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EMERGENCARE: MOBILE EMERGENCY ALERT AND SUPPORT SYSTEM

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Article Info

Abstract

EmergenCare is transforming emergency response in Pakistan by addressing issues such as poor infrastructure, delayed assistance, and limited public awareness. Using advanced technology, the app connects individuals in emergencies with nearby drivers and hospitals through real-time location tracking and communication. Its distress signal feature ensures quick alerts, significantly reducing response times and saving lives. Beyond immediate aid, EmergenCare fosters a sense of safety within communities and enhances the overall efficiency of emergency services. Transparency and a user feedback system ensure continuous improvement, reinforcing the app's commitment to excellence. As EmergenCare evolves, it exemplifies how technology and innovation can tackle critical societal challenges, offering a lifeline to those in need.

Keywords: *emergency response, real-time location tracking, communication, distress signal, response time.*

Introduction

Effective emergency management requires prioritizing the allocation of medical resources based on immediate needs. Gang Kou and Wenshuai Wu (2014) introduced a model that combines grey theory with multi-criteria decision-making techniques. This approach evaluates the availability of medical resources, identifies optimal strategies, and equips emergency decision-makers with the tools to respond swiftly and effectively. In urban areas, a key decision for emergency medical services (EMS) is choosing between public or private providers for local service delivery. Arthur et al. (2006) analyzed factors influencing these decisions. In Iran, EMS—known as "Emergency 115"—was launched in 1978 with support from the United States. According to Bahadori (2010), the government-funded system provides free services. National benchmarks stipulate that EMS should respond to 80% of cases within eight minutes in cities and 15 minutes in suburban areas. While these standards are met across Iran, they remain unachieved in Tehran, the capital.

Emergency Medical Services (EMS) serves as a cornerstone of public safety, offering initial care and transportation for critically injured individuals before hospital treatment. Aboueljinane et al. (2013) highlight the importance of EMS in efficiently answering emergency calls, delivering first aid, and ensuring patients reach suitable emergency departments. Tools like simulations, mathematical programming, and queuing theory are frequently used to optimize EMS performance, with computer simulation models proving especially effective for analyzing and improving operations.

Sultan Al Shaqsi (2010) described EMS as an integrated system of personnel, facilities, and equipment working together to provide coordinated care for people experiencing sudden injuries or illnesses. The primary mission of EMS is to deliver timely, effective care that minimizes the risk of unnecessary fatalities or long-term health issues. Its key roles include ensuring access to emergency services, delivering community-based care, providing safe transport, and offering appropriate care upon arrival at a healthcare facility. In India, the world's second most populous nation, EMS faces challenges due to a lack of centralized oversight for training and operations. Mohit and Ethan (2014) pointed out that this fragmented system leads to disparities in service availability and is further hindered by limited public awareness of emergency contact numbers.

Addressing traffic accidents remains a significant challenge for Emergency Medical Services (EMS). Konstantinos Kepaptsoglou et al. (2011) proposed a response plan that integrates a location optimization model with a genetic algorithm to strategically position emergency vehicles within urban transportation systems. This method uses accident data—such as frequency and severity—to guide deployment decisions and enhance the effectiveness of emergency responses.

Research Objective

The research objective of EmergenCare revolves around improving the efficiency and effectiveness of emergency response services in Pakistan.

The definite objectives encompassed by the aim are as follows:

A. Minimizing Response Times
The research seeks to investigate strategies to reduce response times in emergency situations, ensuring prompt assistance and medical care for victims.

B. Improving Accessibility The goal is to enhance the accessibility of emergency services, especially in regions with limited infrastructure, by leveraging technological advancements and innovative solutions.

C. Streamlining Coordination The research emphasizes the development of strategies to streamline coordination among users, drivers, and hospitals, promoting a more integrated and synchronized approach to emergency response.

