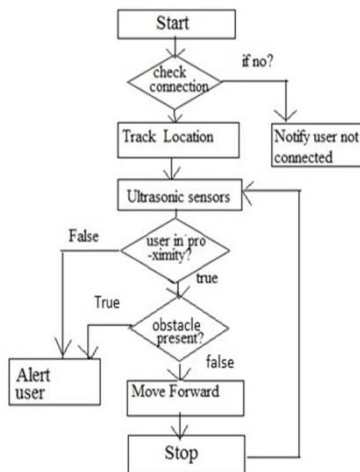


Figure 11: Flowchart of Smart Briefcase

The above figure describes that, the operation will start. For the first the system will check for the connection. If not, the user will be notified to establish a connection. Then after establishment the connection. GPS system will be on to track the location. The ultrasonic sensor will detect the object and

measure the distance between them. Then if the object is present the bag will start following the user.

4.4 Merits

- Simple to get connected with Smart Briefcase Apps Can be launched quickly. It provides user friendly GUI where user can easily interface with the system. Easy to control bag with this android application.
- It consists of various security mechanism which provide user a reliable machine. The anti-theft mechanism is being provided. Buzzers are used which alert the user.
- The suitcase is designed to follow the user without dragging it.
- The map and the markers would help the owner to track down the exact location of the bag.
- The flags in the map would help the owner to check how far the bag is from the owner.

4.5 Demerits

- The battery must be charged while travelling with these bags
- Smart briefcase is bounded by the speed limit.
- The bag can't go up itself on the stair, so either someone would have to carry it or make use of escalators or lift.

CONCLUSION

- The limitations of the traditional luggage will overcome with Smart briefcase. The market is still new and has potential to accept the new face of luggage. Move the briefcase easily using autonomous.
- The smart briefcase will ensure its safety and builds security for its user. From built-in scales to GPS tracking and mobile apps, these bags won't make hauling stuff any lighter, but they could make the experience less harrowing.
- This smart briefcase when designed will solve the most common problems of briefcase loss faced by the passengers at the airports. The GPS tracking, Bluetooth controlling will help the passengers to have safe and secure journey without any fear of luggage loss. This prototype when developed for the general public will be of great benefit and use to them.

FUTURE SCOPE

- The application should be more dynamic and it should show the live feed of the movement of the luggage which updates every time the luggage is in movement.

The tracking could be taken online using the cloud technology.

- The introduction of Digital Locks into the luggage will help the user secure the contents of the luggage with the help of dynamic encryption algorithms and techniques which will safeguard any Machine to Machine Communication.
- It comes with GSM module which helps us to triangulate its location when GPS is failed to retrieve the data.
- Get the status of the flights, regulations using app and pack accordingly.
- It can be used to charge any electronic device.
- Weight of the suitcase can be easily displayed.
- Unique id for each suitcase to avoid mixing.
- Manual drive mode with mobile application will possible.

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