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BASAVESHWAR ENGINEERING COLLEGE BAGALKOTE
587102

(2023-24)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Mini Project (22UEC511P) Report on

CONDUCTOR LESS BUS TICKETING SYSTEM USING RFID AND ACCIDENT INFORMATION THROUGH GPS AND GSM

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CERTIFICATE

This is to certify that project entitled ***"Conductor less Bus Ticketing system using RFID and Accident Information through GPS and GSM"*** *is a bonafied work carried out by student team of* ***1) Bhagyashree Sangamesh Hiregoudar (2BA22EC020) 2)Bhavani Ratnakumar Vaijapur (2BA22EC023) 3) Draxayini Somalinga Mundaganur (2BA22EC031)****. The Project report has been approved as it satisfies the requirements with respect to the Mini Project work prescribed by the university curriculum for* ***Bachelor of Engineering in Electronics and Communication Engineering*** *(5th semester) during the academic year of 2024-25.*

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- **Bhagyashree Sangamesh Hiregoudar**
- **Bhavani Ratnakumar Vaijapur**
- **Draxayini Somalinga Mundaganur**

ABSTRACT

In today's modern world the life style and comfortableness is enhanced due to the advancing technology. Public transportation is a vital part of urban mobility, yet inefficiencies in ticketing processes, such as reliance on conductors and manual fare collection, can lead to delays and operational challenges.

Project presents the Development of Conductor less Bus ticketing system using RFID technology, combined with a GPS and GSM-enabled accident alert system. The proposed system aims to enhance the public transportation experience by automating ticketing processes and ensuring passenger safety during emergencies.

The RFID-based ticketing module eliminates the need for conductors by allowing passengers to tap their RFID cards when boarding and alighting from the bus. The system calculates the fare based on the distance travelled using GPS data, and the fare is deducted automatically from the user's preloaded RFID card.

The accident information system leverages GPS and GSM technologies to ensure passenger safety. In the event of an accident, sensors in the bus detect the collision and automatically send real-time location details and an emergency alert to predefined contacts, such as transportation authorities or emergency services, via GSM.

The integration of these technologies provides a cost-effective, user-friendly, and efficient solution for urban transportation systems, aiming to improve service reliability and passenger safety. This system has the potential to revolutionize public transport by promoting automation and reducing manual intervention.

CONTENTS

Chapter 1:

INTRODUCTION

In today's fast-paced urban environments, efficient public transportation systems are vital for ensuring smooth mobility. Traditional bus information systems often struggle to provide real-time data and seamless communication between buses and passengers, leading to inefficiencies and poor user experiences. To address these challenges, integrating advanced technologies like Radio Frequency Identification (RFID) and Accident Information through GPS and GSM module is a solution for creating an intelligent bus information system and prevention of accident.

This system utilizes RFID technology to track the entry and exit of passengers in real-time and enables the passengers to use smart cards for automated fare collection [*From Reference [4]*]. This system doesn't require Conductors [*From Reference [2]*]. Simultaneously, the integration of GPS and GSM enhances safety by enabling real-time accident detection and location-based alerts to emergency services and authorities, ensuring timely responses [*From Reference [8]*].

This innovative approach streamlines ticketing, improves transparency and enhances passenger safety, contributing to smarter and more reliable urban transit systems.

1.1 Motivation

Implementing a conductor-less bus ticketing system using RFID technology offers numerous benefits that enhance both passenger experience and operational efficiency. This innovative approach streamlines fare collection, reduces fraud, and promotes environmental sustainability, making public transportation more accessible and user-friendly. Additionally, the integration of GPS and GSM technologies addresses the critical need for passenger safety by enabling real-time accident detection and swift communication of location based alerts to emergency services and authorities.

Traditional ticketing methods require manual intervention, which is prone to errors, delays, and conflicts. Introducing an RFID-based system simplifies the process by allowing passengers to pay fares electronically, ensuring accurate fare collection while reducing human dependency and operational costs. Additionally, the automated system provides convenience and transparency for both passengers and operators, promoting a smoother travel experience.

The motivation for this system lies in its potential to transform public transportation into a safer, more efficient, and user-friendly experience, addressing long-standing issues while embracing the advantages of automation and connectivity. By integrating technology into everyday infrastructure, the project helps the country move closer to global standards of urban mobility and safety, reflecting progress towards becoming a developed nation.

1.2 Objectives

The objectives of the proposed project are…

1. Automate Ticketing Process.
2. Improve Operational Efficiency.
3. Enhance Passenger Convenience.
4. Ensure Passenger safety.
5. Enable Real-Time Tracking.
6. Promote Sustainable Development.
7. Improve Emergency Response.
8. Support Smart City Initiatives.

1.3 Literature Survey

The papers that we have referred to do this project are as given below,

1. “RFID based Smart Transportation System with Android Application”. R Akter, MJH Khandaker, S Ahmed, published in 2020 2nd International Conference on Innovative Mechanisms for Industry Applications. Publisher IEEE, Conference location Bangalore, India.

2. “Conductor less Bus Ticketing System Using RFID Technology”. Nishtha Agarwal, Kartik Bansal, Vedant Verma, Nidhi..., Department of Electronics and Communication Engineering, KIET Group of Institutions, Delhi NCR, Ghaziabad 201206, UP, India. International Journal for Research in Applied Science & Engineering Technology (IJRASET).
3. Jalila AI Kalbani, Arwa AI Yafai. "Bus detection system for blind people using RFID". International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 6, 2014.
4. A Mithbavkar, et al. "IOT Based Smart School Bus Student Tracking System." International Journal of Innovative Research in Science, Engineering and Technology, Volume 3, Issue 3, 2014.
5. DR Zabin, et al. "Design and Development of a Wireless Smart Attendance System." International Journal of Computer Applications, Volume 122, No. 3, 2015.

1.4 Problem Statement

Design and implementation of a conductor less bus ticketing system using RFID that issues ticket automatically to the Passenger’s. In parallel, the system integrates accident detection and reporting mechanisms using GPS and GSM technologies.

The Conductor-less Bus Ticketing System using RFID aims to address these inefficiencies by enabling a contactless, automated fare collection system. Passengers will use RFID cards to pay fares, eliminating the need for conductors. This reduces operational costs, ensures accurate revenue collection, and improves the boarding process's speed and convenience.

In the event of an accident, the system will automatically detect the impact and send real-time location data to emergency services or predefined contacts, ensuring timely assistance and improved passenger safety using GPS and GSM.

Key Challenges:

- ✓ Integration of RFID technology.
- ✓ Cost of implementation.
- ✓ Accident detection Reliability.
- ✓ GPS and GSM Connectivity.
- ✓ Power supply and Backup.
- ✓ Data Security.
- ✓ Maintenance Challenges.

