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Smart Baggage Claim System

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Abstract: ***This paper describes the prototype of Smart Baggage Claim System (SBCS) for airports in order to prevent the mishandling of baggage. SBCS comprises of a conveyor belt with RFID scanner, the baggage tagged with RFID and the motors for controlling the movements. The RFID not only increases asset visibility but also mitigate risk, theft and loss. The system is controlled with the help of an Arduino Uno which is an open source microcontroller and GSM module which on the commands of Arduino Uno lets the passenger know the status of their baggage. The device first separates the baggage based on flight number and keeps the count of all baggage assigned to a particular flight, later lets the passenger know if their bag is on the conveyor belt or is picked by someone else.***
Keywords: RFID, Airport system and Baggage detection.

I. INTRODUCTION

More than 4 billion bags are checked in annually across the globe and this number is increasing exponentially every year. SITA baggage report suggests that the number of cases of mishandling have decreased with the introduction of new technologies. However no one wants to arrive at destination without their belongings. Mishandled baggage is an additional cost to aviation industry. In 2016 aviation industry lost around 2.1 billion dollars due to mishandled baggage. Airlines are looking for a better alternative to reduce the number of mishandled baggage while accommodating more bags. This paper describes the prototype of Smart Baggage Claim System (SBCS) which can reduce the chances of losing a baggage at airport. SBCS consists of RFID scanner and the bags are provided with RFID tags rather than old barcode system. Baggage can be sorted without any manual labor (increased efficiency) with the help of tags and simultaneously a count is maintained to keep a check on mishandling of a baggage. A similar count is maintained at the destination where a RFID scanner is tagged along with the conveyor belt. As soon as baggage arrives at conveyor belt, the RFID tag is scanned and with the help of GSM module a message is sent to the passenger. If the scanner can not find the tag again a message is sent to the passenger to check whether the bag is reached to right hands. With the present methods report shows that 4 in 1000 passengers have a complaint of mishandling of their baggage. With the implementation of SBCS this number can further be reduced. With, collaboration with the government and the private organization SBCS can provide assistance to both aviation industry and the passengers.

II. LITERATURE REVIEW AND COMPARATIVE STUDY

With the introduction of new methods research and development on the area has grown considerably and is expected that with the help and support of government and private organizations it'll continue to do so. Here some of the existing research has been discussed which led to the idea of SBCS. [1] proposed an architecture that uses Internet of Things concept and focuses on RFID based tracking of baggage. A smart check-in and check-out process is proposed that allows the baggage sorting with the help of RFID. At check-in tag is attached to every bag with the details of passenger and this information is stored on local server. At destination when bag arrives on conveyor belt, they will use a unique identification code provided to them at the time of check in to take their baggage. When the code matches servo motor opens the gate and baggage is pushed out of gate.[2]discussed about the use of RFID and IOT to mitigate the delay problem at check-in by automating using self-service counters connected to the airport servers.[3] states that the major requirements of airport is quick processing of baggage sorting. Present used method of Barcode system has a high error percentage and the transportation process is very slow. RFID is used to trace baggage at various security stages and informs passenger about their luggage.[4] their system is designed with 8051 microcontroller, RF transmitter, RFID,GSM module and motors for controlling the movement. GSM module is introduced to ensure that passenger is involved in the process.

Motor driven IC is used to operate locking system to change the direction of conveyor belt. In the SBCS the use of RFID in check-in process has been combined with the detection of baggage at the conveyor belt with the help of RFID scanner. [1] , [2] and [3] have discussed about the use of RFID for check-in and sorting of baggage but did not incorporate a GSM module to let the passenger know about the status of their baggage on their system.

On the other hand [4] has introduced GSM module and motor driven IC to operate the direction of conveyor belt. SBCS combines all these into a single system and additional to these provides a SMS facility for passengers to let them know the status of their baggage on the conveyor belt. If a baggage is found on conveyor belt, an alert will be sent to the mobile of passenger through SMS service. If the baggage is picked up from belt again a message will be sent to passenger alerting them about the activity.

