Chapter 10
Smart Disaster Management Minimizing Response Time in Disaster Situations Using AI

Usharani Bhimavarapu
https://orcid.org/0000-0002-0246-1420
Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, India

ABSTRACT

Rescue Team Scheduling Mode is an essential part of disaster management that facilitates timely deployment of emergency response teams with optimal utilization of resources. Conventional scheduling models are likely to fail in accommodating dynamic environments, uncertain disaster scenarios, and real-time decision-making. To address these challenges, a robust scheduling algorithm is presented, which combines machine learning, reinforcement learning, and optimization techniques. The algorithm takes into account factors like the severity of emergencies, availability of teams, current traffic conditions, and environmental limitations to distribute resources optimally. Using algorithms such as Multi-Objective Genetic Algorithm (MOGA), Ant Colony Optimization (ACO), and Reinforcement Learning (RL), the model redistributes teams adaptively and optimizes routes. The suggested mode of scheduling also provides equitable load distribution, reduces response time, and improves coordination among different agencies.

DOI: 10.4018/979-8-3373-0245-4.ch010

INTRODUCTION

Artificial Intelligence (AI) is revolutionizing crisis management and emergency response by enhancing disaster preparedness speed and efficiency. Predictive analytics powered by AI has the ability to determine potential threats and predict disasters by analyzing real-time and historical data. Machine learning algorithms trawl large data sets and find patterns, enabling officials to respond ahead of a crisis proactively. Artificial intelligence early warning systems improve readiness by availing timely notifications from environmental and meteorological information. Technologies lower the response time, pay for damages, and save lives. AI also eases interactions among emergency teams, the state, and the public. AI chatbots give immediate information, such that impacted communities get timely guidance. AI social media monitoring allows the authorities to track opinions and arising hazards amid crises. The predictive ability of AI allows governments and institutions to make effective disaster management decisions. AI assists emergency response teams in becoming stronger and minimizing the effects of disasters. AI is also essential in supplementing disaster response with automation and intelligent decision-making. AI-driven image recognition drones conduct real-time aerial evaluations of the impacted zones. The drones can pick out survivors, evaluate the level of damage to structures, and chart damaged regions to aid rescue missions. Robots driven by artificial intelligence are sent into danger zones where human entry is unsafe, i.e., in rubble or chemical spill-affected areas. Autonomous vehicles driven by AI can ferry relief supplies, shortening the logistical delays in affected areas. Decision-support systems based on AI scan inputs from many sources and give advice to first responders about the best action. The systems combine satellite imagery, weather, and emergency reports to create actionable information. AI enhances the distribution of medicine, food, and shelter to the affected people as well. Machine learning applications give priority to rescue efforts by urgency and severity. Human mistakes are minimized and relief activities are streamlined in coordination during disasters. Through AI, emergency teams can provide informed choices and carry out schemes more accurately.

AI enables crisis communication in guaranteeing the communication of life-saving information to victims. Natural language processing (NLP) allows AI-driven chatbots to offer real-time assistance in emergencies. Chatbots respond to questions, direct individuals to secure areas, and disseminate critical updates. Artificial intelligence-based speech recognition technologies filter through emergency calls for identifying distress and route critical cases first. AI-based social media sentiment analysis notifies authorities of public fears and disinformation. AI also enhances multilingual communication through real-time translation, making crisis messages inclusive. AI-based virtual assistants aid emergency hotlines by filtering out non-emergency cases, hence enabling human operators to treat the emergency ones. AI