1.5 Application in Societal context

1.Enhanced Public Transportation Efficiency:

- **Automated Fare Collection:** Reduces human dependency, minimizing delays and errors in ticketing.
- **Streamlined Boarding:** Speeds up passenger boarding, reducing wait times and ensuring timely bus operations.

2. Cost-Effective Operations:

- Eliminates the need for onboard conductors, reducing operational costs for public transport operators.
- Savings can be utilized to improve infrastructure or subsidize fares for low-income passengers.

3. Improved Passenger safety:

- **Accident Reporting:** Immediate alerts with GPS coordinates ensure faster response times by emergency services, potentially saving lives.
- **Automated Impact detection:** Minimizes delays in assistance by reducing reliance on manual reporting.

4. Increased Transparency and Accountability:

- Reduces fare evasion and revenue loss, ensuring public funds are utilized effectively.
- Provides authorities with data for auditing and planning future transport enhancements.

5. Promotes a Cashless Society:

- Encourages digital transactions through RFID cards, supporting the transition to a cashless economy.
- Accurate tracking of vehicle routes and usage aids in optimizing fuel-efficient operations.

6. Environmental Benefits:

- Faster boarding and reduced idle time at bus stops decrease fuel consumption and emissions.
- Accurate tracking of vehicle routes and usage aids in optimizing fuel-efficient operations.

7. Urban Planning and Development:

- Data from GPS and RFID systems can help city planners analyse traffic patterns, optimize bus routes, and enhance public transport infrastructure.
- Helps reduce congestion by promoting efficient mass transit.

8.Reducing Traffic Congestion:

- Faster boarding and disembarking processes improve the efficiency of buses, reducing idle time at stops and contributing to smoother traffic flow in urban areas.

9. Supporting Smart Cities:

- The integration of RFID, GPS, and GSM technologies contributes to the development of intelligent transportation systems, a critical component of smart city initiatives.

10. Facilitating Data-Driven Decision Making:

- Data collected from the system, such as passenger count, travel patterns, and fare collection, can be used by authorities to optimize routes, schedules, and resource allocation for public transport services.

Chapter 2: SYSTEM DESIGN

2.1 BLOCK DIAGRAM:

This block diagram represents the system design of a project based on the Arduino Uno microcontroller. Below is the explanation of the various blocks:

1. Arduino Uno: Acts as the central control unit of the system. Interfaces with all the sensors, actuators, and modules.

2. Power Supply: Provides power to the Arduino Uno and other components. Ensures stable operation of the system.

3. Start and Stop Buttons: Start Button Initiates the system's operation. Stop Button Terminates the system's operation.

4. Fire Sensor: Detects fire or high temperature in the environment. Sends a signal to the Arduino Uno for necessary action.

5. Limit Switch: Detects the physical limit or position of a moving part. Provides feedback to the Arduino for controlling operations like opening or closing.

6. RFID Module (MFRC522): Used for identification and access control. Reads RFID cards or tags and communicates data to the Arduino.

7. I2C-LCD: Displays system status or outputs. Communicates with the Arduino using the I2C protocol for efficient data transmission.

8. Servo Motors (Entry and Exit): Control the movement of barriers, gates, or similar mechanisms. Operate based on commands from the Arduino Uno.

