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The Smart Ambulance Services

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ABSTARCT

Efficient and impactful public service delivery, such as healthcare provision, is crucial in contemporary society, particularly in rural areas. Residents in these regions expect consistent access to public services; however, these services are not always readily available. This paper examines the challenges associated with developing an online booking system for ambulances. The difficulties range from inadequate communication, poor road infrastructure, and unstructured addresses to the absence of ambulances, resulting in preventable loss of lives. The paper conducts a comprehensive review and proposes solutions for the effective implementation of the online booking system. Drawing on the findings from the literature review, we designed and executed a framework model utilizing versatile application technologies to provide practical services to patients during emergency situations. The aim is to reduce hospital queues and long waiting times for an ambulance through location-based services. By employing this application, lives in rural areas can be simplified, preventing loss of lives by ensuring a prompt response from the appropriate healthcare providers during crises. The primary focus of this project is to safeguard and enhance personal safety. Thus, the objective of this initiative is to enable users to seek help quickly and conveniently. Additionally, a secure PIN is employed to ensure identity verification and prevent anonymous or malicious attacks.

INTRODUCTION

1.1 Motivation

The global focus on improving ambulance services aims to enhance patient safety and enroute capabilities for optimal care during emergencies. Addressing safety concerns and comfort issues in ambulance design involves analyzing current incidents, consulting EMS personnel, and researching potential obstacles to patient care. Identifying specific design flaws allows engineers to formulate problem statements and propose solutions, ultimately contributing to the overall advancement of ambulance technology. The investigation includes input from various sources, such as online surveys, face-to-face conversations, and visits to emergency facilities, ensuring a comprehensive understanding of the challenges faced by ambulance crews.

1.2 Problem statement

Traffic congestion is a pressing issue in Indian urban areas, resulting in increased delays, fuel consumption, and environmental pollution. The problem stems from intense traffic demand during peak hours and unexpected road capacity reduction due to accidents. Recurrent congestion, often caused by traffic incidents during peak hours, requires sustainable solutions. While expanding road capacity is considered, recent flyover constructions in Hyderabad, such as at Secretariat, Narayanaguda, and Masab Tank, have not effectively alleviated congestion and, in some cases, led to disruptions in traffic flow (Reddy J.S., 2006).

1.3 Purpose/Goal

The primary goal of this thesis is to develop a prototype for the Ambulance Service using GIS when road accidents occur. This Ambulance Management System (AMS) integrates GIS (ArcGIS9.1 network analyst, GPS/GSM) to address routing and accident location challenges during both normal and peak hours. The objectives of the system include: Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University. 2 □ Identifying accidents on the road network. □ Real-time identification of ambulance locations on the road network using GPS coordinates. □ Determining the fastest routes for all ambulances to reach the accident site. □ Analyzing which ambulance can promptly reach the accident site compared to others. □ Once the fastest route from the nearest ambulance to the accident location is determined, calculating the quickest route from the accident site to the nearest hospital. □ In cases of multiple accidents on the road network, finding the fastest routes for ambulances to reach all accidents. □ Identifying the fastest routes from all accidents to promptly reach the hospital. □ Addressing the challenge of congested roads during peak hours and determining optimal ambulance travel routes.

1.4 Scope

The OUR AMBULANCE TEAM SYSTEM ensures constant updates to the database. The citizens of India possess a UNIQUE IDENTITY for AMBULANCE BOOKING FROM HOME. Given that everyone may need to book an ambulance at some stage, the participants include the government of India. The implementation of online systems and machines in the backend significantly decreases manual work, reduces errors, and introduces automation

2. LITERATURE SURVEY

The paper discusses healthcare challenges in rural Mafikeng, South Africa, where inadequate facilities and transport services impact residents. Issues include poverty, lack of essential public services, substandard transportation, and the absence of Emergency Medical Services (EMS). A keyword-based search explores emergency medical services, focusing on ambulance provision in rural areas during emergencies. Existing systems, such as an Ant Colony Optimization algorithm for ambulance routing, are examined as potential solutions to improve healthcare accessibility in rural regions.

Paper Title: Vehicular Sensor Networks with Android Smartphones for Road Surface Monitoring

Authors: Girts Strazdins, Artis Mednis, Georgijs Kanonirs, Reinholds Zviedris, and Leo Selav

Description: Android stands out as one of the most widely adopted smartphone platforms, with its popularity continually on the rise. Recognized for its openness and flexibility, Android provides software developers with seamless access to phone hardware and a robust software API. This paper envisions Android smartphones evolving into a potent and extensively used participatory sensing platform. The focus of this study is the evaluation of Android smartphones concerning road surface quality monitoring. We conducted assessments of various pothole detection algorithms using Android phones equipped with a sensing application while driving in an urban environment.

