

Real-Time Vehicle Localization And Velocity Monitoring Using Smartphone Sensors

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Abstract- This paper presents a real-time vehicle localization and velocity monitoring system using smartphone sensors. The system utilizes GPS, accelerometer, and gyroscope data to estimate vehicle position and speed without requiring dedicated hardware. By applying sensor fusion techniques, accurate results are achieved even in noisy environments. The proposed system is cost-effective, scalable, and suitable for modern intelligent transportation systems.

Keywords: Vehicle Tracking, GPS, Smartphone Sensors, Velocity Estimation, Real-Time Monitoring, Android Application

I. INTRODUCTION

1. Introduction

With the rapid growth of intelligent transportation systems, tracking vehicle location and speed has become essential. Traditional systems rely on dedicated GPS hardware, which increases cost and complexity. This project proposes a smartphone-based solution that uses built-in sensors to monitor vehicle movement efficiently.

2. System Architecture

The system consists of the following modules:

- Data Collection Module (GPS, Accelerometer, Gyroscope)
- Processing Module (Sensor Fusion & Filtering)
- Localization & Velocity Estimation
- User Interface (Android Application)

The application collects real-time data and sends it to a server for processing and visualization.

3. Methodology

The system works as follows:

1. GPS collects latitude and longitude.

2. Accelerometer and gyroscope capture motion data.
3. Data is processed using filtering techniques.
4. Distance is calculated using the Haversine formula.
5. Velocity is estimated using distance over time.

4. Implementation

The application is developed using Android Studio. It includes:

- Login and Registration modules
- GPS tracking functionality
- Real-time data transmission using HTTP requests
- Google Maps integration for visualization
- Speed calculation using mathematical models

5. Results

The system successfully:

- Tracks vehicle location in real-time
- Displays movement on Google Maps
- Calculates vehicle speed accurately
- Provides a user-friendly interface

6. Testing

Various testing methods were used:

- Unit Testing
- Functional Testing
- System Testing
- Performance Testing
- Integration Testing
- User Acceptance Testing

These tests ensured accuracy, reliability, and performance of the system.

7. Advantages

- Low-cost solution
- No additional hardware required

- Real-time monitoring
- Easy to use and scalable

8. Limitations

- Depends on GPS signal availability
- Sensor noise may affect accuracy
- High battery consumption
- Performance may reduce in poor environmental conditions

9. Future Enhancements

- Integration with cloud computing
- Use of machine learning for better accuracy
- Fleet management system
- Real-time traffic analysis
- Battery optimization techniques

10. Conclusion

This system demonstrates that smartphones can effectively replace traditional tracking hardware. By using built-in sensors, accurate vehicle localization and velocity estimation can be achieved. The project provides a scalable and efficient solution for modern transportation needs.

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