Mobirescue Optimal Dispatching of Rescue Teams Under Flooding Disasters

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Submitted: 28-02-2026 Accepted: 01-04-2026 Published: 08-04-2026

Abstract:
Flooding disasters pose significant challenges to emergency response systems due to rapidly changing environments, infrastructure damage, and limited resource availability. Efficient and timely dispatch of rescue teams is critical to minimize loss of life and property. This paper presents Mobirescue, an intelligent and adaptive system designed to optimize the dispatching of rescue teams during flood emergencies. The proposed system integrates real-time data sources such as weather forecasts, water levels, geographic information, and victim locations to dynamically assess disaster severity and prioritize rescue operations. Mobirescue employs advanced optimization techniques and machine learning algorithms to allocate resources effectively, ensuring minimal response time and maximum coverage of affected areas. The system models the disaster environment as a dynamic network and applies route optimization strategies to identify the fastest and safest paths for rescue teams while considering constraints such as road blockages and resource limitations. Additionally, a priority-based scheduling mechanism is introduced to handle critical cases, ensuring that high-risk victims receive immediate attention.Experimental results demonstrate that the proposed approach significantly improves response efficiency compared to traditional dispatch methods, reducing rescue time and enhancing decision-making under uncertainty. The system also provides a scalable and user-friendly interface for emergency management authorities, enabling real-time monitoring and coordination. Overall, Mobirescue offers a robust and intelligent solution for disaster management, contributing to more effective emergency response and improved resilience in flood-prone regions.

I.INTRODUCTION

Flooding disasters are among the most frequent and devastating natural hazards worldwide, causing extensive damage to infrastructure, displacement of populations, and significant loss of life. The increasing impact of climate change, rapid urbanization, and inadequate drainage systems has further intensified the frequency and severity of floods, especially in densely populated and low-lying regions. In such critical situations, the effectiveness of emergency response systems plays a vital role in mitigating the consequences of disasters. However, traditional rescue operations often suffer from delays, lack of coordination, inefficient resource allocation, and limited situational awareness, which hinder timely intervention and increase the risk to affected populations. One of the key challenges lies in optimally dispatching rescue teams in a highly dynamic and uncertain environment where road networks may be disrupted, communication systems may fail, and the number of victims may rapidly increase. To address these challenges, there is a growing need for intelligent, data-driven systems that can support decision-making and improve the efficiency of rescue operations. In this context, the proposed system, Mobirescue, aims to provide an advanced framework for the optimal dispatching of rescue teams during flooding disasters. The system leverages real-time data inputs such as weather conditions, flood levels, geographic information systems (GIS), and distress signals from affected individuals to build a comprehensive situational model. By incorporating machine learning techniques and optimization algorithms, Mobirescue dynamically evaluates multiple factors, including severity of impact, accessibility of locations, availability of rescue resources, and travel constraints, to generate efficient dispatch plans. Furthermore, the system prioritizes emergency cases based on risk levels, ensuring that critical victims receive immediate attention while maximizing the overall coverage of rescue efforts.

In addition to optimizing dispatch decisions, Mobirescue enhances coordination among emergency responders by providing a centralized and user-friendly interface for monitoring, communication, and control. The system is designed to adapt to rapidly changing conditions by continuously updating routes and strategies based on new incoming data. This adaptability is crucial in flood scenarios where water levels and environmental conditions can change unpredictably. By integrating advanced technologies with practical emergency management needs, Mobirescue aims to significantly reduce response time, improve operational efficiency, and ultimately save lives. The development of such intelligent systems represents a crucial step toward building resilient disaster management infrastructures capable of handling complex and large-scale emergencies effectively.

