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LifeSaver: A VaDE-Based Intelligent Ambulance Positioning System for Optimal Emergency Response and Alert System

Ranjith Jayakumar S[1] and Dr. Lipsa Nayak[2]

MCA Student, Department of Computer Applications[1]

Assistant Professor, Department of Computer Applications[2]

Vels Institute of Science, Technology & Advanced Studies (VISTAS), Chennai, Tamil Nadu, India

ranjithjayakumar5@gmail.com and info.lipsa@gmail.com

Abstract: *Every day, the number of traffic accidents rises as the automobile population increases. According to a survey by the World Health Organization (WHO), 1.3 million people die and 50 million are wounded annually around the globe. Most people die because they don't get medical help at the scene of an accident or becauseit takes too long for rescuers to get there. The time after an accident can be optimally used to make a difference between a life saved and life lost, if recovery actions are able to take place in time. However, routing problems and traffic congestion is one of the major factors hampering speedy assistance*

Keywords: World Health Organization (WHO), Variational Deep Embedding (VaDE), Admin login, Geo location.

I. INTRODUCTION

Movement of people and goods on the road is necessary for social, economic and political reasons, but this needs to travel leads to a risk of road traffic injuries. Road accident is most unwanted thing to happen to a road user, though they happen quite often. A total of 4,61,312 road accidents occurred in 2022, which claimed 1,68,491 lives, while 4,43,366 people were injured, according to a new report released by the Ministry of Road Transport and Highways (MoRTH).

II. LITERATURE SURVEY

T. D. Hanawy Hussein, M. Frikha and J. Rahebi, "HARRIS HAWKS OPTIMIZATION FOR AMBULANCE VEHICLE ROUTING IN SMART CITIES", *Eastern-European Journal of Enterprise Technologies*, vol. 122, no. 3, 2023.

The ambulance routing problem is one of the capacitated ambulance routing problem forms. It deals with injuries and their requests for saving. Therefore, the main aim of the ambulance routing problem is to determine the minimum

Chowdhury, S. Kaisar, M. E. Khoda, R. Naha, M. A. Khoshkholghiand M. Aiash, "IoT-based emergency vehicle services in intelligenttransportation system", *Sensors*, vol. 23, no. 11, pp. 5324, 2023.

Emergency Management System (EMS) is an important component of Intelligent transportation systems, and its primary objective is to send Emergency Vehicles (EVs) to the location of a reported incident. However, the increasing traffic in urban areas, especially during peak hours, results in the delayed arrival of EVs in many cases, which ultimately leads to higher fatality rates, increased property damage, and higher road congestion.

U. Mittal and P. Chawla, "Acoustic Based Emergency Vehicle Detection Using Ensemble of deep Learning Models", *Procedia Computer Science*, vol. 218, pp. 227-234, 2023.

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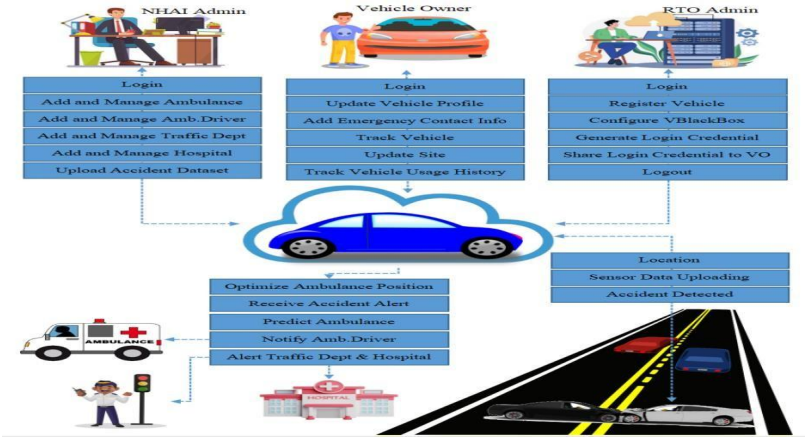
The temporal and spectral structure is possessed in the time-frequency domain by sound events. Analyzing and classifying acoustic environment using sound recording is an emerging research area. Convolutional layers can quickly extract high-level features and shift-invariant features from the time-frequency domain.

S. J. Arul, M. B. S, L. S, G. Kaliyaperumal Sufiyan and J. K. K. A, "Modelling and Simulation of Smart Traffic Light System for Emergency Vehicle using Image Processing Techniques", ***2023 3rd International Conference on Innovative Practices in Technology andManagement (ICIPTM)*****, pp. 1-4, 2023.**
Emergency vehicle detection and Density-based traffic signalling systems provide a more efficient alternative to today's traditional traffic systems. The system calculates the vehicle's density using image processing and to recognisethe emergency vehicle and notify the appropriate lane with a green light.