Literature Review

In the study led by P. Beraldi and team (Beraldi, 2004), they're delving into the challenge of creating reliable emergency medical services. They're grappling with the fact that real-life situations are often uncertain and unpredictable. The focus is on finding ways to create strong mathematical models that can handle these uncertainties effectively. They specifically use a framework called stochastic programming, emphasizing a probabilistic approach. This approach involves developing a model with probabilistic constraints to address both the location and sizing issues in emergency medical services. On another note, R. Aringhieri and colleagues (Aringhieri, 2017) recognize a gap in previous review papers that discuss (EMS) location problems. They highlight that only a few reviews consider the full spectrum of EMS systems. Their review aims to bridge this gap by introducing the concept of an emergency. care pathway. This aligns with the evolving trend in healthcare systems, which involves shifting the central role from healthcare providers to patients.
According to Vassiliki Koufi and her team (Koufi, 2010), (EMS) are of utmost importance due to the range of activities involved, spanning from the initial call to an ambulance service to the patient's discharge from the emergency department. The seamless collaboration and coordination of these activities are crucial for both patients and the overall performance of emergency healthcare services. The paper explores the creation of a Personal Health Record (PHR)-based EMS within a cloud computing environment. They highlight the significance of cloud-based services in emergency care, providing easy and immediate access to patient data from virtually any location and device. In another study led by Qiang Su and team (Su, 2015), the focus is on the critical nature of response speed in (EMS), especially in pre-hospital lifesaving scenarios. Every second is vital in emergency cases, necessitating a meticulous design of the EMS network to deliver timely and reliable services. The focus of the paper is on improving the way ambulances are usually deployed, aiming to make the distribution of first-aid resources more efficient. (Levick & Nadine, 1994) mentions

Research Method

In Figure 1 system flow diagram showcases a seamless interaction between the user and driver interfaces, where users can request help through the "Ask for Help feature, triggering a distress signal with their location. The app's location detection function enables the retrieval of nearby drivers and hospital locations, facilitating prompt response. Once a driver accepts the request, they provide assistance, leading to the user's feedback, which enhances the overall service quality and ensures continuous improvement in the emergency response process.

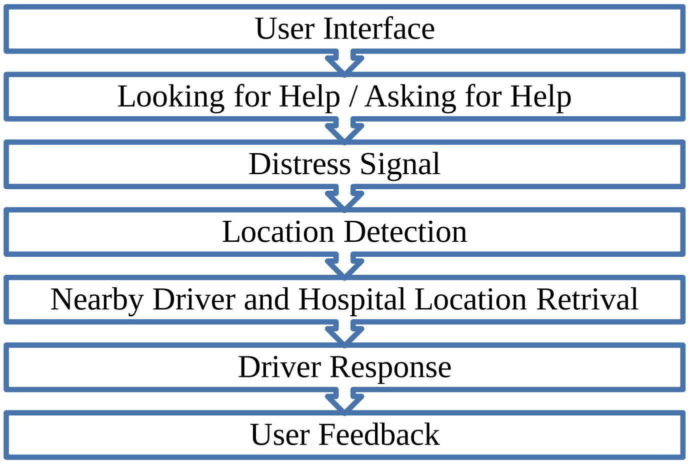

Figure 1: System Flow

Real Time Location Tracking

Real-time location tracking is the extension of core EmergenCare. By permission from the user, the app makes use of GPS in order to track and feed of the new coordinates as the user moves. This information is stored and processed by the backend system, and is available only to the right kind of receivers, which will be like drivers or nearby hospitals or any other responder. This feature makes it easy for emergency interventions since they will not be derailed by hacking.

Figure 2: Real Time Location Tracking (Map View)

Report Alert to Close Relatives

The fast “Alert Nearby Friends and Family” icon allows a person to share the information in an emergency with selected contacts or relatives. Depending on the situation, with a single touch, chosen people get the user’s coordinates and the state of affairs. This gives security and allows the contacts to start taking actions or extend their support and encourages safety and togetherness into the app.

User Feedback System

EmergenCare encourages users to share their Through social media, the company needs to engage its consumers and ask them how it finds the app’s performance, speed, and usability. Users can provide words feedback, as well as ratings like when reading a book or watching a movie, and occasionally the app can ask certain questions in order to enhance features the user likes or the things the user feels should be changed in order to always provide significant updates for the user.

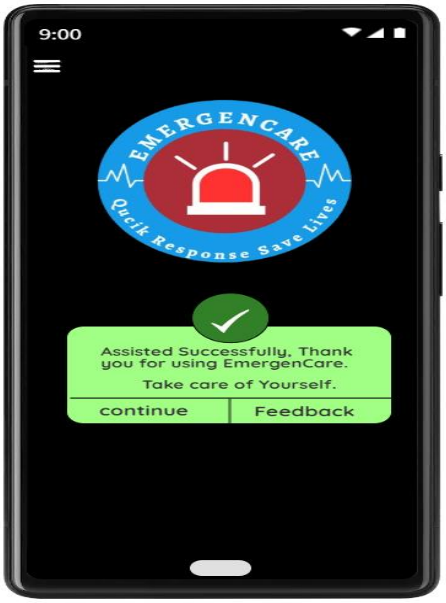

Figure 3: Feedback after successfully assisted

MongoDB ATLAS

This service offers a flexible and user-friendly approach to deploying, overseeing, and expanding MongoDB databases on major cloud platforms like AWS, Google Cloud, and Azure. MongoDB Atlas streamlines the process by providing automated provisioning, configuration, and maintenance of databases, liberating users to concentrate more on application development rather than the intricacies of database management. Key features include automated backups, monitoring functionalities, and robust security measures such as encryption at rest, guaranteeing the reliability, security, and compliance of stored data. Moreover, MongoDB Atlas seamlessly integrates with various MongoDB tools and services, providing a holistic solution for the creation and administration of contemporary, scalable, and secure applications.