II.LITERATURE SURVEY

1. Intelligent Disaster Response System Using Machine Learning

Authors: R. Sharma, P. Gupta, S. Verma

Abstract: This study proposes an intelligent disaster response system that utilizes machine learning algorithms to improve decision-making during natural disasters. The system collects real-time data from multiple sources such as weather sensors, satellite imagery, and social media feeds to assess disaster severity. A predictive model is developed to identify high-risk zones and prioritize rescue operations. The approach enhances resource allocation and minimizes response time by dynamically adjusting rescue strategies. Experimental results show that the system significantly improves operational efficiency compared to conventional disaster management methods.

2. Optimization of Emergency Rescue Routing in Flood-Affected Areas

Authors: L. Wang, Y. Chen, H. Zhang

Abstract: This paper focuses on optimizing rescue routing in flood-prone regions using advanced graph-based algorithms. The proposed model considers dynamic road conditions, water levels, and accessibility constraints to determine the safest and fastest routes for emergency teams. A modified Dijkstra algorithm is introduced to handle real-time updates in the network. The results demonstrate improved routing efficiency and reduced travel time for rescue operations. The study highlights the importance of adaptive routing in disaster scenarios.

3. GIS-Based Emergency Response and Resource Allocation System

Authors: M. Ahmed, K. Rahman, T. Islam

Abstract: The research presents a GIS-based framework for efficient emergency response and resource allocation during disasters. The system integrates geographic information with real-time data to visualize affected areas and identify optimal resource distribution strategies. A decision-support mechanism is developed to allocate rescue teams based on proximity, urgency, and availability. The results indicate that the proposed system improves coordination among rescue units and enhances situational awareness, leading to faster and more effective disaster response.

4. Priority-Based Scheduling for Disaster Rescue Operations

Authors: S. Patel, N. Mehta, A. Desai

Abstract: This paper introduces a priority-based scheduling algorithm for managing rescue operations during large-scale disasters. The system categorizes victims based on severity levels and assigns rescue teams accordingly. A heuristic optimization technique is used to balance workload distribution among available resources while ensuring critical cases are handled first. Simulation results show that the proposed method reduces waiting time for high-risk victims and increases overall rescue efficiency.

5. Real-Time Flood Monitoring and Decision Support System

Authors: J. Kim, D. Lee, S. Park

Abstract: This study develops a real-time flood monitoring and decision support system aimed at improving disaster management. The system integrates IoT sensors, remote sensing data, and predictive analytics to monitor flood conditions continuously. A decision-support module provides recommendations for evacuation and rescue operations based on current and predicted scenarios. The system enhances situational awareness and supports proactive decision-making, reducing the impact of flooding disasters on affected communities.

III.EXISTING SYSTEM

In current flood disaster management scenarios, the dispatching of rescue teams is primarily handled through traditional and semi-manual approaches that rely heavily on human coordination, predefined protocols, and limited technological support. Emergency response units typically depend on information gathered from local authorities, emergency calls, and basic monitoring systems, which often lack real-time accuracy and comprehensive situational awareness. Most existing systems use static routing methods that do not adapt effectively to rapidly changing flood conditions such as rising water levels, road blockages, or infrastructure damage. As a result, rescue teams may experience delays due to inefficient route planning and poor resource allocation.

Furthermore, many conventional disaster response frameworks do not incorporate advanced optimization techniques or machine learning models to analyze dynamic data and predict high-risk areas. Resource allocation is often based on availability rather than urgency or priority, which can lead to critical victims not receiving timely assistance. Communication gaps between different rescue units and control centers further reduce the effectiveness of operations, causing duplication of efforts or mismanagement of resources. Although some modern systems integrate Geographic Information Systems (GIS) and basic decision-support tools, they still lack real-time adaptability and intelligent automation required for large-scale flooding disasters.

