

Drone-Based No-Internet Communication Network

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Abstract: *Natural disasters such as earthquakes, floods, and landslides often lead to the collapse of conventional communication infrastructure, which will make rescue operations difficult and delay emergency response. This project will present the development of a Drone-Based No Internet Communication Network using ESP32 and GPS modules. The system will integrate a NEO-6M GPS module to obtain real-time location coordinates and an ESP32 microcontroller to create a Wi-Fi hotspot, enabling victims to connect and send SOS. Each SOS message will be automatically tagged with the sender's GPS location and will be transmitted to a base station through ESP-NOW or mesh networking. By deploying the system on a lightweight drone powered by a portable battery, communication coverage will be quickly established in disaster-affected areas.*

The proposed system will be cost-effective, portable, and scalable, providing a practical solution to ensure timely rescue operations, reduce response delays, and enhance disaster management efficiency..

Keywords: Disaster Communication, Drone, ESP32, GPS, Wi-Fi Hotspot, Mesh Networking, Rescue System

I. INTRODUCTION

Natural disasters such as earthquakes, floods, and landslides often cause a complete collapse of communication infrastructure. In such scenarios, victims are unable to send their location or emergency messages, which delays rescue operations and increases fatalities. Traditional communication systems are expensive and dependent on cellular or satellite networks, which may not be available in rural or disaster-affected regions. This project, "Drone-Based No-Internet Communication Network", will aim to design and develop a low-cost and portable communication system using ESP32 microcontroller and GPS module mounted on drones. The drone will act as a mobile communication relay by creating a Wi-Fi hotspot to enable victims to connect using their smartphones and send SOS messages without internet. Each message will be tagged with real-time GPS coordinates and transmitted to a base station laptop or smartphone using ESP-NOW or mesh networking. By deploying drones in affected areas, communication coverage will be quickly established, supporting faster rescue and relief operations. In situations where internet connectivity or cellular infrastructure is unavailable, drone-based communication networks serve as an alternative for enabling data exchange and coordination. These networks are particularly useful in disaster management, defense communication, and remote monitoring applications. Unlike traditional systems that rely on fixed infrastructure, drones can form an adaptive ad-hoc network where each drone acts as a communication relay node. Technologies such as ESP32, LoRa, and GPS modules make it possible to create low power, long-range, and location-aware communication links between drones and ground users. The primary goal of such networks is to provide a temporary communication channel during emergencies or in areas lacking network coverage. Research has focused on optimizing routing protocols, energy management, and mobility control to ensure seamless connectivity and efficient data transfer. With advancements in embedded systems and wireless protocols, drone-based no-internet communication systems are becoming more practical, scalable, and affordable.



II. LITERATURE SURVEY

In recent years, Unmanned Aerial Vehicles (UAVs), commonly known as drones, have gained significant attention as a promising solution for enhancing communication in emergency and remote environments. Various researchers have proposed innovative frameworks and algorithms to utilize drones for establishing reliable, adaptive, and efficient communication networks during disasters or low-infrastructure scenarios. (2025) proposed a drone-assisted mesh network framework designed to provide emergency connectivity in remote and low-infrastructure zones. Their study demonstrated that drones could function as mobile network nodes, dynamically forming communication links to maintain connectivity during disaster situations. Extending this work, Sutradhar and Manipal Academy of Higher Education (2025) presented a drone-based mesh communication model that improved data transmission reliability in critical situations. Their research emphasized the adaptability and mobility of drones for emergency rescue operations and post-disaster recovery. (2024) introduced a geo- drone-based Service-Oriented Architecture (SOA) routing algorithm, aimed at improving communication stability in emergency ad-hoc networks. Their approach significantly enhanced wireless link reliability, proving highly effective in challenging disaster environments where traditional infrastructure fails. (2024) developed a drone-based mobile full-duplex optical communication system, enabling simultaneous data transmission and reception. This advancement supports high-capacity and low-latency communication, which is vital for real-time data exchange during emergency response operations. (2024) focused on optimal handover strategies for Search and Rescue (SAR) drones using a digital twin-based approach. Their model ensured uninterrupted connectivity as drones transitioned between coverage zones, which is essential for maintaining continuous situational awareness in rescue missions. Furthermore, their work highlighted the synergy between deep learning, IoT, and real-time monitoring, enhancing operational efficiency and safety in critical conditions. Krishnakumar and Asokan (2023) proposed a geographic drone-based route optimization technique for emergency ad-hoc networks. Their findings indicated improvements in communication speed, energy efficiency, and reliability, which are crucial for time-sensitive disaster management. (2022) designed an inspection network for UAVs based on 4G/5G communication technologies, demonstrating how next-generation wireless systems could enable long-range, low-latency, and high-throughput connectivity for remote monitoring and emergency response. (2021) investigated drone-assisted multiple-antenna backscatter IoT sensor networks, illustrating how UAVs can enhance connectivity in resource-constrained environments. Their research revealed the potential of integrating drones with IoT infrastructure to extend communication coverage and improve data collection in large-scale systems such as disaster zones, agriculture, or environmental monitoring. Overall, these studies collectively emphasize the growing importance of drones as intelligent communication agents capable of supporting resilient, adaptive, and high-performance networks in critical situations. The integration of technologies such as AI, IoT, 5G, and optical communication further strengthens the role of UAVs in establishing robust emergency communication frameworks for future smart and disaster-resilient societies.

