ChatGPT

Project Report: ESP8266-Based Wi-Fi Drone Detection & Alert System

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1. Title:\ ESP8266-Based Wi-Fi Drone Detection & Telegram Alert System

2. Abstract:\ This project presents a lightweight, low-cost drone detection system using an ESP8266 microcontroller. By scanning 2.4GHz Wi-Fi signals in the vicinity, the system identifies potential drone controllers or unauthorized devices. Upon detection of suspicious activity based on RSSI (signal strength) and MAC address filtering, the system sends an immediate alert via a Telegram bot. This system is intended for early detection of unauthorized drone presence, particularly in security-sensitive zones.

3. Objective:\ To develop a portable, real-time drone detection system that:

- Detects nearby Wi-Fi-based drone controllers
- Sends real-time alerts via Telegram
- Operates on minimal hardware with battery support
- Can be extended for future IoT/security applications

4. Block Diagram:

```
[ Drone/Wi-Fi Source ]
        |
        v
[ ESP8266 ] --> Scans for SSIDs + MACs
        |
        v
[ Whitelist/Blacklist Filtering ]
        |
        v
[ Signal Strength Check (RSSI) ]
        |
        v
[ Trigger Alert ] --> [Telegram Bot API] --> [User Notification]
```

5. Components Used:

- ESP8266 NodeMCU
- Li-Po Battery (3.7V, optional)
- Micro-USB Cable
- Optional: OLED Display, Passive Buzzer, Directional Antenna

6. Software & Libraries:

- Arduino IDE
- ESP8266WiFi.h
- WiFiClientSecure.h
- Telegram Bot Library (HTTPS)

7. Workflow:

1. ESP8266 boots and connects to Wi-Fi
2. Initiates Wi-Fi scan of nearby 2.4GHz devices
3. Compares detected MACs against whitelist
4. Filters by signal strength (> -70 RSSI)
5. If suspicious, formats a message
6. Sends alert via Telegram API using HTTPS

8. Sample Output (Serial Monitor):

```
 Scanning for nearby devices...
Suspicious device: A4:CF:12:34:56:78 (RSSI: -59)
Telegram alert sent.
```

Telegram Message:

```
 Suspicious Drone Detected!
MAC: A4:CF:12:34:56:78
RSSI: -59
```

9. Applications:

- Drone no-fly zone security
- Border surveillance
- IoT-based security monitoring
- Educational/research tool for wireless security

10. Future Scope:

- Integration with GPS and real-time mapping
- Logging to Firebase or Google Sheets
- Buzzer or LED display alert
- Detection of other RF protocols (e.g., DJI OcuSync, 5.8GHz)

11. Conclusion: This project successfully demonstrates a cost-effective approach to drone signal detection using off-the-shelf components. The integration with Telegram makes it ideal for instant alerts without relying on complex infrastructure. With future upgrades, it can evolve into a fully capable, field-ready detection module.

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