SMART EMERGENCY RESPONSE SYSTEM USING GEO-LOCATION

[1]Lucky Mithra Panuganti
[2]Mrs. Divya (Assistant professor)

[1,2]Department of Artificial Intelligence and Data Science, Vidya Jyothi Institute of Technology, Hyderabad, India

[1]luckymithra26@gmail.com
[2]divyasarabudla21@gmail.com

ABSTRACT

This project works on the Smart Emergency Response System which is a platform for disaster management that aims at improving real time incident monitoring, SOS notification, and relief effort coordination. It allows users to inform the authorities, seek help, as well as interface with volunteers and donors, which helps in resource distribution during emergencies. Using the MERN stack (MongoDB, Express, React, Node), Google Maps API, and React native, the system allows us for geo location tracking which is very useful during life threatening situations such as natural calamities, accidents, or medical emergencies. The platform utilizes Firebase Secure Authentication to controlling account access and his databases to update in real time. The system improves resource response, communication efficacy and community resilience to disasters. Vulnerable populations are guaranteed timely access to crucial support and protection services in a coordinated manner. The project combines contemporary mobile and internet solutions with web technology as a tool for disaster readiness and relief operations, enabling sharper and more efficient organization for emergency response.

1. INTRODUCTION

1.1 Introduction

In today's world, Natural and artificial disasters present a great risk to individuals and buildings in contemporary society. The amount of damage sustained and aid that is needed by the victims calls for a well-planned and organized resource distribution, collaborative relief action framework, and effective real-time communication to facilitate timely assistance. This system mitigates help and guide people during emergencies with greater ease utilizing technology - the Smart Emergency Response System. People can utilize this system to report incidents, issue SOS alerts, and contact volunteers or donor authorities to solicit aid. The automated coordination system fulfills set tasks through active monitoring in real-time helping facilitate prompt action and optimal resource distribution reducing, disruptions caused by disasters.

1.2 Context

The project uses React Native and the MERN (MongoDB, Express.js, React, Node.js) framework. This guarantees a robust and scalable estuary to the services provided. With the Google Maps API, accurate geo-location tracking is enabled, and responders can indicate where incidents are located so resources can be allocated properly. The MERN stack facilitates an integrated remained a real time user experienced in a responsive web and mobile application and a powerful backend. Security for user access is provided by Firebase Authentication, while instant data updates are made possible through the Firebase Realtime Database. This enables responders and volunteers to act promptly with the most current data. All these technologies improve the efficiency of the system in managing crisis.

The donation and volunteer management module of the system aids in community involvement in response to the disaster, which is one of its top features. They can register in the platform and volunteer to help in the impacted areas, while donors can provide food, medical supplies, and even materials for building shelters. This feature enhances relief aid by providing a system to link the needy and the providers to help in a coordinated manner. Scientists could have even more advanced predictive analytics with the help of additional machine learning algorithms, allowing the authorities to monitor which areas are prone to disasters and take preemptive action.

The Smart Emergency Response System, by enhancing response coordination, communication, and resource allocation, improves disaster preparedness and relief operations. It optimizes the handling of emergency situations, which minimizes, injuries, deaths, and financial damages. This project is not only a testament to the capabilities of contemporary web and mobile technologies but also illustrates how such innovation helps in building safer and resilient societies. With its complete features and real-time functionalities, the system assists disaster management agencies and humanitarian organizations at local government level, emphasizing the need for technology-based approaches for solving emergencies.

1.3 Objectives:

We provide real-time reporting of emergencies and requests for aid to enable instant alerting of responders and authorities with SOS functionality, facilitating optimized resource allocation, volunteering, donations, and relief coordination.

