DESIGN AND DEVELOPMENT OF RFID TRACKING DEVICE FOR AIRLINE LUGGAGE

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Nama Penyelia

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Abstract of the project presented to the Senate of Management & Science University in partial fulfilment of the requirements for the degree Bachelor of Science in Mechanical Engineering (Hons.)

DESIGN AND DEVELOPMENT OF RFID TRACKING DEVICE FOR AIRLINE LUGGAGE

By

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June 2023

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Abstract

Radio frequency identification (RFID) is one of the easy-to-use sensor technologies for some circles. This technology has been found quickly, and diverse companies use RFID to improve their operating efficiency and to gain a competitive edge. In an industrial flight, the airport or a large airline has been looking for opportunities to adopt RFID in the baggage handling area for a long time. Many trials have been carried out in many U.S., European, and Hong Kong airports. The RFID Tag found is much more accurate in addition to the barcode, and its performance is also measured far above code bar code. The journal describes the state of the planning of the use of RFID at airports, architecture and implementation in major airlines, with a special focus on improving the service due to better handling of baggage safety, increased airport security at This airline by implementing RFID technology along with network technology and implementation baggage tracking system with mobile application.

Abstrak tesis yang dikemukakan kepada Senat Management & Science University sebagai memenuhi sebahagian keperluan untuk ijazah Sarjana Muda Kejuruteraan Mekanikal (Kepujian).

DESIGN AND DEVELOPMENT OF RFID TRACKING DEVICE FOR AIRLINE LUGGAGE

Oleh

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June 2023

Fakulti Sains Maklumat dan Kejuruteraan

Abstrak

Pengenalan frekuensi radio (RFID) ialah salah satu teknologi penderia yang mudah digunakan untuk sesetengah kalangan. Teknologi ini telah ditemui dengan cepat, dan pelbagai syarikat menggunakan RFID untuk meningkatkan kecekapan operasi mereka dan untuk mendapatkan kelebihan daya saing. Dalam penerbangan industri, lapangan terbang atau syarikat penerbangan besar telah lama mencari peluang untuk menggunakan RFID di kawasan pengendalian bagasi. Banyak percubaan telah dijalankan di banyak lapangan terbang A.S., Eropah dan Hong Kong. Tag RFID yang ditemui adalah lebih tepat sebagai tambahan kepada kod bar, dan prestasinya juga diukur jauh melebihi kod bar kod. Jurnal itu menerangkan keadaan perancangan penggunaan RFID di lapangan terbang, seni bina dan pelaksanaan dalam syarikat penerbangan utama, dengan tumpuan khusus untuk meningkatkan perkhidmatan kerana pengendalian keselamatan bagasi yang lebih baik, peningkatan keselamatan lapangan terbang di Syarikat penerbangan ini dengan melaksanakan teknologi RFID bersama dengan teknologi rangkaian dan pelaksanaan sistem pengesanan bagasi dengan aplikasi mudah alih.

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INTRODUCTION

1.1 BACKGROUND OF THE PROJECT

Along with the development of technology, various public facilities have been developed to provide easy access to its users. Of the various ease of access that is felt today, one example is the use of smart cards for various things. Simple examples are ATM cards, cards for payment systems, and various other applications. The smart card uses a technology called RFID (Radio Frequency Identification) [1].

RFID is a technology that is expanding quickly as more and more industries begin to employ it. RFID transmits data via radio frequency waves, as the name suggests. The RFID tag and the RFID reader, which are both integrated within the gadget, are the two components that transmit data wirelessly. A card with an RFID tag inserted in it is typically used to employ RFID technology. This type of RFID with an item in the form of a card or tag is commonly utilised in many industries, businesses, hospitals, hotels, and other settings. The use of RFID technology simplifies things since it relies solely on reading data and information from tags to carry out identification. Although RFID has advantages that are trustworthy for usage in all industries, barcode or QR code technology still outperforms RFID. [2].

1.2 PROBLEM STATEMENT

There are so many modes of transportation that can be used to travel to a place. Today, many people travel by plane. In addition to fast travel times, various comforts are provided by airlines. On the other hand, the price of airline tickets is getting more affordable, allowing more people to travel by plane. However, there is a problem that is a big scourge for air transportation. Thus, a problem that occurs frequently is the misplacement of luggage, travellers' greatest worries. More than half of issues can already be avoided with careful planning, but it's always a good

idea to be ready for unforeseeable circumstances, particularly those involving your belongings.

