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Smart Luggage Tracker

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***Abstract*: The Aviation industry is an area that has high potential to benefit from Radio Frequency Identification (RFID). A major loophole in Aviation industry is luggage mishandling. Luggage is often misplaced or lost and cases of damage to belongings are common. We propose to implement a luggage tracing and handling system using Smart RFID tags which is based on cloud server. This algorithm is highly secure and is used for generating tags that are attached to printed luggage label. The details of passenger and airline are stored in it. A prototype at the two locations of check-in and check-out is to be developed. RFID readers in the check-out areas facilitate step by step tracking of luggage. Real time location is also tracked and stored in a cloud server. Each passenger has a unique RFID code which has to be entered on the website to know the exact location and status of their luggage. Details include the exact time of arrival of luggage, location, net weight before and after loading. This information lets the passenger to take necessary action if the luggage has been misplaced, stolen or tampered.**

***Keywords*: Microcontroller, RFID, IoT, RFID Reader**

1. Introduction

The Internet is one of the biggest achievements mankind has encountered in the last few decades. Over time, the Internet has changed its services to make it more attractive and accessible to the users. Due to the rapid growth of the Internet, connecting different objects to users through mobile phones and computers is no longer a dream. Networks of connected objects through the Internet lead to a new concept, the Internet of Things. One of the key areas which can benefit enormously from the Internet of things is aviation. Among many troubles related to air travel, baggage related problems are the most common and infuriating. It turns out that one-third of travellers suffer from delayed, lost, and stolen luggage and the percentage of luggage's being misplaced or delayed or lost are increasing day by day. There are some existing solutions that enable passengers to track their luggage using a mobile phone with the help of GPS system and also there are devices that can be placed inside the baggage that gives the track of the baggage. However, such systems are quite expensive and therefore are not affordable by most passengers. So, for providing a better, secure, simple and free of cost system to the passengers, we have proposed a design of baggage tracking and baggage handling system using smart RFID tags and IOT which is based on the cloud server. Smart Luggage Tracker, it is designed to track the luggage at both arrival and departure sides. The tracking is monitored and displayed on a webpage that can be used by every passenger by just entering their passport number as id.

2. Working principle

A. Technology used

The Smart Luggage Tracker uses RFID (Radio Frequency Identification) Technology to track luggage at various stages of loading into the cargo flight. RFID is a wireless non-contact use of radio frequency waves which is used to transfer data. Tagging luggage with RFID tags allows passengers to automatically and uniquely identify and track their luggage. The RFID tags are attached to the passenger luggage and are scanned by RFID Readers at various locations. This information is made available to the passenger through a log in enabled website irrespective of the airline boarded by the passenger.

A Radio-Frequency Identification System has two parts:

I. RFID Tag
II. RFID Readers

The RFID reader consists of antennas. The scanning antenna in the RFID puts out the radio-frequency signals in a relatively short range. RFID radiation does two things:

I. It provides a means of communicating with the RFID tag
II. It is assigned to provide the RFID tag with energy to communicate. An RFID tag does not contain batteries, and can, therefore, remain usable for very long periods of time (maybe decades). Once the RFID tags detected the activation signal from the antenna, it energies the RFID chip, and its pieces of information are transmitted to its microchip which is to be picked up by the scanning antenna.

The RFID tags may be of one of two types, Active and Passive. Active RFID tags have their own power spruce; the advantage of these tags is that the reader can be much farther away and still get the signal. Even though some of these devices are built to have up to 10 years life span, they have limited life span, passive RFID tags, however, do not require batteries, and

is much smaller and have a virtually unlimited life span. In this project, we have used passive RFID tags for demonstration.

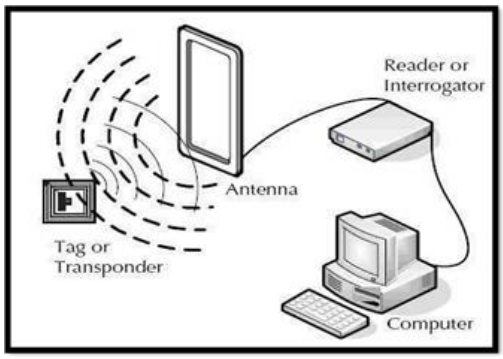

Fig. 1. Data Shared to web through RFID

The figure 1, shows how information is passed from RFID tags via antennas. In the RFID component on the tag there, are two parts: a microchip that stores and processes information, and an antenna to receive and transmit the signals. The tag contains a serial number which is specified for one specific object. To read the information encoded on a tag, a two-way radio transmitter-receiver called an interrogator or the reader emits a radio signal to the tag using an antenna. The RFID tag responds with the information written in its memory. The reader or interrogator receives this information and sends it to the RFID computer program.

