



OPTRONIX 2025

9th International Conference on Opto - Electronics and Applied Optics Conference Proceedings

*Organized by ECE and CSE(IoT)
Department, UEM Kolkata*

CONTENTS

PageNo.	TOPICNAME
8	Biography of the Speakers & The Chief Guests
20	Keynote Speeches
26	Abstract of Accepted Papers
27	Detection of Heart Patient using Machine Learning Algorithms
28	Prospects of Hybrid LoRa Communication Framework for Ultra-Efficient UAV Mediated Disaster Management
29	IoT-based Automated Soil Monitoring and Irrigation System
30	Exploring Data Transmission Efficiency in Li-Fi Communication Systems
31	Prediction of Future Lightning: A Novel Deep Learning based Approach
32	Smart IoT Based Fire Extinguishing Rover with Real-Time Video Monitoring System
33	IoT based Forest Fire Detection and Extinguishing System

Prospects of Hybrid LoRa Communication Framework for Ultra-Efficient UAV Mediated Disaster Management

¹ Chandramouli Haldar, ² Soumik Podder, ¹ Soma Boral

¹ Department of Computer Science and Engineering, Guru Nanak Institute of Technology, Kolkata, India

² Basic Science and Humanities, University of Engineering and Management, Kolkata, India

Abstract.

Unmanned Aerial Vehicles (UAVs) are turned out to be more prevalent in disaster management for search and rescue missions, environmental monitoring, and damage assessment. However, one of the biggest issues in such missions is to possess an efficient communication network, particularly where there is no conventional infrastructure. Low power but long range properties are associated with LoRa technology that essentially facilitates good UAV communications but at the expense of low data rate and non-scalability. This article suggests a hybrid communication system consisting of a Multi-UAV LoRa Mesh Network (FANET) and ad-hoc LoRaWAN infrastructure emplaced by UAVs to mitigate these challenges. In the proposed system here, a group of UAVs form a self-healing LoRa-based mesh network to communicate and share data over extensive coverage areas, while individual UAVs act as temporary aerial LoRaWAN gateways, consolidating and relaying data to ground stations. This architecture provides more resilient, energy-efficient, and adaptive communication among UAVs, as well as enhanced data gathering through ground sensors. Such attributes are the result of dual-layer integration, which resolves the limitations of standalone LoRa or LoRaWAN systems while allowing for persistent use in challenging, infrastructure-limited environments. The technology holds a lot of promise for real-time disaster situations that call for adaptability and communications reliability.

Keywords— UAV, Disaster Management, LoRa, LoRaWAN , FANET (Flying Ad Hoc Network), integration, Emergency Response