9. L293D Motor Driver: Drives the DC gear motor. Interfaces between the Arduino and the motor for bidirectional control.

10. DC Gear Motor: Provides mechanical movement for the system, such as conveyor belts or doors.

11. Relay: Acts as a switch to control high-power devices using the Arduino.

12. GSM Module: Sends or receives SMS or calls. Used for communication, such as sending alerts or updates.

13. GPS Module: Provides location data to the system. May be used for tracking or navigation purposes.

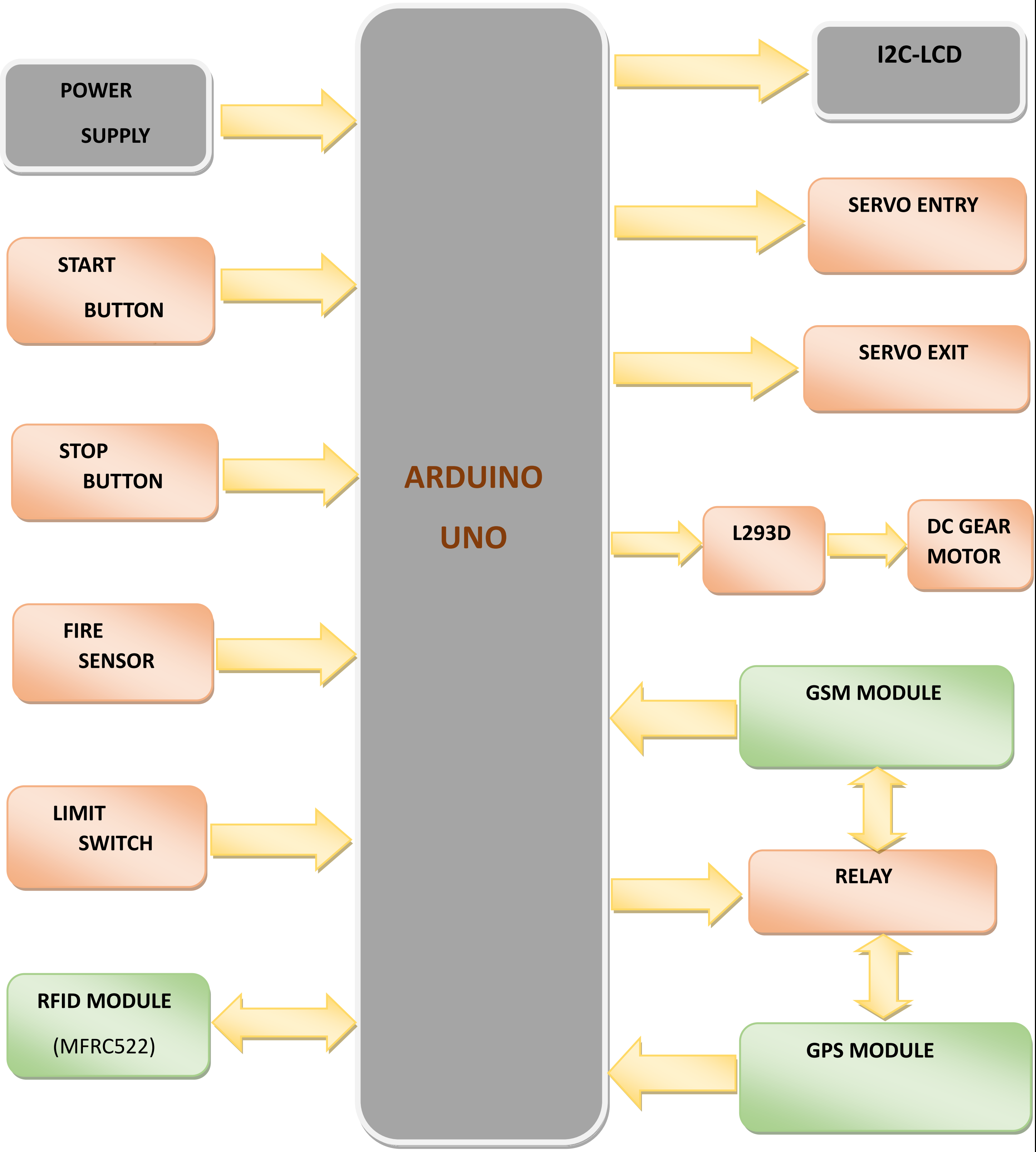

Fig 2.1: Block Diagram

2.2 COMPONENTS

1. ARDUINO UNO:

The Arduino UNO is a standard board of Arduino. Here ‘UNO’ means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010. The board is equipped with sets of digital and Analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and Analog Input/ Output pins (I/O), shields, and other circuits.

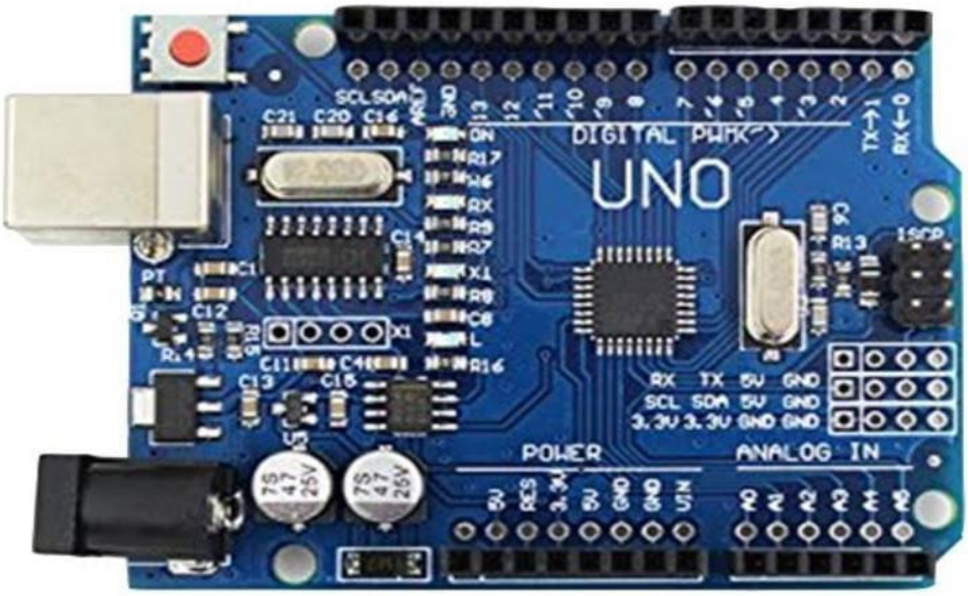

Fig 2.2: Arduino UNO Board

It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 Analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It operates at 5V. It contains everything needed to support the microcontroller. simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter battery to get started. We can program the Arduino UNO using the Arduino IDE. The Arduino IDE is the

Integral Development program, which is common to all the boards. We can also use Arduino Web Editor, which allows us to upload sketches and write the code from our web browser (Google Chrome recommended) to any Arduino Board.

It is an online platform. The USB connection is essential to connect the computer with the board.

2. MFRC522-RFID MODULE:

The MFRC522 RFID module is a popular and cost-effective module used for short-range communication with RFID cards and tags. It operates at a frequency of 13.56 MHz and communicates with a microcontroller (like Arduino) using the SPI protocol.

- Operates at 13.56 MHz frequency.
- Supports ISO 14443A/MIFARE standard RFID cards.
- Typical reading range: 2-5 cm (depending on the antenna and card/tag quality).
- Low power consumption: typically operates on 3.3V.
- Communication protocols: SPI, I2C, and UART (SPI is most common).
- Highly integrated reader/writer IC with antenna onboard.

Fig 2.3: MFRC522 RFID Module

Pinout:

- VCC: Power Supply
- GND: Ground
- RST: Reset pin to initialize the module
- IRQ: Interrupt pin (usually not used)
- MISO/SCL: Master In Slave Out (SPI data line)
- MOSI/SDA: Master Out Slave In (SPI data line)
- SCK: Serial Clock (SPI clock line)
- SS: Slave Select (SPI chip select)

3. I2C LCD:

An I2C LCD is a liquid crystal display (LCD) that uses the I2C protocol to display text and characters. It's used in applications that need a visual or textual display, such as Arduino projects. An I2C LCD is a standard LCD module equipped with an I2C backpack to simplify interfacing with microcontrollers. The I2C (Inter-Integrated Circuit) communication protocol allows the LCD to operate using just two pins (SDA and SCL) instead of multiple data and control pins required in standard LCDs.

- Simplifies wiring compared to parallel-mode LCDs.
- Common configurations: 16x2 (16 characters, 2 rows) and 20x4 (20 characters, 4 rows).
- Compatible with 5V and 3.3V systems.
- Operates using I2C protocol, typically at 100kHz or 400kHz.