M. A. Abdeen, M. H. Ahmed, H. Seliem, T. R. Sheltami, T. M. Alghamdi and M. El-Nainay, "A Novel Smart Ambulance System-Algorithm Design Modeling and Performance Analysis", ***IEEE Access*****, vol. 10, pp. 42656-42672, 2022.**
There is a growing demand for smart systems nowadays where provided services can be improved using modern technologies of sensing, communication, high computing performance, signal processing and multimedia. Such technologies can be utilized to improve ambulance and emergency services.

III. METHODOLOGY SECTION

Accident Data: Input data related to accidents, including their severity, type, time, and geographical coordinates, are collected from various sources such as accident databases, traffic monitoring systems, and emergency calls.
Ambulance Deployment Plans: The system generates deployment plans indicating the optimal placement of ambulances based on real- time demand, accident severity, and geographical location. These plans are outputted to control center operators for implementation.
Real-time Alerts: When an emergency occurs, real-time alerts containing relevant information about the incident, such as location, severity, and recommended response actions, are sent to ambulances, traffic departments, and hospitals to facilitate timely response and coordination.



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Dataset:

id	gid	area	city	latitude	longitude	num_accide	nh_number
1	2	ARK Nagar	Trichy	10.826353	78.712434	4	NH 67
2	2	ARK Nagar	Trichy	10.826874	78.712439	2	NH 67
3	2	ARK Nagar	Trichy	10.827575	78.712493	1	NH 67
4	2	Ammanpet	Thanjavur	10.827628	78.712649	3	NH 136
5	2	Uthukuli	Erode	10.827296	78.712649	5	84A
6	2	Rayapuram	Chennai	10.826798	78.712627	2	NH 114
7	2	ARK Nagar	Trichy	10.826292	78.712622	1	NH 67
8	2	ARK Nagar	Trichy	10.825744	78.712611	3	NH 67
9	2	ARK Nagar	Trichy	10.825478	78.712579	4	NH 67
10	2	ARK Nagar	Trichy	10.825526	78.712437	3	NH 67
11	2	ARK Nagar	Trichy	10.826063	78.712442	3	NH 67
12	2	ARK Nagar	Trichy	10.826353	78.712434	2	NH 67
13	3	Velayudhap	Trichy	10.87446	78.773432	2	NH 81
14	3	Velayudhap	Trichy	10.874723	78.774848	1	NH 81
15	3	Velayudhap	Trichy	10.875229	78.777798	3	NH 81
16	3	Velayudhap	Trichy	10.875229	78.781124	4	NH 81
17	3	Velayudhap	Trichy	10.874807	78.775663	2	NH 81
18	3	Velayudhap	Trichy	10.874461	78.773432	1	NH 81
19	4	Ammanpet	Thanjavur	10.839	79.121939	2	NH 136
20	4	Ammanpet	Thanjavur	10.839432	79.121555	3	NH 136
21	4	Ammanpet	Thanjavur	10.839853	79.121281	7	NH 136
22	4	Ammanpet	Thanjavur	10.840043	79.121239	2	NH 136
23	4	Ammanpet	Thanjavur	10.839276	79.121764	1	NH 136
24	4	Ammanpet	Thanjavur	10.839	79.121939	1	NH 136
25	5	Uthukuli	Erode	11.294129	77.759313	2	84A
26	5	Uthukuli	Erode	11.294739	77.759096	3	84A
27	5	Uthukuli	Erode	11.295465	77.758908	5	84A
28	5	Uthukuli	Erode	11.295623	77.758929	4	84A
29	5	Uthukuli	Erode	11.294639	77.759208	1	84A
30	6	Rayapuram	Chennai	13.111897	80.292085	2	NH 114
31	6	Rayapuram	Chennai	13.11349	80.292321	3	NH 114

