

ABSTRACT

POTHOLE DETECTION AND ESTIMATION

Introduction:

Potholes are a prevalent and dangerous issue affecting roads worldwide, leading to vehicle damage, accidents, and increased maintenance costs. Traditional pothole detection methods, which often rely on manual inspection and periodic road surveys, are time-consuming, inefficient, and costly. The increasing adoption of Artificial Intelligence (AI) and Machine Learning (ML) has opened new possibilities for automating pothole detection, estimation, and repair planning in real-time.

Problem Statement:

Current methods of pothole detection are limited by their inability to provide continuous, large-scale, and accurate monitoring. The challenge lies in creating an efficient system that can not only detect potholes but also estimate their dimensions, such as depth and width, to prioritize repairs effectively.

Proposed Solution:

This research proposes an AI and ML-based approach for automated pothole detection and estimation. By utilizing computer vision techniques and deep learning models, such as Convolutional Neural Networks (CNNs), the system can analyze images and sensor data from cameras and accelerometers mounted on vehicles. The model is trained to identify potholes and estimate their size by processing real-time input from both visual and sensor data, ensuring high accuracy and low latency. Additionally, advanced data fusion techniques are employed to enhance estimation capabilities, allowing for better prediction of pothole severity.

Benefits and impacts:

The AI and ML-based pothole detection system improves accuracy, reduces costs, and enhances road safety by prioritizing repairs in real-time. It supports smart city integration and offers economic, environmental, and public safety benefits. The system aids urban planning, extends road lifespan, and fosters innovation in AI for smarter infrastructure management.

Implementation Plan:

The implementation plan involves collecting road condition data using vehicle-mounted sensors and cameras. Deep learning models will be trained to detect and estimate potholes from this data. The AI system will be integrated with real-time data from vehicles for continuous monitoring. After development, the system will be tested for accuracy and performance on various road types. It will then be deployed on a fleet of vehicles, with ongoing updates and improvements based on real-world feedback. The system will be maintained regularly and scaled to cover larger areas as needed.

Conclusion:

In conclusion, the AI-based pothole detection system presents a powerful, cost-effective way to improve road safety and maintenance. By using real-time monitoring and precise pothole estimation, it enables smarter repair prioritization and resource optimization. This game-changing technology not only accelerates pothole fixes but also paves the way for a future with better-managed roads, ensuring safer and more efficient travel for everyone.