Results

The front-end of the application was designed in React Native with the support of Android Studio. The main interface of the app is the Login/Signup page where the user have to login first if they do not have their account, so the user has to sign up.

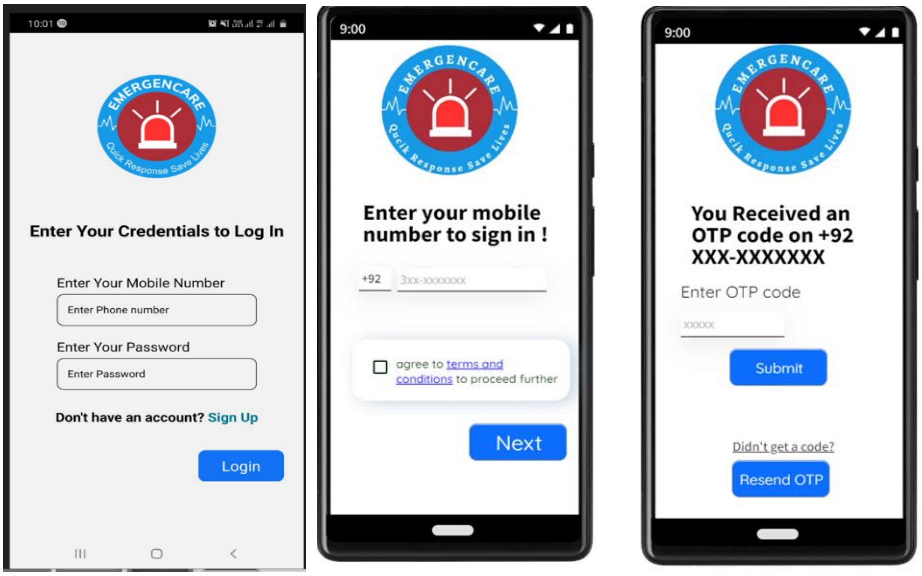

Figure 4: Login/Signup page

When the user open the app, the first interface shown is login screen and if the person is not registered then they have to register by using signup button and then by finishing signup using their mobile number. We have two modes of registrations which are victim and driver. One can register as a driver or victim depending on their choice. They can also switch between these two modes.

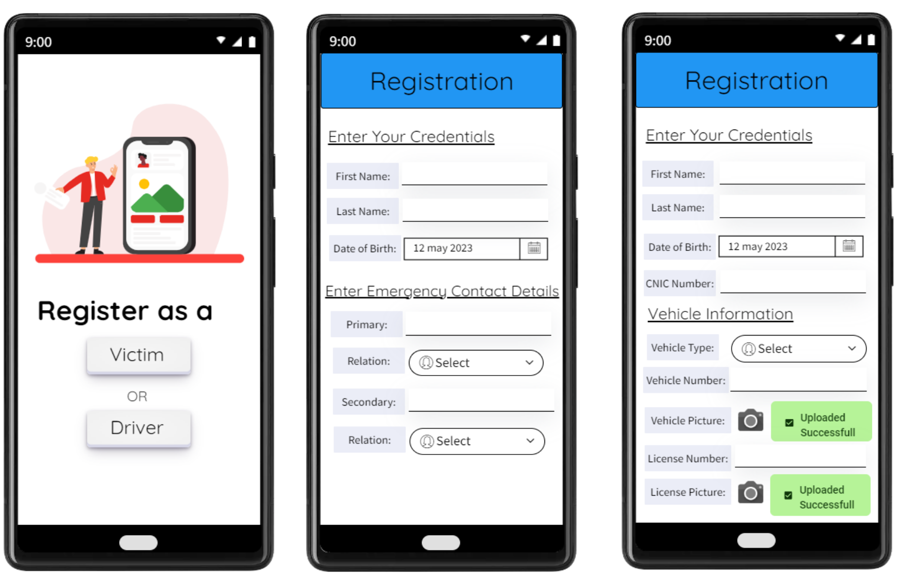

Figure 5: Registration (Driver/Victim)

Now, the person is registered successfully after completing the registration process so the person's data will be stored in the database.