III. METHODOLOGY

The system we are proposing in this paper will not alter the business process at the airport, but it will reduce the delay and increase the efficiency. The system is described into two main categories.

A. *Departure*

1) *Smart bag Tags:* No matter how automated baggage systems are installed at terminals, we still need individual guarantee that the baggage we check in will come the same way. Eliminating baggage mishandling altogether is nearly impossible; though some regions are pretty close to achieve it. RFID tags are being used rather than conventional barcodes to improve the process. Bags are provided with the RFID tags that have all the data related to the passenger assigned to it.

Figure 3.1 Prototype of Conveyor Belt with Baggage

2) *Segregation using Arduino Uno and Motors:* As the baggage moves to the belt. It passes through a scanning process and without the use of manual labor segregation is achieved. When the scanning of baggage is done, with the help of Arduino Uno and motors the baggage allowed to move only through the path that leads to assigned flight. A count is maintained as the loading of baggage takes place with the help of RFID tags.
3) *Buzzer and LED Alert:* During the boarding process if there's any unidentified baggage on the belt, an alert will be displayed on the screen with a buzzer and a Red LED will glow.

B. *Arrival*

1) RFID scanner based identification: When the baggage is unloaded onto a conveyor belt, RFID tags on the baggage are scanned are identified. A count is run simultaneously to prevent the mishandling of baggage; a message is displayed soon after all the bags are moved to the belt.

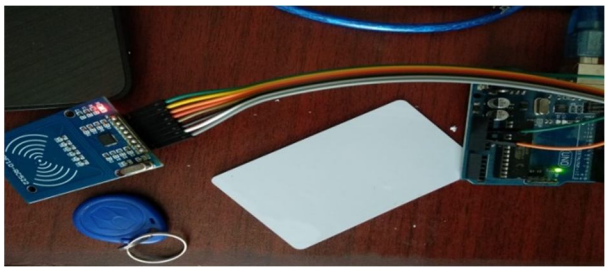

Figure 3.2 RFID Scanner connected with Arduino Uno

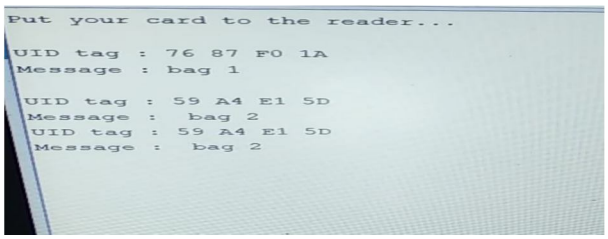

Figure 3.3 Scanned reading of RFID tags

2) GSM Module (SIM 900 A): After the baggage is identified on the conveyor belt, a GSM module is used to send a SMS to the passenger informing them about the status of their baggage. As soon as the baggage is off the belt an alert is sent to passenger to minimize the chances of mishandling of baggage.

3) Node MCU (ESP 8266): This is an alternative method for GSM module. The output of the Arduino Uno is taken in a variable and with the help of ESP 8266 is published to the online platform Adafruit.io and IFTTT.

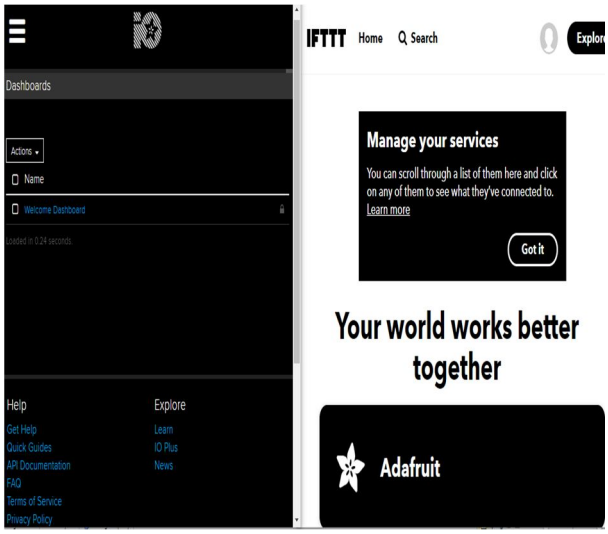

Figure 3.4 Adafruit.io and IFTTT layout

4) Adafruit.io: This is a cloud service that makes our data useful. Adafruit.io allows the simple data connections with little programming. To use this service with the Arduino Uno certain libraries are needed to be installed that includes Adafruit IO, Adafruit MQTT and ArduinoHttpClient libraries.