B. Process

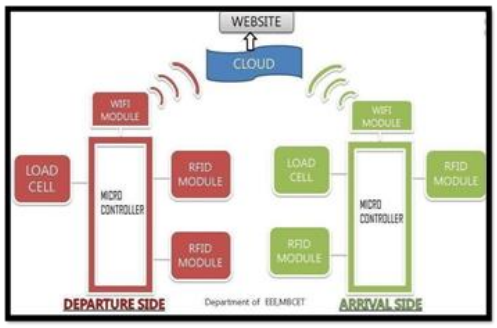

Fig. 2. Smart luggage tracker schematic

From the figure, the major components used for realizing this technology are Micro Controller, Load Cell, Wi-Fi Module, RFID Reader, RFID Tag, Cloud Server and Device. As the airline ticket is issued to the passenger, an RFID tag is generated at the counter which includes details such as passenger Name, Address, Flight No, Destination, etc. A Load Cell is used to measure the initial weight of the passenger luggage which is also stored in the tag. This tag is attached to the luggage and is dispatched for loading to the cargo flight. Two RFID readers are located at the departure side and the same arrangement is made on the arrival side. As the luggage passes the various phases of loading, the RFID readers scan the tag. This information is then sent to the Micro Controller. The interactions between the Micro Controller and RFID reader is done serially through the UART (Universal Asynchronous Receiver Transmitter) protocol. From the Micro Controller, the Wi-Fi module fetches this information and sends it to the Web-page through a database. In the database, programming is done to update the webpage with the luggage details. The passenger can log in to the webpage using their passport number.

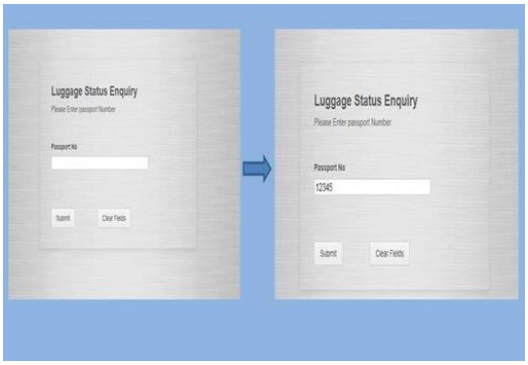

Fig. 3. Passenger login window

Once they are logged in they are redirected to a new window which indicates the status of their luggage. It also contains information about the estimated and time of arrival as well as initial and final weight of luggage, thus ensuring the detection of tampering which is prevalent in connected flights.

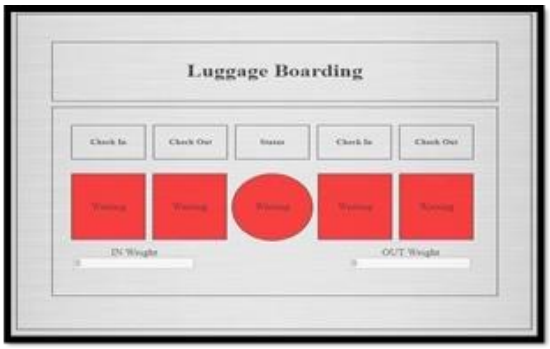

Fig. 4. Luggage Status as Logged before check in

3. Development stage

About the hardware, there are four microcontrollers used in this project. Two on each side i.e., two on arrival side and two on departure side. In this project, microcontroller, PIC16F877A is used. Then there is an RFID reader used two on each side. EM 18 is the RFID Reader we use in this project. We use a 20kg load cell to measure the weight of the baggage. The Load cell is connected to the analogue of the microcontroller. The Reader is connected to the microcontroller; the microcontroller is then connected to the internet through the Wi-Fi module. The Wi-Fi module we are using is ESP01 and it has an operating voltage of 3.3 to 6.6V.

We have created a web page using domain esprojects.in. The passengers can log in into the web page using the passport number as their login id. Then they are redirected to their

account. In their account, the passenger will be able to know the status of their luggage as shown in Fig.4. Each of the blocks will turn green when the luggage has passed each of these locations.

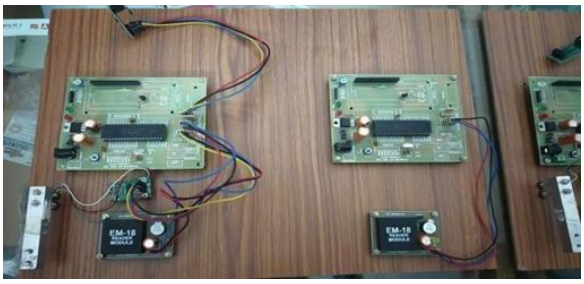

Fig. 5. Hardware one side (Arrival/Departure)

4. Conclusion

The proposed system is a smart, low cost and secure approach to minimize luggage mishandling rate at airports. It is using reliable, secure and light RFID technology. No agreements or international protocols are needed between the airports, it can be adopted by any airport around the world, reduce the number of luggage mishandling and the passenger time spent finding their luggage. Available tracking devices and technologies are expensive. Our technology can be used by an ordinary man at no cost. Once implemented it does is a huge relief for both airlines and passengers. The experiment results further conclude that the bags can be easily tracked and can get to know the status of the bag by just referring to a webpage.

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