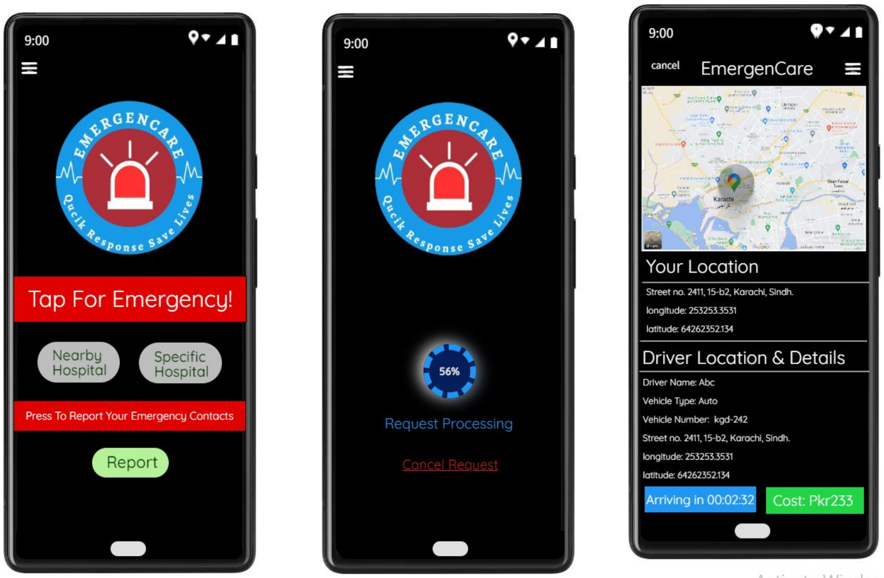

Figure 6: Emergency Response Button and Processing Screens

The main interface for the victim is shown in Figure 6. There are buttons shown as "Nearby Hospital" and "Specific Hospital". If a person is in severe condition, they can opt for nearby hospital for which the distress signal will be directly generated on the driver's interface or if a person wants to choose the hospital otherwise by the use of Specific hospital. There is also a "Report" button which by pressing it will send an alert to the close relatives which the victim has already given in the registration process. When a victim tap's on either button, it will request the process and redirect the request on driver's screen. After accepting the victim request by the driver will be shown to the user.

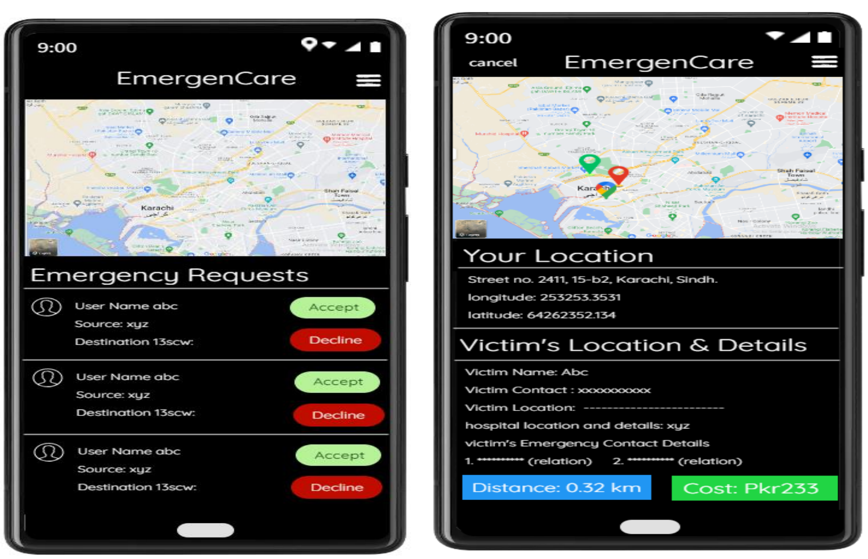

Figure 7: Emergency Request and Victim's Track Record

In Figure 7, all the emergency requests have been shown on the driver's screen for which the driver can accept or decline the victim's request. When accepted by the driver, the victim's information will be shown on the driver's screen (e.g. victim location, victim contact, victim relatives emergency contact etc.), and as the driver covers their distance to the victim's location the calculated distance will be reduced from time to time. There is cost is shown on the victim screen but after completing the assistance to the victim it will be shown to the driver as well.

