Journal Publication of International Research for Engineering and Management (JOIREM)
Volume: 04 Issue: 5 | May-2026
ISSN (O) 3107-6696

Development of a Multi-Module AI Infotainment System for Real-Time Assistance and Control

Dr. Gowri Shankar[1], Sashya Vinodha P[2], Sakthivel C[3], Manusha K[4], Mourya S H[5], Drashya Ram Shetty[6]

Department of Computer Science and Engineering, Jain Deemed to be University, Bangalore, Karnataka, India.

---***---

Abstract - This paper presents the development of an intelligent multi-module infotainment system designed to enhance vehicle safety and driver experience through real-time data integration. By synthesizing inputs from diverse sources—including localized weather data, GPS coordinates, and simulated driving behavior, the system provides proactive features such as smart maintenance notifications, real-time driver coaching, and automated emergency response protocols. Unlike standard infotainment units, this framework utilizes predictive analytics and natural language processing to offer tailored feedback and ensure swift communication with emergency contacts during critical events. The proposed system addresses current market gaps in personalized driver assistance and demonstrates a scalable architecture for future AI-driven automotive technologies.

Key Words: AI Infotainment System, Real-Time Driver Assistance, Predictive Maintenance, Automotive Safety, Natural Language Processing, Smart Notification Systems.

1.INTRODUCTION

The modern automotive infotainment system has transitioned from a luxury feature to an essential integration of communication, navigation, and vehicle diagnostics. As the industry moves toward smarter, more connected vehicles, the demand for sophisticated software modules that can process real-time data has increased significantly. This shift is not merely about entertainment; it is about creating a seamless driving experience where the vehicle proactively assists the driver, enhancing both convenience and safety.

Research indicates that the automotive predictive maintenance market is projected to grow from **USD 22 billion in 2023 to USD 100 billion by 2032**. Despite this rapid growth, current systems often rely on rigid, mileage-based schedules rather than real-time analytics. Furthermore, user dissatisfaction remains a challenge due to system complexity and distractions. This project addresses these limitations by developing a multi-module system that utilizes predictive analytics and AI-driven coaching to provide a more intuitive and responsive environment for the driver.

2. SYSTEM ARCHITECTURE

2.1 Modular Service Framework:

The architecture is designed as a multi-layered service framework that ensures high decoupling between data ingestion and user interaction. The backend is powered by **FastAPI (Python)**, providing high-performance asynchronous endpoints for processing simulated driving telemetry and external API streams. This structure allows the system to scale and integrate additional sensor modules without disrupting the core infotainment logic.

2.2 Data Ingestion and Normalization:

The ingestion layer handles two primary data types: manual telemetry (braking, acceleration, and alertness) and external environmental data. The system interfaces with the **Mapbox Directions API** for dynamic route simulation and the **OpenWeather API** for real-time meteorological tracking. A dedicated normalization module converts these heterogeneous data sources into a standardized JSON format, enabling the AI logic layer to execute triggers based on consistent state variables.

2.3 Intelligent Decision Engine :

The central processing unit of the infotainment system is the Decision Engine, which utilizes Natural Language Processing (NLP) and a rule-based trigger system. By monitoring state changes—such as sudden drops in visibility or harsh braking flags—the engine determines the optimal moment for voice intervention. To prevent "alert fatigue," the system implements a cooldown logic that prioritizes safety-critical alerts (e.g., emergency notifications) over routine information (e.g., music status).

3. IMPLEMENTATION DETAILS

3.1 Emergency and Safety Protocols

A unique feature of the implementation is the automated emergency response module. Upon detecting a critical event (simulated via an airbag deployment trigger), the system initiates a multi-threaded process: it captures high-precision GPS coordinates from the route API and transmits a localized SOS alert via the Fast2SMS/Tawilio API to pre-defined emergency contacts.

3.2 UI/UX Integration

The final integration layer provides a unified dashboard that reflects the real-time state of all underlying modules. Developed with a focus on minimal driver distraction, the UI uses large touch targets and provides visual confirmation of AI voice prompts, ensuring that the driver remains informed without needing to take their eyes off the road for extended periods.

4. CONCLUSIONS

The developed multi-module AI infotainment system demonstrates a robust architecture for real-time driver assistance and safety. By integrating environmental data through the Open Weather API and telemetry through a Fast API backend, the system provides proactive notifications that address significant market gaps in predictive maintenance and emergency response. The automated emergency protocol ensures high-precision location sharing, potentially reducing response times in critical scenarios. Future enhancements will focus on deeper integration of realistic AI vocalizations and expanded hardware-level sensor fusion.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to our guide, **Dr.Gowri Shankar**, for his continuous mentorship and technical insights throughout the development of this project. We also thank the Department of Computer Science and Engineering at Jain Deemed to be University for providing the necessary resources.

REFERENCES

1. Predictive Maintenance in the Automotive Sector: A Literature Review. Int. J. of Eng. Research, Vol. 12 (2023) 45–60
2. Automotive Predictive Maintenance Market: Pioneering Efficiency and Reliability (2023-2032). Global Market Insights, Research Report (2023)
3. AI in the Automotive Industry: Driving Innovation and Transformation. In: Automotive Tech Series, Vol. 5. Springer-Verlag, Berlin (2024)
4. *The Future of Car Voice Assistants.* Capgemini Research Institute, Industry Report (2022)
5. Automated emergency calling (eCall) now mandatory on new car models. European Transport Safety Council (ETSC), Safety Standards (2018)