Paper Title: System for Accident Detection with SMS Notification

Authors: Supriya Vidhate, Mamta Tadavi, Manisha Jagtap, Rajratan Janrao

Description: In the contemporary world, highway accidents have become a frequent occurrence. Numerous lives are lost each year due to inadequate medical care following accidents. Currently, there is no effective method for timely notification of the correct authorities to potentially save lives. Our project involves the development of a device designed to not only detect car accidents but also promptly notify the relevant authorities as soon as an accident occurs. Paper Title: Utilizing QR Code and Mobile Application to Enhance Service Processes in Thai Hospitals Authors: Chayakrit Charoensiriwath, Navaporn Surasvadi, Suporn Pongnumkul, Thunyasit Pholprasit Description: Overcrowding in Thai public healthcare facilities presents a significant challenge. Limited resources, including a scarcity of doctors, nurses, and medical devices, contribute to this problem. Various strategies have been attempted to alleviate hospital overcrowding. Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University.

4 Paper Title: Cloud Computing and Accident Handling Systems

Authors: Jabar H Yousif, Dinesh Kumar Saini

Description: This study investigates the current challenges in cloud computing solutions for life-critical systems, specifically car accident systems in the Gulf region. The Gulf region faces a high death rate due to car accidents, exacerbated by inadequate accident handling facilities.

Paper Title: Evaluation of Medication Adherence Apps and Creation of a Web-based Resource

Authors: Seth Heldenbrand, Bradley C. Martin, Paul O. Gubbins, Kristie Hadden, Catherine Renna, Rebecca Shilling, Lindsey Dayer

Description: This research aims to assess the features and health literacy levels of existing medication adherence apps. The goal is to create a searchable website aiding healthcare providers and patients in identifying high-quality adherence apps. Medication nonadherence remains a significant issue leading to poor health outcomes and unnecessary healthcare expenses.

Paper Title: Accident Detection in Vehicular Networks Through OBD-II Devices and Android-based Smartphones

Authors: Jorge Zaldivar, Carlos T. Calafate, Juan Carlos Cano, Pietro Manzoni

Description: This paper proposes an Android-based application utilizing On-Board Diagnostics (OBD-II) interfaces to monitor vehicles and detect accidents. The integration of smartphones with vehicles aims to enhance user experiences and provide new functionalities while driving.

Paper Title: GPS-based Tracking and Health Parameter Detection

Authors: Shivali Walvekar and Kinjal More

Description: This study focuses on displaying the current location of ambulances and patients' health parameters on an LCD display, simultaneously sending this information to the hospital.

Paper Title: Intelligent Accident Detection and RF Communication

Authors: Bhandari Prachi, Dalvi Kasturi, and Chopade Priyanka

Description: This web-based application shows the nearest ambulances, clinics, and pharmacies to the user. Sensors in vehicles contribute to automatic accident detection, promptly notifying the ambulance. Research Study by Abelsson et al. (Reference [12]) Description: Abelsson et al. conducted a study describing specialist ambulance nurses' perceptions when assessing patients exposed to severe trauma. The study emphasized the importance of preparedness for emergencies, confidence in leadership, and continuous professional knowledge development. Research Study by Bruce et al. (Reference [13]) Description: Bruce et al. explored the experiences of nurses receiving patients brought into the hospital as emergencies by ambulance crews. The study analyzed the handover and triage Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University. 5 process, emphasizing the vital interplay between prehospital and hospital personnel for patient care. Prehospital reporting was perceived as a crucial dialogue for planning, symbolizing the handover, and presenting both ideal and non ideal scenarios.