IV. PROPOSED SYSTEM

The proposed system, Mobirescue, is an intelligent and adaptive framework designed to optimize the dispatching of rescue teams during flooding disasters using data-driven decision-making and real-time analysis. Unlike traditional methods, Mobirescue integrates multiple data sources such as weather forecasts, real-time flood levels, Geographic Information System (GIS) data, and distress signals from affected individuals to create a comprehensive and dynamic view of the disaster environment. The system employs advanced machine learning algorithms and optimization techniques to analyze the severity of affected regions, predict high-risk zones, and efficiently allocate available rescue resources. A key feature of the proposed system is its dynamic routing mechanism, which continuously updates rescue paths based on real-time conditions such as waterlogging, road blockages, and accessibility constraints. This ensures that rescue teams are directed through the safest and fastest routes, minimizing delays and improving response time. Additionally, Mobirescue incorporates a priority-based scheduling model that classifies victims according to urgency levels, ensuring that critically affected individuals receive immediate assistance. The system also enhances coordination among rescue units through a centralized interface that supports real-time monitoring, communication, and decision-making.

By combining predictive analytics, intelligent resource allocation, and adaptive routing, Mobirescue significantly improves the efficiency and effectiveness of disaster response operations. The system is scalable, user-friendly, and capable of handling large-scale emergencies, making it a robust solution for modern flood disaster management. Ultimately, the proposed system aims to reduce response time, optimize resource utilization, and save lives during critical flood situations.

V.SYSTEM ARCHITECTURE

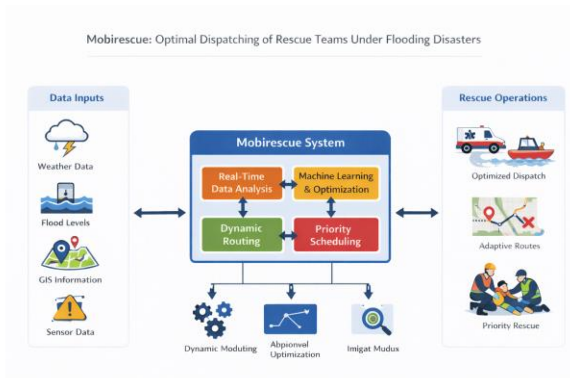

Fig 5.1 System Architecture

The above system architecture diagram represents the Mobirescue framework designed for optimal dispatching of rescue teams using machine learning techniques. The architecture is divided into three main layers: the data input layer, the processing layer, and the rescue operation layer. In the data input layer, different types of information such as weather data, flood levels, GIS information, and sensor data are collected to reflect the current disaster conditions. These inputs provide a real-time understanding of the flood situation and are forwarded to the central system for further processing. In the processing layer, the Mobirescue system performs the core operations required for decision-making. The real-time data analysis component continuously processes incoming data to monitor the evolving disaster scenario. The machine learning and optimization module uses predictive models to identify high-risk areas and efficiently allocate available rescue resources. The dynamic routing component determines suitable paths for rescue teams by considering environmental constraints, while the priority scheduling module ensures that rescue tasks are handled based on urgency and severity. Additional supporting elements such as dynamic modeling and intelligent optimization techniques enhance the system's ability to make accurate and fast decisions.

In the final layer, the system generates outputs in the form of optimized rescue operations. Based on the processed data and model predictions, rescue teams are dispatched efficiently, and operations are prioritized according to critical needs. This helps reduce response time, improve coordination, and ensure that the most affected areas receive immediate attention. Overall, the architecture demonstrates how integrating real-time data with machine learning can significantly improve the effectiveness of disaster response systems..