5) IFTTT: This portal allows us to connect all our different apps and devices. With the help of Adafruit.io the data is received and with the help of IFTTT we can easily program to send the message based on the conditions provided. Not only can we send Android SMS but there are dozens of other facilities available on IFTTT.

IV. ARCHITECTURE

SBCS device can be classified into two main parts, one for the departure and the other for arrival. This section describes the design and functioning of systems and subsystem of these two parts.

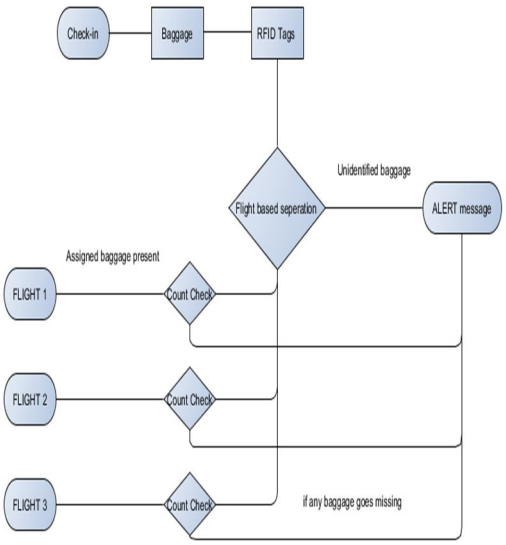

Figure 4.1 Flowchart of process at Departure

1) SBCS Departure Architecture is as Follows

a) During the check-in the user details are linked to a RFID tag.

b) Bags are tagged with RFID's before moving them to the belt.

c) Bags are separated automatically based on the flight they have to be moved with the help of RFID tags and if any unidentified bag is spotted an alert will be sent to the airlines.

d) Before loading them to flight a count is done to ensure no baggage goes missing.

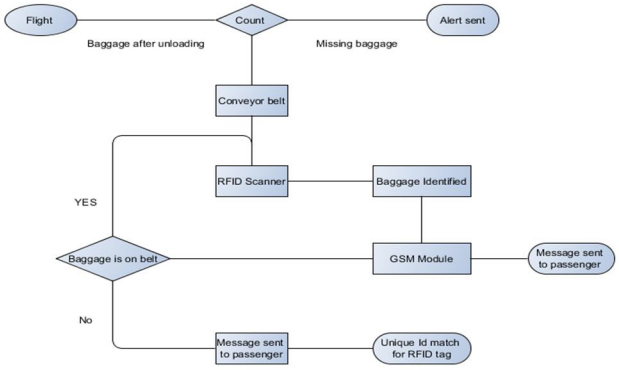

Figure 4.2 Flowchart of process at Arrival

2) SBCS Arrival Architecture is as Follow

a) While unloading the baggage from flight again a check is made to ensure all bags are present on the conveyor belt if not, an alert is generated.

b) Baggage is passed through scanner and simultaneously if baggage is identified then a message is sent to the passenger.

c) As soon as baggage goes off the belt, the passenger will be informed.

V. FUTURE SCOPE

The "Smart Baggage Claim system" project envisions future enhancements that would increase the efficiency of the system. A mobile application can be developed which traces the status of baggage and a unique pin is generated at the time of check-in. A passenger can only claim their baggage if the unique pin matches with the one on the database. RFID enabled tickets can be introduced to reduce the complexity at various stages of process. SBCS would provide aviation industry and passengers an easy-to-use, reliable and secure system that can minimize the chances of mishandling of baggage.

VI. CONCLUSION

The system we have designed and fabricated is a prototype and there is still scope for adding more features and making it industry ready. We have used Arduino Uno and GSM module for their low cost and simplicity. Along with the existing system Unique code access can be used for providing more security and decrease the issues regarding the mishandling of baggage. With the time the cost of RFID is decreasing and at later stages conveyor belt with inbuilt tag scanners can be used to improve the efficiency. Apart from this, collaborating with the government and private companies will be essential for setting up SBCS devices at maximum places.