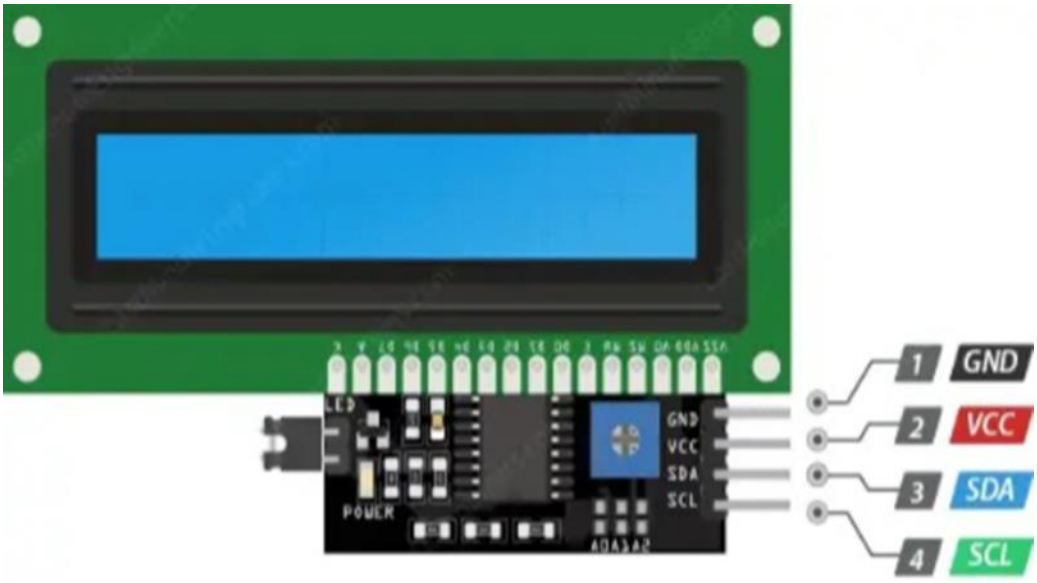

Fig 2.4: I2C Liquid Crystal Display

Pinout:

- VCC: Power supply (5V or 3.3V)
- GND: Ground
- SDA: Serial Data Line (I2C data)
- SCL: Serial Clock Line (I2C clock)

For other boards: On Arduino UNO: SDA (A4), SCL (A5).

4. L293D-MOTOR DRIVER:

The L293D Motor Driver IC is a dual H-bridge motor driver integrated circuit. It allows you to control the direction and speed of two DC motors or one stepper motor simultaneously. It is commonly used in robotics and embedded systems projects to interface low-power microcontrollers with higher-power motors.

- ➢ Dual H-Bridge configuration.
- ➢ Can control two DC motors or one stepper motor.
- ➢ Motor supply voltage: 4.5V to 36V.
- ➢ Logic voltage: 5V.
- ➢ Output current: 600mA per channel (1.2A peak).
- ➢ Supports PWM for speed control.

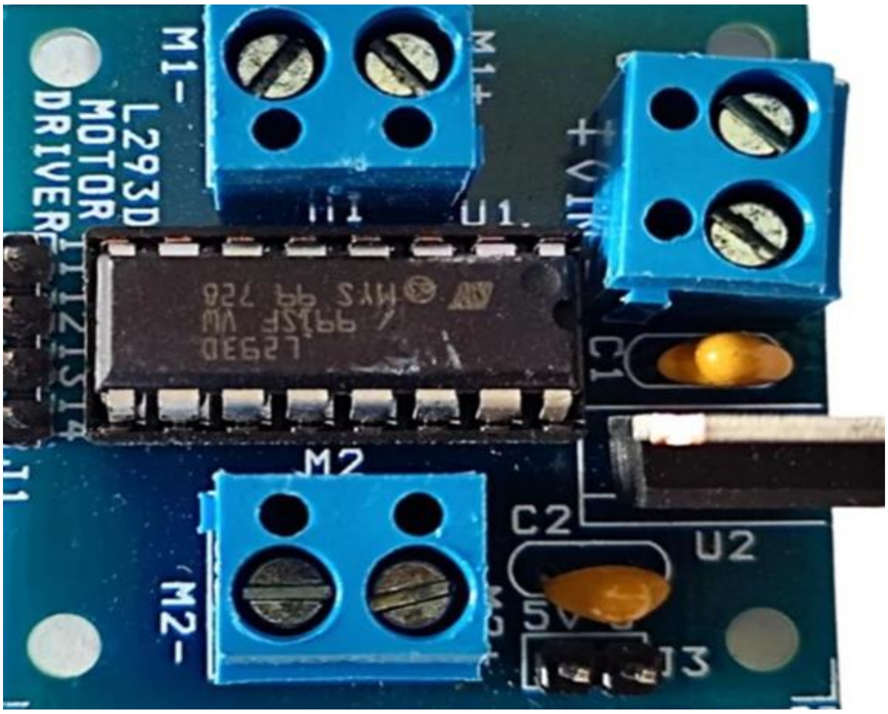

Fig 2.5: L293D Motor Driver

5.GPS MODULE (NE06):

The GPS NEO-6 module is a compact GPS (Global Positioning System) receiver widely used in electronics and embedded systems projects to determine precise location coordinates. It is based on the NEO-6 series chipset manufactured by u-blox, a company specializing in positioning and wireless communication technologies.

GPS Module (NEO-6) is used for Real-time location tracking.

Fig 2.6: GPS Module (NEO-6)

Role of GPS NEO-6 in the System-

1. Location Tracking:

- The GPS NEO-6 module provides real-time coordinates (latitude and longitude) of the bus.
- Used to determine boarding and deboarding points of passengers.
- Helps calculate the distance travelled and dynamically compute ticket prices.

2. Accident Reporting:

- In the event of an accident, the system sends the GPS location to emergency services or predefined contacts through the GSM module.
- The location data is captured in the form of NMEA sentences, processed, and sent via SMS.

Interfacing GPS with Microcontroller-

- The GPS module communicates with the microcontroller via UART.
- NMEA sentences (like GPGGA and GPRMC) are parsed to extract location data.

6.GSM MODULE (SIM A7670C):

The SIMA7670C is a GSM/4G LTE communication module designed for IoT and embedded applications. It provides reliable connectivity for sending and receiving SMS, voice calls, and internet-based communication over mobile networks.

Key Features of SIMA7670C -

1. Multi-Band Support:

- Supports GSM, GPRS, and LTE Cat-M1/NB-IoT.
- Ideal for IoT projects requiring low power and wide coverage.

2. Data Transmission:

- Capable of sending/receiving SMS.
- Supports internet connectivity for cloud-based communication (if needed).

3. Compact Design:

- Easy to integrate into microcontroller-based systems.

4. Communication Protocols:

- Communicates with microcontrollers using UART or USB interfaces.
- Supports AT commands for configuration and communication.

5. Low Power Consumption:

- Designed for battery-operated IoT applications.

Fig 2.7: GSM Module (SIM A7670C)

Role of GSM SIMA7670C in the Project -

1. Accident Alert System:

- ➢ Data Transmission: In case of an accident, the GSM module sends an SMS with the real-time location (from the GPS NEO-6 module) to emergency contacts.
- ➢ Example SMS:
- ➢ Accident Alert! Location
- ➢ Communication Protocol

2. Backup Communication:

- If internet/cloud-based communication is required (e.g., for real-time monitoring), the GSM module can upload GPS data to a server.

Pin Connections -

- RX/TX: Connected to the microcontroller's TX/RX pins (e.g., Arduino).

- GND: Connected to the system's ground.
- VCC: Powered by a 3.3V or 5V supply.