accident_data

IV. EXPERIMENTAL RESULTS

Fig:1 This is the home page for the Ambulance positioning system

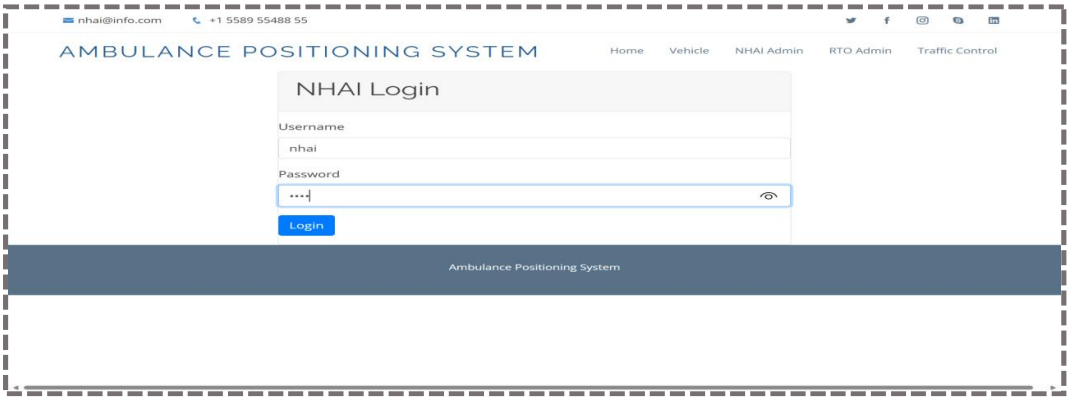

Fig:2 Login page for NHAI Login

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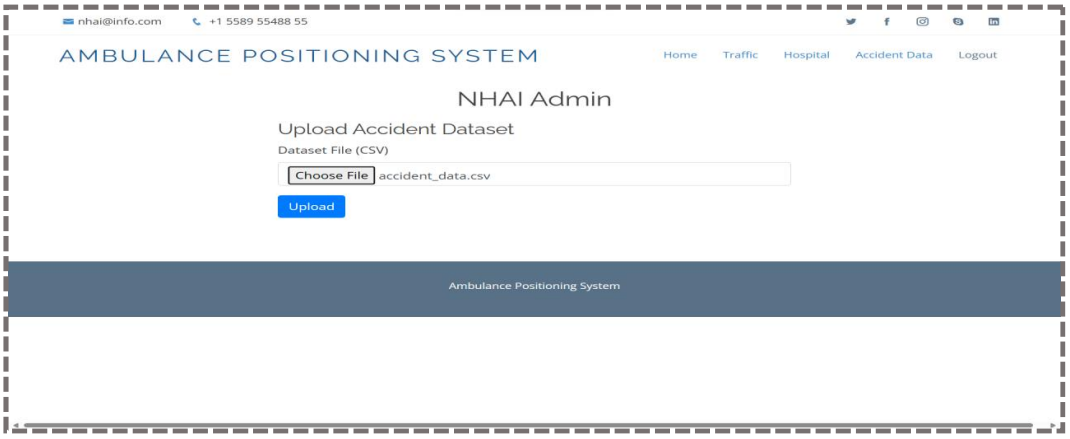

Fig:3 Uploading the accident dataset collected

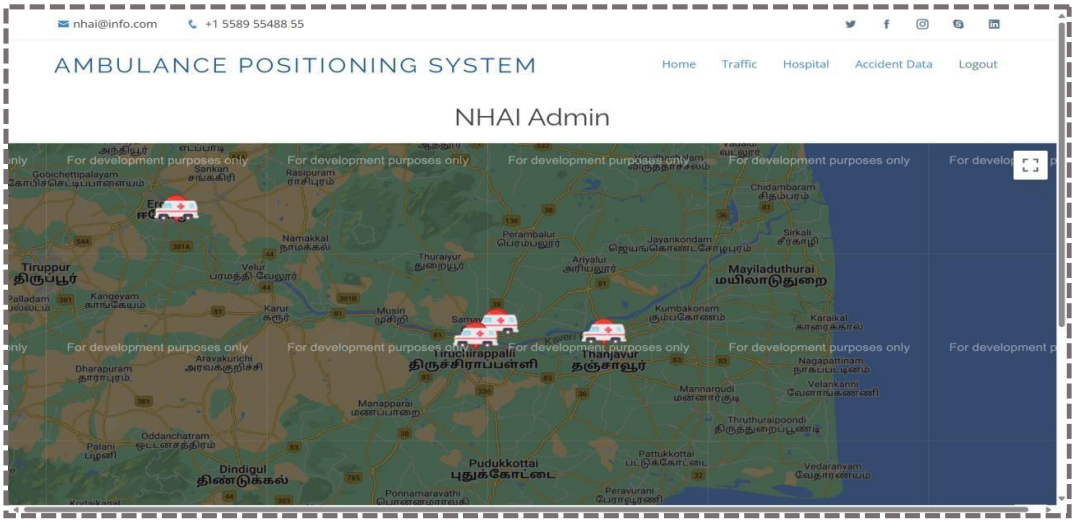

Fig:4 Visual view of the accident dataset uploaded

Fig:5 Details shown after Vehicle registration

V. CONCLUSION

In conclusion, the escalating number of traffic accidents worldwide underscores the urgent need for innovative solutions to improve emergency response times and save lives. According to the World Health Organization (WHO),

millions of people suffer injuries or lose their lives annually due to delays in receiving medical assistance after accidents. This project proposes a ground-breaking approach to address this issue by leveraging advanced technology and real-time data analysis. The use of Variational Deep Embedding (VaDE) in conjunction with unsupervised generative clusteringoffers a novel method for optimizing ambulance positioning strategies. By identifyinghigh-risk areas and determining the closest suitable locations for ambulance deployment, this system aims to significantly reduce response times, potentially making the difference between life and death for accident victims.

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[3]. U. Mittal and P. Chawla, "Acoustic Based Emergency Vehicle Detection Using Ensemble of deep Learning Models", *Procedia Computer Science*, vol. 218, pp. 227-234, 2023.

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