Over 3 billion bags are checked at airports worldwide each year, a staggering number that is expected to skyrocket over the next two decades [1]. From January to June 2021, over 692,884 luggage were mishandled by US airlines, over 200,000 more than in the first half of 2020. In total, about 160 million bags were enplaned in the first half of 2021, 45 million more than in the same period in 2020 [2]. To overcome this problem, a system is needed that allows automatic and accurate baggage check-in to minimize the occurrence of mishandled baggage such as implementing an RFID Luggage tracker.

1.3 OBJECTIVES OF THE PROJECT

The objectives of the study under our scope are as follows:

1. To design RFID luggage tracking system for tracking the passengers' luggage.
2. To monitor the luggage from departure airport until the destination airport.

1.4 SCOPE OF PROJECT

RFID Tracking Device for Airline Luggage are using RFID tag and scanner to track and monitor the movement of passengers' luggage in the airport from check-in procedure until passengers arrived at their destination. This system integrated with database so it will minimize mishandled or any loses of luggage. This project also supported by SMS push notification system so passenger will get updated for their luggage position. Thus, it will raise the passenger satisfaction and reduce the airline cost due to loss of luggage.

1.5 SIGNIFICANCE OF THE PROJECT

RFID technology provides a solution for luggage control and management in airports, and it has the potential to save the aviation industry. The introduction of this system will assistto lower the spread of fraud attempts and thefts, as well

as reduce the costs associated with excessive luggage misplacement, such as reimbursements and indemnities. It becomes a solution for businesses that need to comply with International Air Transport Association Resolution 753 (IATA).

1.6 LIMITATION

Due to early stage, this project can only store a few numbers of user data. Furthermore, the SMS push notification takes some time to send the notification to the passenger phone number.

Another limitation is the project still use RFID card, but in the future, it will be change into RFID tag for more compact.

CHAPTER 5
CONCLUSION

5.1 CONCLUSION

In conclusion, the design and development of an RFID tracking device for airline luggage presents a significant advancement in the aviation industry. This technology offers numerous benefits, ranging from improved operational efficiency to enhanced customer experience and increased security measures.

The implementation of RFID tracking devices enables real-time and accurate monitoring of luggage throughout its entire journey, from check-in to the final destination. By utilizing radio frequency identification technology, airlines can streamline baggage handling processes, minimize errors, and reduce the likelihood of lost or misplaced luggage. This not only improves operational efficiency for airlines but also enhances customer satisfaction by ensuring that their belongings arrive safely and promptly.

Furthermore, the RFID tracking device enhances security measures within airports. With the ability to track luggage at every stage of its journey, airports can quickly identify and address any potential security threats, such as unauthorized access or tampering. This technology enables seamless integration with existing security systems, creating a comprehensive and robust baggage management system. Also, with the built in SMS notification system, passenger will have worry free about the location of their luggage.

However, it is essential to acknowledge that the successful implementation of RFID tracking devices requires careful planning, infrastructure upgrades, and staff training. It is crucial for airlines to invest in the necessary infrastructure and ensure seamless integration with existing systems, such as baggage handling systems and airport databases.

5.2 RECOMMENDATION

In summary, future improvements for the RFID tracking device for airline luggage include miniaturization and lightweight design, integration of sensor technologies, real-time geolocation and mapping integration, cloud-based data management and analytics, and integration with passenger mobile applications. These enhancements would enhance convenience, safety, providing real-time tracking and mapping capabilities, enabling data analysis in the cloud, and empowering passengers with real-time updates through mobile applications.