7.SERVO MOTOR:

The SG90 Servo Motor is a small and lightweight servo widely used in electronics projects for precise angular control. In the Conductor-less Bus Ticketing System Using RFID and Accident Information through GPS and GSM project, the SG90 servo motor can serve various functions, such as controlling mechanical components or indicating specific statuses. Here's how it fits into the system:

Overview of SG90 Servo Motor

1. Specifications:

- Torque: 1.8 kg/cm (at 4.8V).
- Operating Voltage: 4.8V to 6V.
- Control Angle: 0° to 180°.
- Weight: ~9g.
- Signal Control: Controlled via PWM signals.

2. Size and Build:

- Compact design makes it suitable for space-constrained applications.
- Comes with plastic gears for lightweight operation.

3. PWM Control:

- The position is controlled using a 50Hz PWM signal.

Role of SG90 in the Project

1. Gate Control:

- The servo motor can control an automatic entry/exit gate mechanism for passengers. For example:
- When an RFID card is scanned, the gate opens (servo rotates to a specific angle).
- After a delay, the gate closes automatically (servo returns to the initial angle).

2. Indicator Mechanism:

- The servo can be used to raise/lower a small flag or pointer to indicate specific states (e.g., boarding complete, accident detected).

3. Emergency Signal:

- It can physically rotate an indicator to alert nearby individuals in case of an accident.

Interfacing SG90 Servo with Microcontroller

The SG90 connects directly to a microcontroller (e.g., Arduino) using three wires:

- VCC (Red): Connect to a 5V power supply.
- GND (Brown): Connect to the system ground.
- Signal (Orange): Connect to a PWM-capable pin on the microcontroller.
  Servo 1: Connect to Pin 6 of Arduino.
  Servo 2: Connect to Pin 7 of Arduino.

8.FIRE SENSOR:

A fire sensor is a vital component in ensuring the safety of passengers and assets in the bus. When integrated with GSM and GPS modules, it enhances the system by providing real-time alerts and accurate location data to emergency services or concerned authorities.

Role of the Fire Sensor in the Project

1. Fire Detection:

- Monitors the bus interior for flames, smoke, or high temperatures.
- Acts as a safety feature to detect potential fire hazards.

2. Alert System:

- Triggers an alarm or LED indicator to notify passengers and the driver.
- Sends fire alert messages through the GSM module with the bus's real-time GPS location.

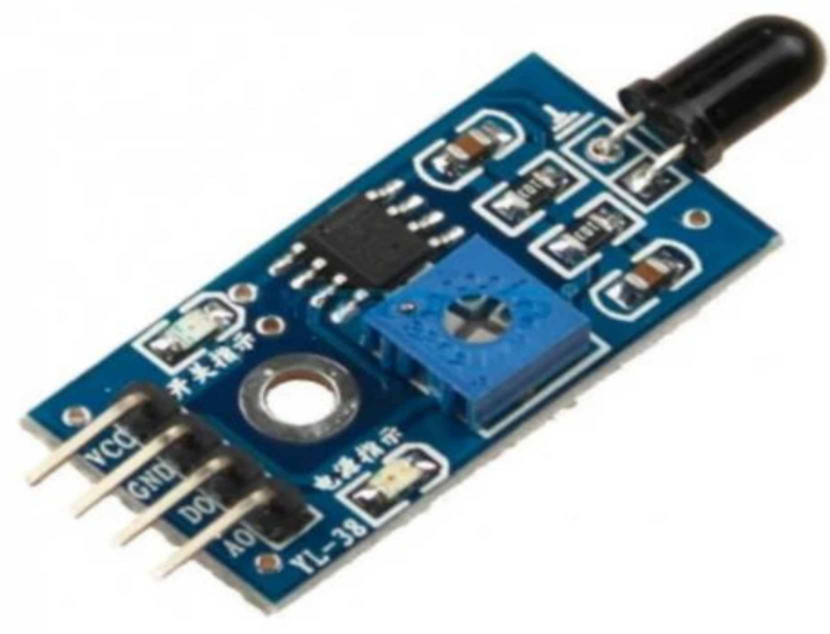

Fig 2.9: Fire sensor

- Interfacing a Flame Sensor with Microcontroller.
- A flame sensor is a popular choice for fire detection in embedded projects.

Connections:

- VCC: Connect to a 3.3V or 5V power supply.
- GND: Connect to the system ground.
- DO (Digital Output): Connect to a digital input pin on the microcontroller for binary detection.
- AO (Analog Output): (Optional) Connect to an analog input pin for more precise flame intensity readings.

Integration with GSM and GPS Modules:

GSM Module:

- Sends an SMS alert about the fire incident.
- Example SMS:

- Fire Alert! Immediate attention required. Location: Latitude 12.9716, Longitude 77.5946.

GPS Module:

- Provides the location coordinates of the bus to be included in the alert message.

9.DC GEAR MOTOR:

A DC gear motor is a type of motor combined with a gear reduction system to provide higher torque and lower speed. The DC gear motor is ideal for automating mechanical systems like doors or barriers in the project. Its ability to handle high torque and operate at controlled speeds makes it a reliable choice for public transportation applications.

Fig 2.10: DC Gear Motor

Connection:

- Pin 1: Connect to the OUT 1 pin of the L293D Motor Driver.
- Pin 2: Connect to the OUT 2 pin of the L293D Motor Driver.

10.LIMIT SWITCH:

A limit switch is an electromechanical device used in various applications to detect the presence or position of an object.

- Automation: Ensures that systems like RFID readers and emergency alerts activate at the right time.
- Safety: Helps detect emergency situations and facilitates faster response.
- Efficiency: Reduces unnecessary power consumption by activating systems only when needed.

Role of Limit Switch:

- A limit switch can be used to detect the opening and closing of bus doors.
- This detection can trigger the RFID system to activate, ensuring it scans RFID cards only when the doors are open, reducing unnecessary scans and power usage.
- In case of an accident, the limit switch can be connected to safety mechanisms like emergency exits or airbags.
- It can also detect impacts or mechanical changes in the vehicle (e.g., door deformation) and trigger the GPS/GSM module to send location-based alerts.

11.START AND STOP BUTTON:

1. Start Button

The Start Button activates the bus's systems when the journey begins.

Purpose:

- Activate RFID System: When the start button is pressed, the RFID reader is powered on and ready to scan passenger cards as they enter the bus.
- Initialize GPS and GSM: The GPS module starts tracking the bus's location, and the GSM system becomes ready to send/receive data.
- Power On Auxiliary Systems: Other systems like automatic doors, safety sensors, and displays are activated.

