Fingerprint Access Control System

Components Used:

- ESP8266 WiFi module
- Fingerprint Sensor
- Relay Module
- I2C LCD
- Buzzer
- Twilio API for WhatsApp notifications

Circuit Diagram:

Code Explanation

Libraries Used:

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <SoftwareSerial.h>
#include <Adafruit_Fingerprint.h>
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClient.h>
#include <UrlEncode.h>
```

Setup Function:

```
void setup() {
  Serial.begin(115200);
  mySerial.begin(57600);
  pinMode(RELAY_PIN, OUTPUT);
  digitalWrite(RELAY_PIN, HIGH);

  lcd.init();
  lcd.clear();
  lcd.backlight();

  finger.begin(57600);
  connectToWiFi();

  if (finger.verifyPassword()) {
    lcd.clear();
    lcd.print("Sensor Ready!");
  } else {
    lcd.clear();
    lcd.print("No Sensor Found!");
    while (1) { delay(1); }
  }

  displayMenu();
}
```

Main Loop:

```
void loop() {
  if (Serial.available()) {
    char command = Serial.read();
    if (command == '1') {
      enrollFinger();
      displayMenu();
    } else if (command == '2') {
      int id = getFingerprintID();
      if (id >= 0) {
        digitalWrite(RELAY_PIN, LOW);
        delay(8000);
        lcd.clear();
        lcd.print("Access Granted!!");
        Serial.println("Access Granted!! ID: " + String(id));

        // Send WhatsApp notification
        sendMessage("Access granted. Fingerprint ID: " + String(id));

        delay(8000);
      } else {
        lcd.clear();
        lcd.print("No Match");
        Serial.println("No Match");
        digitalWrite(RELAY_PIN, LOW);
      }
```

```
      digitalWrite(RELAY_PIN, HIGH);
      displayMenu();
    }
  }
}
```

How It Works:

- **Enroll Fingerprints**: When you press `1` on the serial monitor, the system will enroll a fingerprint by capturing and storing the fingerprint image.
- **Check Access**: When you press `2`, the system will compare the input fingerprint with stored fingerprints and grant or deny access based on the match.
- **WhatsApp Notification**: When access is granted, a message is sent to a WhatsApp number using the Twilio API.

Setup Wi-Fi and API

Before running the code, ensure you have the correct Wi-Fi credentials and Twilio API key set up in the code:

```
const char* ssid = "Your_SSID";
const char* password = "Your_PASSWORD";

String phoneNumber = "+YourPhoneNumber";
String apiKey = "YourTwilioAPIKey";
```

Conclusion:

This project integrates a fingerprint sensor with Wi-Fi capabilities to control access and send notifications via WhatsApp.

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