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SOURCE CODE

```
#include <SPI.h>
#include <MFRC522.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <SoftwareSerial.h>
// Set the LCD address to 0x27 for a 16 chars and 2 line display
LiquidCrystal_I2C lcd(0x27, 16, 2);
SoftwareSerial sim(9, 10);

String number = "+601151696385"; // +880 is the country code

int state1 = 0;
int state2 = 0;

#define RST_PIN    9
#define SDA_PIN    10

MFRC522 mfrc522(SDA_PIN, RST_PIN);

void setup() {
  lcd.init();
  // Turn on the blacklight
  lcd.backlight();
  Serial.begin(9600);
  sim.begin(9600);
  SPI.begin();
  mfrc522.PCD_Init();
  lcd.setCursor(0, 0);
   lcd.print("RFID & GSM BASED");
  lcd.setCursor(0, 1);
  lcd.print("ATTENDANCE SYST.");
  delay(3000);
  lcd.clear();
  lcd.setCursor(7,0);
  lcd.print("BY ");
  lcd.setCursor(3, 1);
  lcd.print("EKI HERUKA");
  delay(3000);
  lcd.clear();

 lcd.clear();
  lcd.print("Lunarian Airlines ");
  lcd.setCursor(0, 1);
  lcd.print("Scan Your Card>>");
}
```

```
void loop() {
  rfid();
}
void rfid()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent())
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor
  String content = "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {
    Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
    Serial.print(mfrc522.uid.uidByte[i], HEX);
    content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
    content.concat(String(mfrc522.uid.uidByte[i], HEX));
  }
  content.toUpperCase();
  if (content.substring(1) == "90 BF 67 20" && statel == 0)
  {

    lcd.clear();
    lcd.setCursor(7, 0);
    lcd.print("Mr. Eki Heruka ");
    lcd.setCursor(7, 1);
    lcd.print("90BF6720");
    info();
    SendEki();
    statel = 1;
  }
  else if (content.substring(1) == "90 BF 67 20" && statel == 1)
  {

    lcd.clear();
    lcd.setCursor(7, 0);
    lcd.print("Mr. Eki Heruka ");
    lcd.setCursor(7, 1);
    lcd.print("90BF6720");
    info();
```

```
    SendEki();
    state1 = 0;
  }
    else if (content.substring(1) == "90 88 DE 20" && state2 == 0)
  {
    lcd.clear();
    lcd.setCursor(7, 0);
    lcd.print("Mr. Tan Sri ");
    lcd.setCursor(7, 1);
    lcd.print("9088DE20");
    info();
    SendTanSri();
    state2 = 1;
  }
  else if (content.substring(1) == "90 88 DE 20" && state2 == 1) /
  {
    lcd.clear();
    lcd.setCursor(7, 0);
    lcd.print("Mr. Tan Sri ");
    lcd.setCursor(7, 1);
    lcd.print("9088DE20");
    info();
    SendTanSri();
    state2 = 0;
  }
  else   {
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("ID : ");
    lcd.print("Unknown");
    lcd.setCursor(0, 1);
    lcd.print("Access denied");
    Serial.println(" Access denied");
    delay(1500);
    lcd.clear();
  }
}
void smsSend()
{
  lcd.setCursor(0, 0);
  lcd.print("Sending SMS");
  for (int x = 11; x < 16; x++)
  {
    lcd.setCursor(x, 0);
    lcd.print(".");
```

```
    delay(1000);
  }
}
void info()
{
  lcd.setCursor(0, 0);
  lcd.print("Name : ");
  lcd.setCursor(0, 1);
  lcd.print("ID   : ");
  delay(1500);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Authorized Access");
  delay(1000);
  lcd.clear();
}
void SendEki()
{
  lcd.setCursor(0, 0);
  lcd.print("SMS Sending");
  sim.println("AT+CMGF=1");
  delay(1000);
  sim.println("AT+CMGS=\"" + number + "\"\r");
  delay(1000);
  if (statel == 0) {
    const char Eki[] = " Mr. Eki, you have successfully checked in baggage at KLIA 2 Airport. Thank you for choosing Lunarian Airlines!";
    sim.print(Eki);
  }
  else if (statel == 1) {
    const char Eki[] = " Mr. Eki, you have successfully checked in baggage at KLIA 2 Airport. Thank you for choosing Lunarian Airlines!";
    sim.print(Eki);
  }
  sim.println((char)26);
  smsSend();
}
void SendTanSri()
{
  lcd.setCursor(0, 0);
  lcd.print("SMS Sending");
  sim.println("AT+CMGF=1");
  delay(1000);
  sim.println("AT+CMGS=\"" + number + "\"\r");
  delay(1000);
  if (state2 == 0) {
    const char TanSri[] = "Mr. Tan Sri, you have successfully checked in baggage at KLIA 2 Airport. Thank you for choosing Lunarian Airlines!";
    sim.print(TanSri);
  }
  else if (state2 == 1) {
    const char TanSri[] = "Mr. Tan Sri, you have successfully checked in baggage at KLIA 2 Airport. Thank you for choosing Lunarian Airlines!";
    sim.print(TanSri);
  }
  sim.println((char)26);
  smsSend();
}
```