2. Stop Button

The Stop Button is pressed to deactivate the system when the journey ends or in case of an emergency.

Purpose:

- Deactivate RFID System: Stops RFID scanning to prevent unnecessary power consumption.
- Send Emergency Alerts: In case of accidents or critical conditions, pressing the stop button can Send the bus's GPS location to authorities or emergency contacts via GSM.

2.3 CIRCUIT DIAGRAM

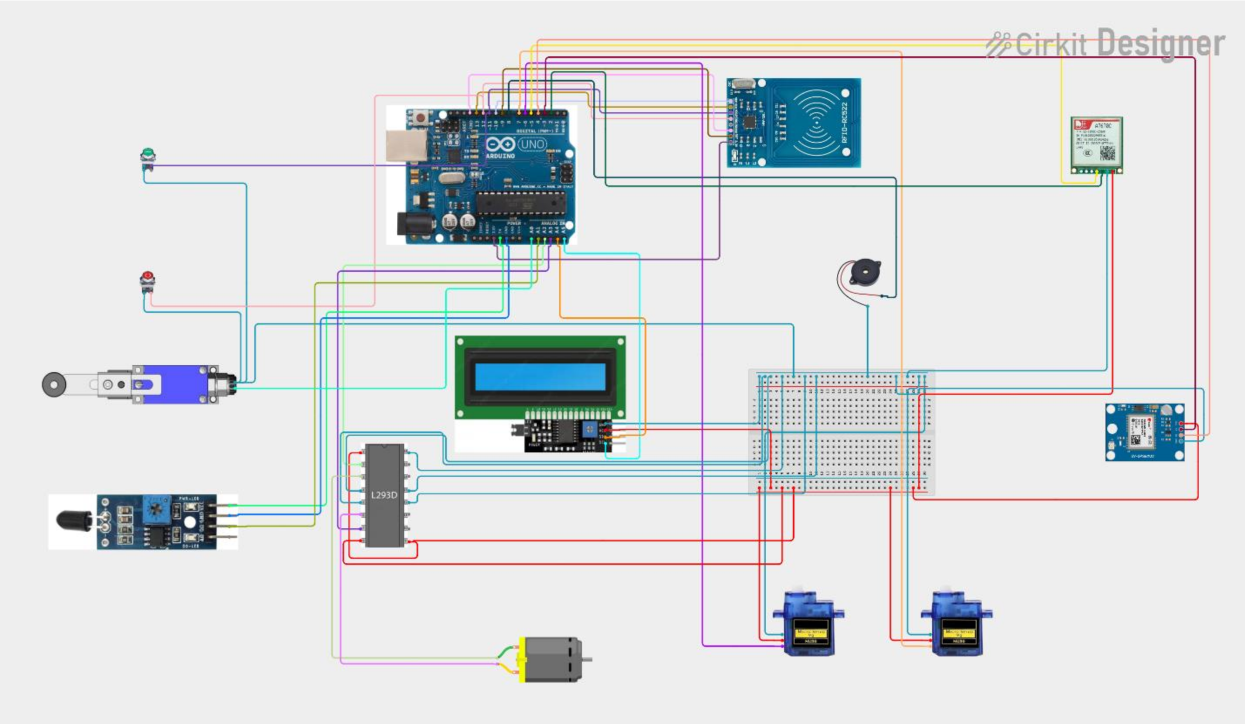

Fig 2.11: Circuit Diagram

1. Arduino to RFID Module: Pin 3.3V – VCC, Pin GND – GND, Pin 9 – RST, Pin 12 – MISO, Pin 11-MOSI, pin 13-SCK and Pin 10-SDA.