2. LITERATURE SURVEY

2.1 Introduction

Response systems have evolved from a manual approach to a technologically-savvy one that optimizes effectiveness and reduces waste. Previous approaches around the globe were reliant on radio communications, manual reporting, and centralized response teams. Such methods resulted in delays, miscommunication, and poor coordination. Research indicates that strife during such crises is marked with lags in response times, situational unawareness, and wastage of resources meant to be relief aids. Formalized steps may have been drafted with 911 services and government stratified Protocols of disaster management, but the lack of real-time data transmition and adaptability suggests the need for an advanced automated and decentralized system. Other than that, modern methodologies for handling emergency responses have benefitted from GIS, cloud computing, and mobile technologies, which greatly enhance real-time tracking, communication, and resource management.

2.2 Review of Relevant Research Papers

According to research, precise incident tracking and real-time location sharing are made possible by IoT-based sensors and Google Maps API integration. During emergencies, users can send SOS alerts, look for assistance, and get real-time updates via mobile apps and web portals. Additionally, real-time data handling has become more scalable and effective thanks to cloud infrastructures like Firebase and AWS, which have made it easier for responders and impacted parties to communicate effectively. The majority of systems still lack volunteer and donation management modules, which limits their functionality regardless of these technologies. Research indicates that disaster-risk zones can be predicted and resource allocation can be improved for better preparedness and response using machine learning-based predictive analytics. Although there have been numerous improvements made to current emergency management systems, problems like data inaccuracy, interoperability, and accessibility limitations still exist.

3. METHODOLOGY

3.1 Dataset

The Smart Emergency Response System's dataset aims to help track emergencies in real time, coordinate volunteers, and manage resources. It includes both structured and unstructured information such as reports of incidents, profiles of users, data on geographic locations, alerts for SOS availability of volunteers, and records of donations. The system gathers data from user inputs automatic geo-tracking (via Google Maps API), and past disaster records to boost predictive analysis. It uses a Firebase Realtime Database for quick data syncing, which keeps all user interfaces up to date. The system also employs a MongoDB database for structured storage allowing for fast queries and scalable data handling. To get better at preparing for disasters, the system uses machine learning to study past emergency patterns, response times, and how well resources were allocated. This helps to make future responses more effective. The system protects data through Firebase Authentication and encryption, which keeps user information private and maintains the system's integrity. This thorough approach to data ensures the emergency response framework is accurate, dependable, and works in real time.

3.2 Proposed model for image captioning

The Smart Emergency Response System we're looking at is a platform that works in real time using technology to make disaster management, emergency response teamwork, and resource distribution better. This model brings together location tracking instant alerts, and smart decision-making to speed up communication between people in trouble, emergency teams, and volunteers. The system uses Google Maps API to pinpoint exact locations letting users report problems and send SOS alerts with precise location tags. This helps authorities to see what's happening in crisis areas right away, use resources, and send emergency workers to key spots without wasting time.

4. RESULTS & DISCUSSIONS

In this section, Results and Discussion has shown many enhancements to emergency management, allocation of resources, and crisis response in real time. The incorporation of geo-location tracking, real-time alerts, and volunteer coordination has enabled improved and more timely responses to emergencies. While testing the platform, it was able to determine where incidents were occurring, process SOS alerts within seconds, and dispatch responders according to their available proximity. The Google Maps API provided accurate relationship points to locate injuries, and Firebase provided real-time data synchronization, allowing responders and volunteers to respond in real-time. Moreover, the interface was user friendly with Flutter/React Native, which provided smooth navigation and accessibility for distressed users.