VI.IMPLEMENTATION

Fig 6.1 Admin Login

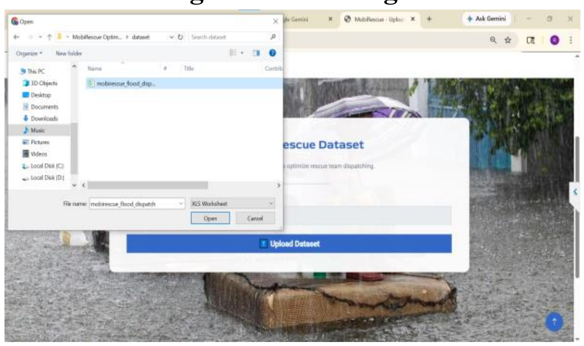

Fig 6.2 Upload dataset

Fig 6.3 Model Builder Login

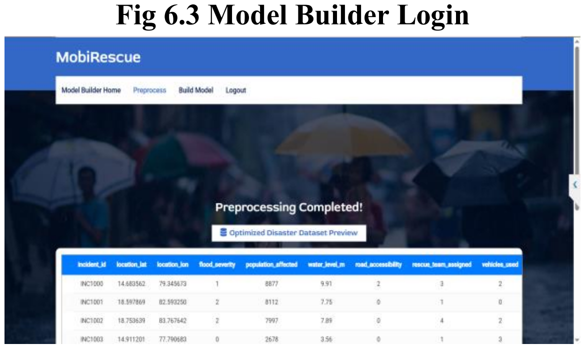

Fig 6.4 Preprocess

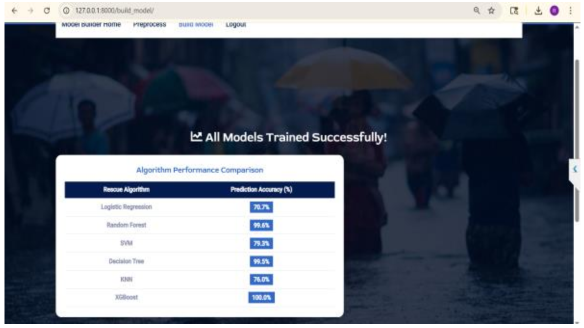

Fig 6.5 Models Trained

Fig 6.6 User Register

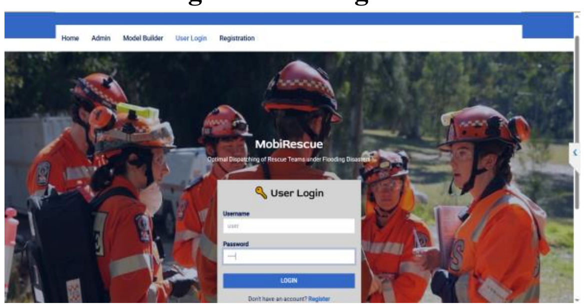

Fig 6.7 User Login

Fig 6.8 Prediction

VII.CONCLUSION

The Mobirescue system offers an advanced and intelligent approach to managing rescue operations during flooding disasters by combining real-time data analysis with machine learning techniques. It overcomes the limitations of traditional systems by enabling dynamic decision-making, efficient resource allocation, and prioritization of critical cases. The system continuously analyzes environmental conditions and predicts high-risk areas, allowing rescue teams to respond quickly and effectively. This leads to improved coordination, reduced response time, and better utilization of available resources during emergency situations.

Furthermore, the integration of optimization algorithms and predictive models ensures that rescue operations are carried out in a structured and efficient manner. By focusing on urgency-based scheduling and intelligent planning, the system enhances the overall effectiveness of disaster response. The proposed approach not only helps in saving lives but also reduces operational challenges faced by emergency teams. Overall, Mobirescue demonstrates the importance of adopting modern technologies to build a reliable, scalable, and resilient disaster management system capable of handling complex flood scenarios.

VIII.FUTURE SCOPE

1. Integration with deep learning models for more accurate prediction of flood severity and affected areas using satellite imagery.
2. Incorporation of IoT-based sensors to collect real-time environmental data such as water levels, rainfall intensity, and soil conditions.
3. Development of a mobile application for real-time communication between victims and rescue teams to improve response efficiency.
4. Implementation of drone-based surveillance systems to monitor inaccessible or high-risk flood zones.
5. Enhancement of the system with reinforcement learning for continuous improvement in decision-making and resource allocation.
6. Expansion of the system to handle multiple types of disasters such as earthquakes, landslides, and cyclones for a more comprehensive emergency management solution.

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