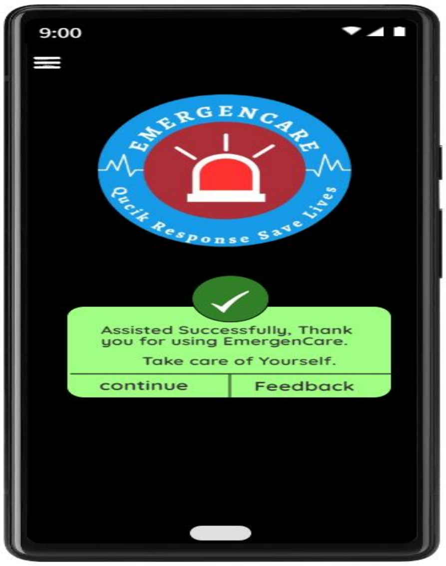

Figure 8: Successful Assistance and Feedback Screen

After successfully assisting the victim by the driver, the victim can give feedback of the driver about how convenient or inconvenient the assistance has been for the victim.

Conclusion and Future Work

EmergenCare represents a groundbreaking solution in Pakistan’s emergency response landscape, utilizing advanced technology to save lives and enhance public safety. Building on its current success, the app’s future lies in integrating cutting-edge technologies such as AI, machine learning, and block chain. AI-powered algorithms can improve emergency triaging and response prioritization, while machine learning can optimize resource allocation and refine responses based on past incidents. Blockchain integration ensures secure and immediate access to medical records, enabling more informed decision-making during emergencies. Expanding beyond emergency services; EmergenCare could incorporate proactive health features like real-time health monitoring, medication reminders, and wellness tips, promoting holistic care. A multilingual interface will improve accessibility for Pakistan's diverse population, while partnerships with communities, healthcare providers, and government agencies can enhance emergency preparedness through workshops and integrated alert systems.

References

[1] G. Kou and W. Wu, "Multi-criteria decision analysis for emergency medical service assessment," *Annals of Operations Research*, vol. 223, no. 1, pp. 239–254, 2014.

[2] A. J. Chiang, G. David, and M. G. Housman, "The determinants of urban emergency medical services privatization," *Critical Planning*, vol. 13, 2006.

[3] M. Bahadori, A. Nasiripur, S. Tofighi, and M. Gohari, "Emergency medical services in Iran: an overview," *AMJ*, vol. 3, no. 6, pp. 335–339, 2010.

[4] L. Aboueljinane, E. Sahin, and Z. Jemai, "A review on simulation models applied to emergency medical service operations," *Computers & Industrial Engineering*, vol. 66, no. 4, pp. 734–750, 2013.

[5] S. Al-Shaqsi, "Models of international emergency medical service (EMS) systems," *Oman Med. J.*, vol. 25, no. 4, pp. 320–323, 2010.

[6] M. Sharma and E. S. Brandler, "Emergency medical services in India: the present and future," *Prehospital and Disaster Medicine*, vol. 29, no. 3, pp. 307–310, 2014.

[7] O. C. Kobusingye, A. A. Hyder, D. Bishai, M. Joshipura, E. H. Romero, and C. Mock, *Emergency medical services*, in *Disease Control Priorities in Developing Countries*, 2nd ed., 2006.

[8] K. Kepaptsoglou, M. G. Karlaftis, and G. Mintsis, "Model for planning emergency response services in road safety," *Journal of Urban Planning and Development*, vol. 138, no. 1, pp. 18–25, 2011.

[9] P. Beraldi, M. E. Bruni, and D. Conforti, "Designing robust emergency medical service via stochastic programming," *European Journal of Operational Research*, vol. 158, no. 1, pp. 183–193, 2004.

[10] R. Aringhieri, M. E. Bruni, S. Khodaparasti, and J. T. Van Essen, "Emergency medical services and beyond: Addressing new challenges through wide literature review," *Computers & Operations Research*, vol. 78, pp. 349–368, 2017.

[11] V. Koufi, F. Malamateniou, and G. Vassilopoulos, "Ubiquitous access to cloud emergency medical services," in *Proc. 10th IEEE Int. Conf. Information Technology and Applications in Biomedicine*, 2010, pp. 1–4.

[12] S. Qiang, Q. Luo, and S. H. Huang, "Cost-effective analyses for emergency medical services deployment: A case study in Shanghai," *Int. J. Production Economics*, vol. 163, 2015.

[13] N. Levick, "Emergency medical services: unique transportation safety challenge," in *Transportation Research Board 87th Annu. Meeting*, 2008.