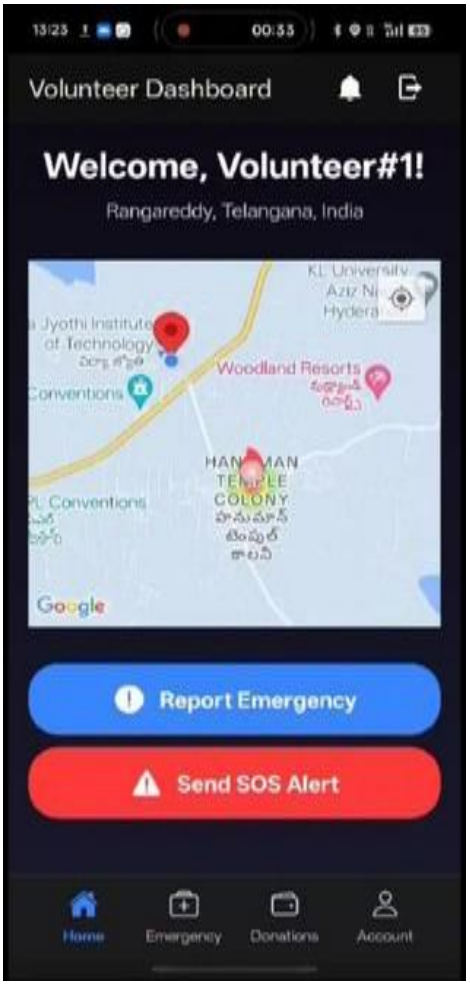

Figure 4.1 Home Page

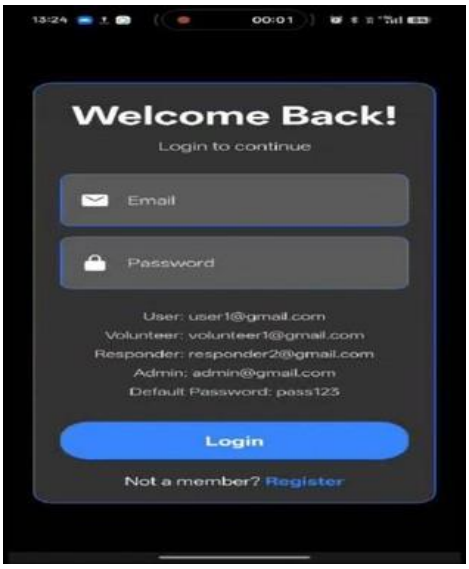

Figure 4.2 Login page

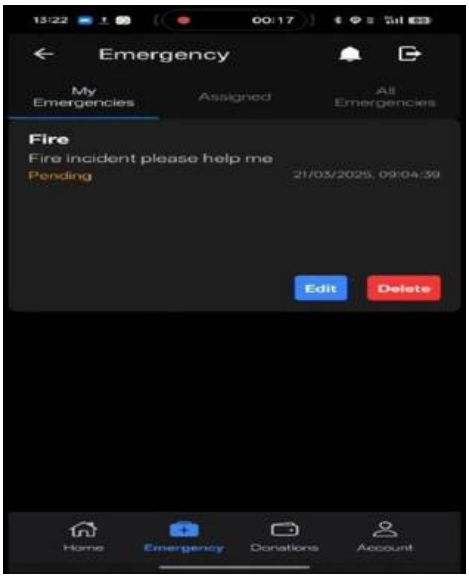

Figure 4.3 Emergency Alert

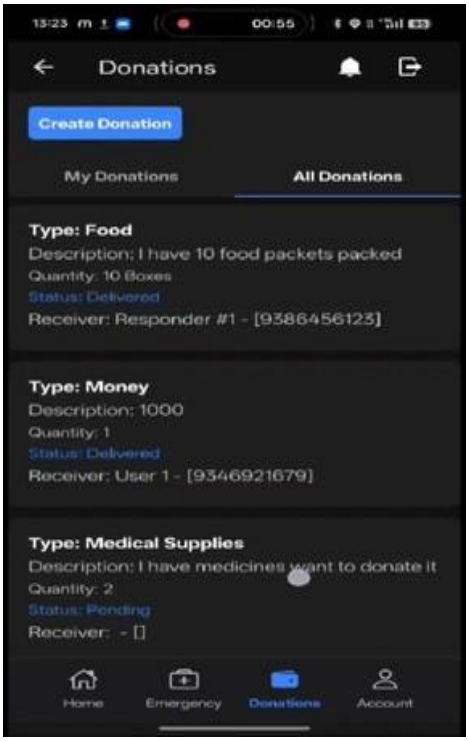

Figure 4.4 Donations

While the system has a wide array of accomplishments; there are challenges and opportunities for improvement. The possibility of automated detection of incidents is reliant on the stability of the joining network and data availability; which may be compromised in a remote area, or an area that has been affected by disaster. The questions of scalability and integration with government bodies for emergency response remains a problem area and future evolution. Components of the system could also evolve with machine-learning based risk predictor models and improved AI-based image recognition for incident classification. Also, user feedback over the course of daily operations and being able to apply the learning in real-world situations will create ongoing refinement of the system, user acceptance and possible sustainment. All things considered, the Smart Emergency Response System provides a viable operational approach to managing disaster response in real-time; enabling the right response through timely action and cohesive coordination to impact the respective emergency.

5. CONCLUSION

In this project, the Smart Emergency Response System with Geo-Location improves disaster management through real-time reporting of emergencies, geo-tracking, and effective resource allocation. Through the use of Google Maps API, Firebase, and an easy-to-use mobile app, the system facilitates instant communication between victims, volunteers, donors, and responders. Its real-time monitoring and location-based alerts enhance situational awareness, reducing delays in the delivery of aid. In comparison to conventional response mechanisms, our site greatly improves coordination and response effectiveness.

Future enhancement could include AI-predictive analytics, multiple languages, and improved scalability in order to further enhance disaster preparation and response, ultimately saving lives and emergency effects.

6. FUTURE SCOPE