2. Arduino to GPS Module: Serial communication: TX (GPS) → pin 4 (Arduino), and RX (GPS) → Pin 3 (Arduino).

3. Arduino to GSM Module: TX (GSM) → pin 5(Arduino), and RX (GSM) → Pin 2 (Arduino).

4. Arduino to LCD Display: Pin A4-SDA, Pin A5-SCL, Pin 5V-VCC, Pin GND-GND.

5. Arduino to Servo Motors: PWM pins control the servos (e.g., doors).

6. Arduino to L293D and DC Motor: Outputs of Arduino connected to inputs of the L293D to drive the DC motor.

8. Buzzer: Negative pin – GND and Positive pin – Pin -8.

3.1 SOFTWARE CODE:

```
#include <SPI.h>

#include <MFRC522.h>

#include <Wire.h>

#include <LiquidCrystal_I2C.h>

#include <Servo.h>

#include <SoftwareSerial.h>

// Define pins for RFID, buzzer, servos, GPS, GSM, motor driver, and controls

#define SS_PIN 10

#define RST_PIN 9

#define BUZZER_PIN 8

#define ENTRY_SERVO_PIN 6

#define EXIT_SERVO_PIN 7

#define GPS_RX 4  // GPS RX Pin

#define GPS_TX 3  // GPS TX Pin

#define GSM_RX 2  // GSM RX Pin

#define GSM_TX 5  // GSM TX Pin

#define ACCIDENT_SENSOR_PIN A0 // Pin for accident detection sensor

// Motor Driver (L293D) pins

#define MOTOR_EN_PIN 11  // Enable pin

#define MOTOR_IN1_PIN 12 // Input 1

#define MOTOR_IN2_PIN 13 // Input 2

// Start/Stop Button and Limit Switch

#define START_BUTTON_PIN 2

#define STOP_BUTTON_PIN 3

#define LIMIT_SWITCH_PIN 7
```

```
// Define the total number of seats in the bus
#define TOTAL_SEATS 30
int availableSeats = TOTAL_SEATS;
// Initialize RFID, LCD, GPS, GSM, and Servos
MFRC522 mfrc522(SS_PIN, RST_PIN);
LiquidCrystal_I2C lcd(0x27, 16, 2);
Servo entryServo;
Servo exitServo;
SoftwareSerial gpsSerial(GPS_RX, GPS_TX);
SoftwareSerial gsmSerial(GSM_RX, GSM_TX);
// Variables for RFID system
long balance = 100; // Example starting balance
int fare = 10;      // Fixed fare amount
bool boarded = false;
// Variables for GPS and GSM
String latitude = "";
String longitude = "";
bool busRunning = false;
bool accidentDetected = false;
void setup() {
  // Initialize serial communication
  Serial.begin(9600);
  // Initialize RFID
  SPI.begin();
  mfrc522.PCD_Init();
```

```
// Initialize LCD
  lcd.init();
  lcd.backlight();
  // Initialize buzzer
  pinMode(BUZZER_PIN, OUTPUT);
  // Initialize servos
  entryServo.attach(ENTRY_SERVO_PIN);
  exitServo.attach(EXIT_SERVO_PIN);
  entryServo.write(0); // Entry gate closed
  exitServo.write(0);  // Exit gate closed
  // Initialize GPS and GSM
  gpsSerial.begin(9600);  // GPS module
  gsmSerial.begin(9600);  // GSM module
  // Accident sensor pin
  pinMode(ACCIDENT_SENSOR_PIN, INPUT);
  // Motor driver setup
  pinMode(MOTOR_EN_PIN, OUTPUT);
  pinMode(MOTOR_IN1_PIN, OUTPUT);
 pinMode(MOTOR_IN2_PIN, OUTPUT);
 // Start/Stop buttons and limit switch
  pinMode(START_BUTTON_PIN, INPUT_PULLUP);
  pinMode(STOP_BUTTON_PIN, INPUT_PULLUP);
  pinMode(LIMIT_SWITCH_PIN, INPUT_PULLUP);
  // Initial setup messages
  lcd.clear();
  lcd.setCursor(0, 0);
```

```
  lcd.print("Bus System Ready");
  delay(2000);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Seats: ");
  lcd.print(availableSeats);
  delay(2000);

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Press Start");
}
void loop() {
   // Start the bus system
  if (digitalRead(START_BUTTON_PIN) == LOW) {
    busRunning = true;
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("System Started");
    delay(1000);
  }
   // Stop the bus system
  if (digitalRead(STOP_BUTTON_PIN) == LOW) {
    busRunning = false;
    lcd.clear();
```

```
  lcd.setCursor(0, 0);
    lcd.print("System Stopped");
  stopBus(); // Stop motor
  delay(1000);
}
 // Check limit switch
if (digitalRead(LIMIT_SWITCH_PIN) == LOW) {
  busRunning = false;
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Limit Switch Hit");
  stopBus(); // Stop motor
    delay(1000);
}
 // Check accident sensor
int accidentStatus = analogRead(ACCIDENT_SENSOR_PIN);
if (accidentStatus > 500 && !accidentDetected) { // Threshold for accident detection
  accidentDetected = true;
  busRunning = false;
  handleAccident(); // Handle accident scenario
}
 // Main bus system logic
if (busRunning && !accidentDetected) {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Place your card");
```

```
 if (mfrc522.PICC_IsNewCardPresent() && mfrc522.PICC_ReadCardSerial()) {
      handleRFID(); // RFID logic for boarding/alighting
    }
  }
}
// Function to handle RFID operations
void handleRFID() {
  // Get card UID
  String cardID = "";
  for (byte i = 0; i < mfrc522.uid.size; i++) {
    cardID += String(mfrc522.uid.uidByte[i] < 0x10 ? "0" : "");
    cardID += String(mfrc522.uid.uidByte[i], HEX);
   }
  cardID.toUpperCase();
  Serial.println("Card UID: " + cardID);
  // Buzzer feedback
  digitalWrite(BUZZER_PIN, HIGH);
  delay(100);
  digitalWrite(BUZZER_PIN, LOW);
  if (!boarded) {
    // Boarding process
      if (availableSeats > 0) {
      if (balance >= fare) {
        balance -= fare;
        availableSeats--;
```

```
      lcd.clear();
      lcd.setCursor(0, 0);
      lcd.print("Boarded Bus");
      lcd.setCursor(0, 1);
      lcd.print("Bal: Rs ");
      lcd.print(balance);
      delay(3000);
      // Open entry gate
      entryServo.write(90);
      delay(3000);
      entryServo.write(0);
      boarded = true;
      moveBusForward(); // Start moving the bus
     } else {
      lcd.clear();
      lcd.setCursor(0, 0);
         lcd.print("Insufficient Bal");
      delay(3000);
     }
    } else {
     lcd.clear();
     lcd.setCursor(0, 0);
     lcd.print("Bus Full");
     delay(3000);
    }
   } else {
```

```
    // Alighting process
    availableSeats++;
     lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Fare: Rs ");
    lcd.print(fare);
    lcd.setCursor(0, 1);
    lcd.print("Bal: Rs ");
    lcd.print(balance);
    delay(3000);
    // Open exit gate
    exitServo.write(90);
      delay(3000);
    exitServo.write(0);
     boarded = false;
    stopBus(); // Stop the bus
  }
}
// Function to handle an accident
void handleAccident() {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Accident Detected");
 // Get GPS data
  getGPSLocation();
   // Send accident alert via GSM
```

```
  gsmSerial.println("AT+CMGF=1"); // Set SMS mode
  delay(1000);
  gsmSerial.println("AT+CMGS=\"+911234567890\""); // Replace with emergency number
  delay(1000);
  gsmSerial.print("Accident Alert! Location: ");
  gsmSerial.print("Lat: ");
  gsmSerial.print(latitude);
  gsmSerial.print(", Lon: ");
  gsmSerial.print(longitude);
   gsmSerial.write(26); // Send SMS (CTRL+Z)
Serial.println("Accident detected. SMS sent.");
  delay(5000);
}
// Function to get GPS location
void getGPSLocation() {
  while (gpsSerial.available()) {
    String data = gpsSerial.readStringUntil('\n');
    if (data.indexOf("GPRMC") != -1) {
      int latStart = data.indexOf(",") + 1;
      latitude = data.substring(latStart, latStart + 10);
      longitude = data.substring(latStart + 12, latStart + 22);
    }
  }
}
// Function to move the bus forward
void moveBusForward() {
```

```
  digitalWrite(MOTOR_EN_PIN, HIGH);
  digitalWrite(MOTOR_IN1_PIN, HIGH);
  digitalWrite(MOTOR_IN2_PIN, LOW);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Bus Moving...");
}
// Function to stop the bus
void stopBus() {
  digitalWrite(MOTOR_EN_PIN, LOW);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Bus Stopped");
}
```

CODE EXPLANATION:

The code implements a smart bus system with features for passenger management, safety, and automation:

1. Passenger Boarding/Alighting: RFID cards handle boarding and fare deduction if the balance and seats are sufficient.Opens entry/exit gates using servos and updates seat availability.

2. Bus Control: Start/stop buttons control the system. A motor driver moves or stops the bus based on conditions.

3. Accident Detection: Monitors a sensor for accidents, stops the bus, and sends GPS location alerts via GSM.

4. Hardware Integration: Uses LCD for displaying seat availability, balance, and status. Interfaces with RFID, GPS, GSM, servos, and sensors for automation.

The code ensures passenger safety, efficient boarding, and real-time monitoring.

