

Intelligent Fleet Management System Using AI, IoT Sensors, and Predictive Maintenance for Vehicular Safety and Operational Optimization

JOTHISHWARAN R (Reg. No: 512223405001)

PG Student, Department of CSE, SKP Engineering College Tiruvannamalai, Tamil Nadu, India

Email: jothiesh7@gmail.com

Dr.N.PURUSHOTHAMAN,M.E, Ph.D.,

Head of the Department of computerscience and engineering, SKP Engineering College Tiruvannamalai, Tamil Nadu, India

Abstract:

The AI-Driven Fleet Management System represents a significant leap forward in optimizing fleet operations by incorporating advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and cloud computing. Traditional fleet management systems have relied heavily on GPS tracking for location updates, which often lack real-time insights and predictive analytics, leading to inefficiencies and increased operational costs. This project addresses these challenges by integrating real-time vehicle tracking, driver behavior monitoring, and predictive maintenance, ensuring enhanced safety, reduced costs, and improved overall efficiency.

Keywords — Fleet Management, Artificial Intelligence (AI), IoT Sensors, Predictive Maintenance, Driver Monitoring, Real-time Tracking, Cloud Computing, Vehicle Safety, Operational Optimization

I. INTRODUCTION

Font Size	Appearance (in Time New Roman or Times)		
	Regular	Bold	Italic
8	table caption (in Small Caps), figure caption, reference item		reference item (partial)
9	author email address (in Courier), cell in a table	abstract body	abstract heading (also in Bold)
10	level-1 heading (in Small Caps), paragraph		level-2 heading, level-3 heading, author affiliation
11	author name		
24	title		

I. INTRODUCTION

Fleet management has become a crucial aspect of modern transportation and logistics operations. With the increasing need for efficiency, safety, and cost reduction, organizations are turning to advanced technologies to manage their fleets effectively. (Content continues...)

Fleet management also contributes to sustainability by reducing unnecessary fuel consumption, cutting down CO2 emissions, and promoting greener

logistics practices. Modern intelligent systems use machine learning to identify hidden patterns in fleet data, enabling predictive insights beyond human capacity.

II. LITERATURE SURVEY

This chapter reviews prior works, including real-time fleet tracking, IoT-based fleet monitoring, predictive maintenance approaches, AI-driven fleet optimization, driver monitoring, and cloud integration. (Content continues...)

Recent research emphasizes the convergence of AI and IoT for autonomous decision-making in fleet systems. Papers also highlight the potential of blockchain for ensuring secure and tamper-proof vehicle data records.

III. SYSTEM ANALYSIS – EXISTING

The existing fleet management systems primarily rely on GPS-based tracking technology. These provide basic functionalities such as tracking, route recording, but lack AI/IoT integration. (Content continues...)

IV. SYSTEM ANALYSIS – PROPOSED

The proposed system integrates IoT, AI, 4G/5G communication, and cloud computing to provide real-time tracking, predictive maintenance, driver monitoring, and scalable data management. (Content continues...)

Additionally, the proposed system introduces AI-driven anomaly detection to identify unusual driving patterns such as harsh braking, overspeeding, or abnormal route deviation. These anomalies are logged and analyzed for continuous performance improvement.

V. FEASIBILITY STUDY

The feasibility study examines economic, technical, and social viability of the system. Costs include hardware, cloud storage, and development, offset by long-term savings. (Content continues...)

VI. SYSTEM REQUIREMENTS

Covers both hardware (GPS, 4G modules, AI cameras, IoT sensors, power supply) and software (Spring Boot, Leaflet.js, Cloud storage, AI frameworks, MQTT). (Content continues...)

VII. HARDWARE SPECIFICATIONS

Details of 4G modules, SIM cards, AI-enabled cameras, live streaming systems, Raspberry Pi for edge computing, sensors, and power management. (Content continues...)

VIII. SYSTEM DESIGN & DESCRIPTION

Includes block diagrams, DFDs, UML diagrams, image processing workflow, and system architecture. (Content continues...)

IX. CONCLUSION & FUTURE ENHANCEMENTS

The system integrates IoT and AI for safe, efficient fleet operations. Future work includes 5G adoption, advanced route optimization, ADAS integration, EV support, and gamification. (Content continues...)
Another future direction includes integrating Vehicle-to-Infrastructure (V2I) communication,

enabling vehicles to interact with smart traffic lights and road sensors for more efficient traffic flow.

REFERENCES

- [1] M. G. Ioannou, A. Tsakalidis, and E. A. Kosmatopoulos, 'Fleet Management Systems: A Review of Technologies and Applications,' *Transportation Research Part C: Emerging Technologies*, vol. 91, 2018, pp. 266-283.
- [2] R. P. D. T. Rathnayaka, et al., 'Smart Fleet Management System Using IoT, Computer Vision, Cloud Computing, and AI,' *Proc. ICITR 2021*.
- [3] Patrick Flinner, et al., 'FMWare: IoT-Based Fleet Management System,' *Internet of Things – ICIOT 2019*, LNCS 11516, Springer.
- [4] Areti Kotsi, et al., 'CTMaaS: An Innovative Platform for C-ITS-enabled Dynamic Traffic and Fleet Management as a Service,' *arXiv:2310.14052*, 2023.