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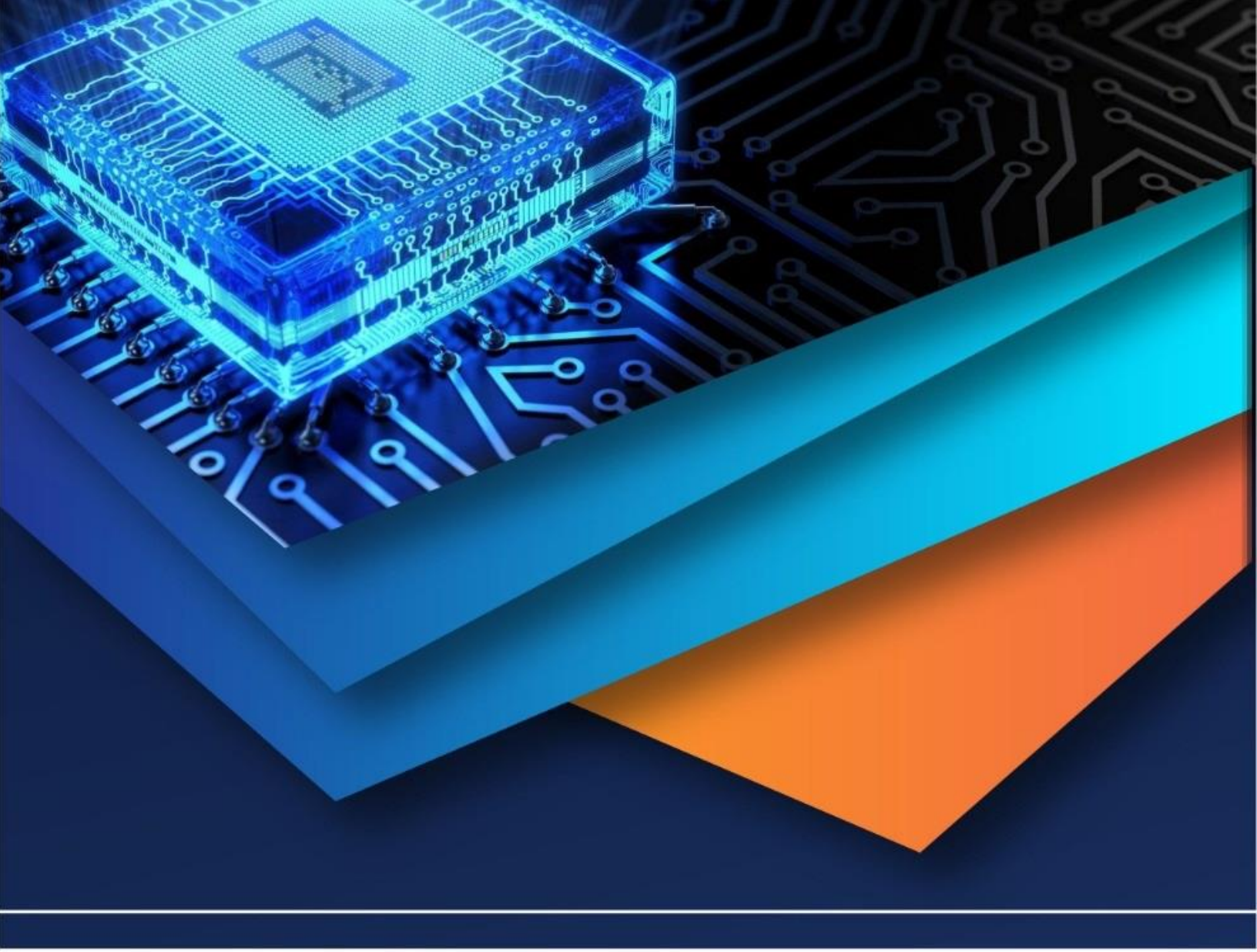

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