III. PROPOSED METHODOLOGY

The system consists of five main components — ESP8266, OLED Display, Neo-6M GPS Module, Li-Po Battery, and a Push Button Switch. The ESP8266 Wi-Fi microcontroller is the core of the system. Two modules are used — one at the ground unit and another on the drone. The ground ESP8266 acts as a Wi-Fi hotspot and collects data such as GPS coordinates and SOS signals. It sends this information to the drone ESP8266 using the ESP-NOW communication protocol. The drone ESP8266 then transmits the received data to the admin server or control center for monitoring. This enables reliable wireless communication even in areas without mobile networks. The OLED display is connected to the ground ESP8266 through I2C communication. It is used to show system information such as Wi-Fi status, GPS connection, SOS sent, and battery level. This helps in easily monitoring the working status of the device without connecting it to a computer. The Neo-6M GPS module provides real-time location data, including latitude and longitude. It communicates with the ESP8266 using UART (TX/RX) pins. When an emergency occurs, the GPS module provides the current location, which is then transmitted by the ground ESP8266 to the drone and further to the rescue team. The Li-Po battery is used as the main power supply for the entire system. It ensures portable and continuous operation of all components, especially during outdoor or emergency conditions. The battery level is also indicated on the OLED display for easy power management. The push button switch acts as an SOS trigger. When pressed by the victim, it sends a signal



to the ESP8266 to collect the current GPS data from the Neo-6M module and transmit it wirelessly to the drone. This helps in sending quick distress alerts with accurate location details to rescuers Overall, the system works in a sequence where the button press activates the ESP8266, the GPS module provides the location, the OLED displays the status, and the data is wirelessly This ensures a fast, portable, and efficient emergency communication mechanism for disaster or rescue operations.

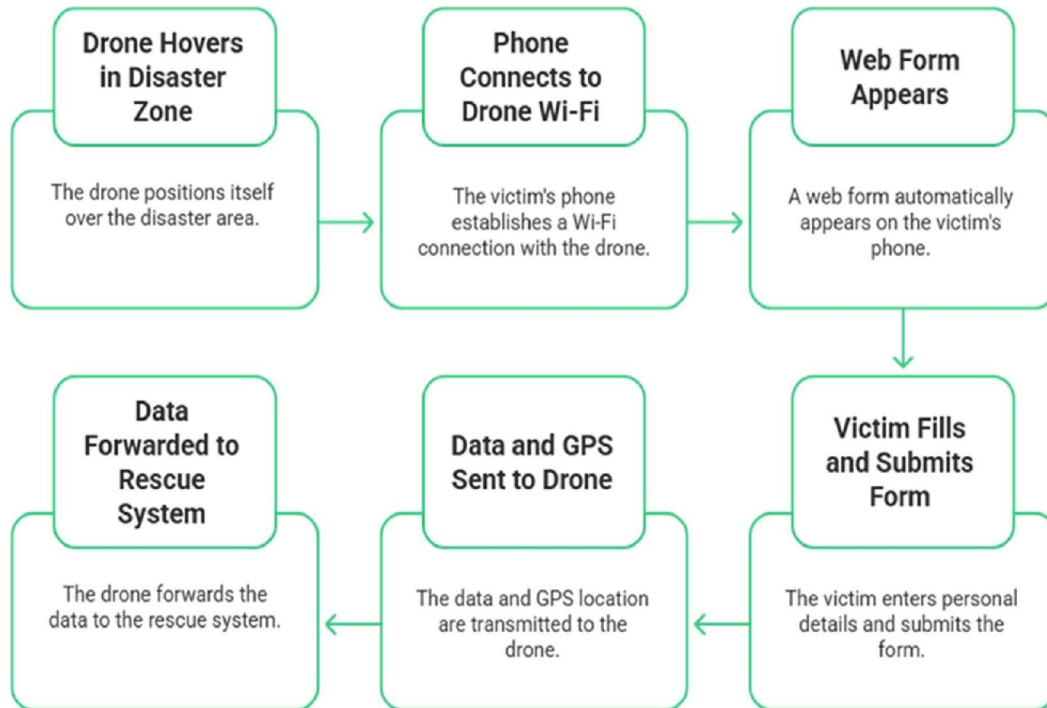


Fig. 1 Block Diagram of System

IV. CONCLUSION

The proposed project will demonstrate that a drone-based ESP32 and GPS communication system can serve as a reliable and cost-effective solution for disaster communication. By providing real-time location data and enabling offline SOS messaging, the system will reduce rescue response times and improve disaster management efficiency. The project will also prove scalable, allowing multiple drones to form a mesh network for covering larger affected areas. The proposed system successfully demonstrates a reliable and low-cost drone-assisted emergency communication network using ESP8266 Wi-Fi microcontrollers. By combining wireless communication with GPS technology, the system ensures that location data and SOS messages can be transmitted effectively even in areas with no cellular network coverage. This makes it highly useful for disaster management, rescue operations, and emergency response in remote regions. The integration of the Neo-6M GPS module, OLED display, and Li-Po battery provides real-time location tracking, easy status monitoring, and portable operation. The use of ESP-NOW communication between two ESP8266 modules allows for quick and efficient data transfer with minimal power consumption. The system design is compact, scalable, and suitable for drone-based deployment, enhancing the overall communication range and reliability. In conclusion, this project demonstrates an innovative use of IoT and drone technology to create a wireless emergency alert system that can save lives during critical situations. With further development, features like cloud integration, live tracking maps, and sensor-based automation can make the system even more powerful and practical for large-scale disaster management and rescue missions.



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