PROPOSED METHOD

4.1 PROPOSED SYSTEM

The envisioned system aims to facilitate the efficient booking of ambulances equipped with the necessary medical support, both within the ambulance and from the hospital. It addresses existing drawbacks by providing the precise location of the patient using Google Maps, coupled with essential patient information. Currently, there are instances where ambulances with advanced equipment and medical support systems are reserved for nonemergency cases, inadvertently impacting the urgency required. Conversely, during emergencies, non-emergency-type ambulances might be dispatched, leading to mismatches between the requester's needs and the ambulance provided. The proposed system introduces the capability to pre-book ambulances for specific cases such as pregnant women, senior citizens, or disabled patients, ensuring their convenient transportation to the hospital. The World Health Organization (WHO) recommends a ratio of at least 1 ambulance per 80,000 people in any city. However, in the case of the national capital, Delhi, the current ratio is alarming, with only 1 ambulance for every 150,000 people [3]. This deficiency exacerbates the imbalance in the availability of emergency-type ambulances. Lives are often lost due to inadequate and unreliable emergency medical services. Additionally, the absence of ambulance availability, lack of patient medical history, and realtime updates to the en-route doctor contribute to worsening patient conditions upon reaching the hospital. The existing system also grapples with issues like ambulance driver refusals, behavioral problems, or unfamiliarity with the destination. To address these challenges, the proposed web application includes features to differentiate between emergency and non-emergency ambulance requirements during booking. On the hospital side, the system efficiently manages ambulance requests, assigning them to qualified drivers. Importantly, in the proposed system, once a driver is assigned duty by the hospital, they have no authority to refuse the assignment. Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University. 16 A. Client Side • Reserving an ambulance for both emergency and non-emergency medical services. • Sending requests to all hospitals in the vicinity. • Receiving driver information and contact details from the hospital. • The IoT-based sensors continually update the patient's pulse rate and temperature, alerting the doctor to variations until the patient reaches the hospital, facilitating continuous monitoring of the patient's status. • Real-time tracking of the ambulance. B. Driver Side Availability Management: • Maintain an updated and accurate schedule indicating availability for ambulance service duty. • Acknowledge and confirm acceptance of assignments within the stipulated timeframe. Dispatch Communication: • Respond promptly to communication from the hospital or the central dispatch system. • Confirm receipt of details regarding the pick-up location, patient information, and destination. Navigation and Routing: • Utilize GPS and mapping tools for efficient route planning and navigation to reach the designated location. • Follow the recommended or assigned route to ensure timely arrival at the pick-up and drop-off points. Vehicle Maintenance: • Regularly inspect and maintain the ambulance vehicle to ensure it is in good working condition. • Report any malfunctions or issues promptly to the appropriate authorities. Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University. 17 Patient Interaction: • Exhibit professionalism and empathy when interacting with patients during transportation. • Provide necessary assistance in safely loading and unloading patients from the ambulance. Emergency Response: • Adhere to protocols for emergency cases, ensuring swift and safe transport to the hospital. • Coordinate with medical personnel to facilitate immediate attention upon arrival. Communication with Hospital: • Maintain open and clear communication with the hospital or dispatch center during transit. • Provide regular updates on the estimated time of arrival and any unexpected delays. Documentation: • Keep accurate records of each trip, including patient details, time of pick-up, and arrival at the destination. • Ensure all necessary documentation is completed for each assignment. Adherence to Policies: • Follow all guidelines and policies set by the ambulance service provider and relevant health authorities. • Adhere to traffic rules and regulations for safe and legal operation of the ambulance. Professionalism: • Uphold a professional demeanor and prioritize the well-being and comfort of the patient. • Represent the ambulance service provider positively in all interactions.

METHODOLOGY

The technologies employed in developing the suggested system include PHP in conjunction with the Google Maps API, XAMPP Server, as well as both Frontend and Backend components. A. Authentication Authentication is initiated by entering a username and password upon accessing the application. Users are required to log in before utilizing the app, and if an individual is not yet registered, they must complete the registration process. During the first-time registration, users need to provide all the requested details and a valid mobile number for verification purposes. The registration form encompasses fields for the user's name, username, password, blood group, date of birth, gender, unique identification number, and other relevant information. While optional, users may choose to submit a medical report during registration by uploading it. Successful registration is contingent upon completing all the necessary information. B. Ambulance Location This module facilitates the provision of the user's current location when sending an

ambulance request and also enables the user to track the location of the ambulance. C. Booking Request This module manages the ambulance request, including details such as the type of booking (emergency or non-emergency), the number of casualties, symptoms (e.g., fever, cold), a photo capturing the user's location for a precise understanding of the patient's condition, and the option to upload a medical report (if available). In case a medical report was not provided during registration or if there is a new report, the user can upload it. Capturing a photo is essential for assessing the patient's condition and verifying the authenticity of the request. Subsequently, the user submits the request, which is then broadcast to all nearby hospitals. The user must wait until receiving an alert confirming the successful Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University. 19 dissemination of the request to nearby hospitals. Once a hospital accepts the request, it becomes unavailable to other hospitals. The hospital gains access to all user details and, based on the specified parameters, dispatches an ambulance to the user, providing the driver's name and contact number.

CONCLUSION

These days, mobile or web applications are far more advantageous than any other system because everyone always has them at their fingertips. People can open and access any application at any time, which makes online or mobile applications more useful in today's world. Therefore, it is a good idea to book ambulance services—both emergency and non-emergency—using an online or mobile application. When a patient is brought to the hospital, this application makes medical emergency services much more beneficial because it allows for prompt treatment or efficient medical care to be provided in the least amount of time due to the patient's symptoms, medical report, and biostatistics (heartbeat, pulse rate, and body temperature) that are recorded during booking. The prototype we envisioned during the initial phase of the project has been successfully implemented and is up and running as a software application. This software application has been designed to meet the features mentioned earlier. The page designing has been done using HTML, CSS and PHP. Smart Ambulance Services School of Computer Science Engineering & Information Science, Presidency University. 43

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