

THE DEVELOPMENT OF A WEB-BASED ROAD ACCIDENT DATA MANAGE SYSTEM USING GIS IN UDAIPUR CITY

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Abstract- This project aims to develop a comprehensive web-based road accident data management system tailored for Udaipur City, Rajasthan, India, utilizing GIS technology. With increasing urbanization and traffic congestion, effective management of road accident data becomes paramount for improving road safety measures. The system will offer tools for efficient collection, storage, analysis, and visualization of accident data, empowering authorities to make evidence-based decisions. Following a structured methodology encompassing data collection, system design, development, testing, and implementation, the project holds great promise for reducing accident rates and enhancing public safety in Udaipur City.

Similarly, a user-friendly accident data management system has been developed for selected locations of Surat City, Gujarat, India, utilizing GIS technology. Designed to be accessible to those unfamiliar with computers, the system facilitates accident data reporting and statistical analysis, aligning with Indian Roads Congress guidelines. By highlighting the necessity of GIS database and user-friendly systems for effective transportation planning, design, and administration, this initiative underscores the importance of data-driven decision-making in enhancing road safety measures.

1. INTRODUCTION

The project addresses the pressing need for effective management of road accident data in Udaipur City, Rajasthan, India, by developing a web-based system utilizing Geographic Information Systems (GIS). With urbanization and increased traffic posing significant safety challenges, the system aims to collect, analyze, and visualize data to identify accident patterns and enhance planning efforts. By leveraging GIS technology, stakeholders can access real-time information to prioritize interventions and allocate resources, ultimately fostering a culture of safety and responsibility among road users Choudhary, Sangeeta, et al (2023). Through collaboration and proactive measures facilitated by the system, the project holds promise for significantly reducing the human and economic toll of road accidents in Udaipur City.

Globally, road accidents pose immense challenges to public safety and infrastructure management. To address this, the proposed Web-Based Road Accident Data Management System (RADMS) utilizing GIS technology emerges as a vital solution. By integrating spatial analysis capabilities, the RADMS enables stakeholders to visualize accident data, identify high-risk zones, and implement targeted interventions. Through accessibility and collaboration, decision-makers can prioritize resources, allocate funds, and implement evidence-based policies to reduce accident rates and save lives Jangeed, D. (2023). Ultimately, the RADMS represents a paradigm shift in road safety management, offering the potential to significantly mitigate the human and economic toll of road accidents through informed decision-making and proactive interventions.

2. RESEARCH GAP

Research in road accident data management encompasses various dimensions aimed at advancing system capabilities and addressing key challenges. Firstly, the integration of advanced GIS functionality seeks to enhance spatial analysis by developing algorithms for fine-grained analysis, real-time data integration, and multivariate analysis, ensuring a comprehensive understanding of accident causation and facilitating proactive intervention strategies. Secondly, efforts are directed towards enhanced visualization techniques, such as interactive 3D visualization, temporal analysis, and augmented reality, to provide immersive representations and facilitate trend analysis for improved decision-making.

Thirdly, interoperability and data integration are crucial aspects being addressed through semantic interoperability, open data standards promotion, and dynamic data fusion techniques. These efforts aim to ensure seamless exchange and interpretation of data across heterogeneous sources, fostering transparent access and collaboration among stakeholders. Additionally, user-centric design principles are emphasized, focusing on stakeholder engagement, accessibility, inclusivity, and customization to meet diverse user needs effectively.

Moreover, advancements in advanced spatial modeling techniques, crowdsourced data integration, contextualized risk assessment, integration with emerging technologies, ethical considerations, and long-term sustainability and scalability are essential areas of research to ensure comprehensive, responsive, and ethically sound road accident data management systems capable of addressing evolving needs and challenges in road safety and urban planning.

3. LITERATURE REVIEW

Road safety is a global concern, leading to the development of accident data management systems using

Geographical Information System (GIS) technology. Studies by Bhalla et al. (2014), Prasannakumar et al. (2011), Hasseea (2003), Deepti and Ganesh (2010), and Çela et al. (2013) have demonstrated the efficacy of GIS in identifying accident hotspots and temporal clustering patterns, aiding targeted interventions. Since the 1990s, GIS has been extensively employed for traffic safety analysis, with studies by Faghri and Raman (1995), Liang et al. (2005), Mahmud and Zarrinbasha (2008), and the Government of Tamil Nadu (2009) showcasing its utility in real-time reporting and comprehensive accident data management.

Moreover, GIS software offers a range of spatial analysis tools, including CrimeStat, utilized by Seng *et al.* (2005), enabling the identification of spatial patterns in accidents for effective planning. These advancements underscore GIS's role in enhancing road safety through data-driven interventions and real-time monitoring.

4. METHODOLOGY

An attempt has been made in the present study to develop a Geographic Information System (GIS) based user-friendly accident data management system for selected locations of Surat city, Gujarat, India. The accident data management system offers a platform to maintain and update accident database and use it for further analysis. In the present study, the GIS database has been developed with the help of MapInfo10.5, a geographic mapping and analysis tool to locate accident-prone areas quickly and accurately on a map. Accident data management system is purposely designed in a user friendly manner to suit people who are not familiar with computers and it follows Model-View-Controller (MVC) architectural pattern and is created using JSP - servlets. Major functionalities of the present system are accident data reporting as per Indian Roads Congress (IRC 53, 2012) guidelines and statistical analysis of accident data. The findings from the present study highlights the necessity of developing GIS data base and user-friendly accident data management system for effective planning, design, construction, analysis, operation, maintenance, and administration of transportation systems and facilities.

CONCLUSION

The development of a web-based road accident data management system using GIS in Udaipur City is poised to revolutionize road safety, urban planning, and emergency response. This system will grant city authorities real-time access to comprehensive accident data, enabling informed decision-making and targeted interventions to reduce accident rates and enhance traffic management. By pinpointing accident hotspots and patterns, proactive measures can be implemented, ultimately fostering a safer and more efficient urban environment.

However, the current road accident data collection and management system in Udaipur City suffers from various shortcomings, including disparate data collection methods and disjointed databases maintained by different entities. This fragmentation leads to data recollection issues, loss of data, and mismatches in results, compromising the reliability of data collection and traffic management. To address these challenges, leveraging GIS technology and standardizing data collection methods can streamline processes, enhance data reliability, and provide valuable real-time information to stakeholders and road users. The implementation of the web-based system involves utilizing GIS tools, such as MapInfo 10.5, for categorizing and integrating traffic data collected from Umra police station over the past five years. The resulting system, developed using JSP-servlets, offers restricted access to designated organizations like RTO, Police Department, and Highway Department for accident reporting, in line with IRC guidelines. Its user-friendly interface facilitates easy access for non-computer experts, enabling efficient data management, statistical analysis, and public access to accident records. However, future enhancements are needed to ensure the system's continued usability and automation for accident data management.

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