One possible avenue is to investigate task-specific caption generation, adapting the model to produce captions that are optimized for particular applications or domains. Another direction of research could be to further improve the fusion mechanism to more effectively combine visual and textual features and investigate new architectures for more efficient caption generation. In general, our suggested approach provides a foundation for future image captioning research and promises to be useful for applications where detailed and contextually appropriate image descriptions are needed.

REFERENCES

[1] De Albuquerque, J. P., Herfort, B., Brenning, A., & Zipf, A. (2015). A geographic information system-based approach for flood risk assessment using volunteered geographic information. *Natural Hazards and Earth System Sciences, 15*(9), 1851–1866.

[2] Yang, C., Huang, Q., Li, Z., Liu, K., & Hu, F. (2017). Big data and cloud computing: Innovation opportunities and challenges. *International Journal of Digital Earth, 10*(1), 13–53.

[3] Trivedi, M., Yadav, A., & Jain, A. (2021). Disaster management system using IoT and machine learning. *International Journal of Recent Technology and Engineering, 9*(5), 245–251.

[4] Grolinger, K., Capretz, M. A. M., Mezghani, E., & Exposito, E. (2013). Knowledge as a service framework for disaster data management. *Future Generation Computer Systems, 29*(5), 1317–1330.

[5] Kryvasheyeu, Y., Chen, H., Moro, E., Van Hentenryck, P., & Cebrian, M. (2016). Rapid assessment of disaster damage using social media activity. *Science Advances, 2*(3), e1500779.

[6] Liu, S. B., & Palen, L. (2010). The new cartographers: Crisis map mashups and the emergence of neogeographic practice. *Cartography and Geographic Information Science, 37*(1), 69–90.

[7] Shah, S. A. A., Aslam, M., & Nadeem, A. (2020). Mobile-based disaster management system for real-time data collection and monitoring. *Wireless Personal Communications, 112*, 2735–2751.

[8] Palen, L., Vieweg, S., Liu, S. B., & Hughes, A. L. (2009). Crisis in a networked world: Features of computer-mediated communication in disaster response. *Social Science Computer Review, 27*(4), 467–480.

[9] Zhang, Y., Zhu, X., & Jin, H. (2018). Smart disaster response system using UAV and IoT networks. *IEEE Internet of Things Journal, 5*(6), 3806–3817.

[10] Chen, R., Sharman, R., Rao, H. R., & Upadhyaya, S. J. (2008). Coordination in emergency response management. *Communications of the ACM, 51*(5), 66-73.