Chapter 3:

IMPLEMENTATION DETAILS

3.1 Operation of the System:

Operation of the Conductor-less Bus Ticketing System

1. System Initialization

- The system powers on and initializes all components: RFID reader, GPS, GSM, LCD, servos, and accident sensors.
- The LCD displays system readiness and available seats.

2. Passenger Boarding

- RFID Card Scanning:
- Passengers tap their RFID card on the reader.
- The system checks the balance and available seats.

Fare Deduction:

- If the balance is sufficient and seats are available, the fare is deducted.
- The entry gate (servo motor) opens to allow the passenger to board.

Seat Update:

- The system decreases the available seat count and displays it on the LCD.
- If the balance is insufficient or the bus is full, a message is shown on the LCD, and boarding is denied.

3. Passenger Alighting

- RFID Card Scanning:
- Passengers tap their RFID card again when alighting.

Seat Update:

- The system increases the available seat count.

Exit Gate Control:

- The exit gate opens to allow the passenger to leave.

4. Bus Movement

- The bus moves forward or stops based on the driver's controls.

- The motor driver controls the wheels of the bus.

5. Accident Detection

- Sensor Monitoring:
- The accident sensor continuously monitors for collisions or other incidents.

Emergency Stop:

- If an accident is detected, the bus stops automatically.

GPS & GSM Alert:

- The system retrieves the bus's GPS coordinates.
- Sends an SMS alert with the location details to emergency contacts via GSM.

6. Manual Control

- The bus driver can start or stop the system using physical buttons.
- A limit switch stops the bus in specific scenarios (e.g., reaching the end of the route).

7. System Status Display

- Real-time updates on seat availability, fare, and operational status are displayed on the LCD.

The system automates ticketing using RFID cards, monitors available seats, and manages fare collection. It also ensures passenger safety through accident detection and GPS-based emergency alerts via GSM. This reduces human intervention and enhances operational efficiency.

Chapter 4:

CONCLUSIONS AND FUTURE SCOPE

4.1 Advantages and Disadvantages:

Advantages:

- Automation: Eliminates the need for manual ticketing, reducing human errors and operational costs.
- Efficiency: Speeds up the boarding and alighting process, ensuring smoother and faster operations.
- Convenience: Passengers can use RFID cards for hassle-free travel without worrying about carrying cash.
- Accurate Seat Tracking: Real-time updates on available seats improve passenger management.
- Safety Features: Accident detection and GPS tracking enable quick alerts and location-based emergency response.
- Transparency: Ensures accurate fare collection and prevents ticket fraud or pilferage.
- Scalability: Can be expanded with additional features like distance-based fares, online recharge, or real-time tracking.

Disadvantages:

- Initial Cost: High setup costs for RFID readers, cards, GSM, GPS modules, and integration.
- Maintenance: Regular maintenance is required for RFID readers, servos, and sensors to ensure system reliability.
- System Failures: Issues with hardware (e.g., RFID reader failure) or power supply can disrupt the system.
- Card Dependency: Passengers must carry and maintain sufficient balance in RFID cards, which may inconvenience some users.
- Technical Expertise: Requires skilled personnel for installation, troubleshooting, and maintenance.
- Network Issues: GSM-based alerts depend on stable mobile network availability, which might not be reliable in remote areas.
- Privacy Concerns: GPS tracking and RFID data may raise privacy concerns if not handled securely.

4.2 RESULT

The Proposed system "Conductor-less Bus Ticketing System Using RFID and Accident Information Through GPS and GSM" aims to streamline public transport ticketing and improve passenger safety.

1. Conductor-less Bus Ticketing System Using RFID: Automation of Ticketing:
    - Passengers can use RFID cards for ticket payment, removing the need for conductors.
    - Real-time Monitoring: The system logs entry and exit data, calculating the fare automatically based on distance travelled.
    - Improved Efficiency: Reduced delays due to manual ticketing and fewer disputes over fare payments.
    - Data Storage: All transactions are stored in a database for auditing and analysis.
    - User Feedback: Passengers get instant confirmation of fare deduction via SMS (optional).

2. Accident Information System Using GPS and GSM:

    - Accident Detection: The system detects unusual changes in speed, angle, or vibrations using sensors.
    - Accurate Location Tracking: GPS pinpoints the exact location of the accident.
    - Emergency Alerts: GSM module sends an SMS with GPS coordinates to emergency contacts or authorities.
    - Timely Assistance: Faster communication ensures quicker response times from rescue teams, minimizing casualties.

Overall Impact:

- Cost-Effectiveness: Eliminates the need for a conductor, reducing operational costs for public transport systems.
- Safety and Reliability: Ensures quick communication in case of accidents, enhancing passenger safety.
- Scalability: The system can be integrated with smart city projects, offering a complete solution for transport management and safety.

4.3 REFERENCES

[1] Nandini M S, Manisha,Pooja D, Poonam Sharma, Ramya M “Smart bus fare collection system”,2019 International Research Journal of Engineering and Technology (IRJET).

[2] Vitthal Waghmare, Rushikesh Santre, Piyush Gupta, Rudull Redijj, “Conductor less bus ticketing”,2019 International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE).

[3] Prafulla P S, Hema K J, Kalavathi S N, Sharath S, Manikanta G “Ticketless Transportation using RFID device”, 2018 International Journal of Engineering Research & Technology (IJERT).

[4] Bhumik Patel, Parthvi Pandey, Durvesh V.Sonar,Tina D’abrco “RFID based bus Ticketing System”,2018 International Journal of Scientific Research & Engineering Trends (IJSRT).

[5] Priyadharshini m, Deebiga K, Gomathy G R, Anusha A “Public Transportation Automation Using Smart Card With Rfid”,2020 International Journal Of Scientific Research And Engineering Development (Ijsred).

[6] Shreaya Andhale, Nirmayee Dighe, Akanksha Kore, Darshana Gaikwad, Jayasudha Koti, “Rfid Based Smart Ticketing System”,2020 Institute Of Electrical And Electronics Engineers(IEEE).

[7] Chayan Sarkar, Jan Jaap Treurniet, Sujay Narayana, R. Venkatesha Prasad, “Seat: Secure Energy-Efficient Automated Public Transport Ticketing System”,2015, Institute Of Electrical And Electronics Engineers(IEEE).

[8] Bus Fare Collection System Using RFID and GPS Shazid Bin Zaman, Richard Victor Biswas and Eftakharul Islam Emon EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair. June 30, 2023

[9] K.R.Aravind., R.Arasu, Asick Ahamed.K., R.Rajakumari, “Automatic Ticket Issuing System For Conductorless Buses”,2019 International Journal Of Scientific & Technology Research (IJSTR).