ResQNotify: Enhancing Road Safety through AI-Enabled Crash Detection and Driver Analysis

Abstract

With a global surge in accidents and fatalities, swift driver response at collision scenes is imperative. This paper introduces ResQNotify, a dashboard camera enhancing driver safety and analysis in the mobility industry. Its primary focus is reducing response time to save lives post-collisions. ResQNotify employs automated driver behavior analysis and intricate Artificial Intelligence and Deep Learning algorithms for crash detection and detailed driver analysis.

Keywords: Artificial Intelligence, Dashcam, Crash Detection, Driver Analysis

Introduction

The primary objective of this study is to explore and implement measures that reduce the response time to road accidents, thus increasing the probability of delivering emergency assistance within the golden hour. In this context, "emergency assistance" pertains to alerting the user's family members, informing local police stations and hospitals, and contacting helpline numbers in proximity. Additionally, the paper delves into the secondary objective of utilizing the same system for driver behavior analysis. This multifaceted approach provides fleet managers with an automated tool for evaluating and monitoring driver performance, offering insights that contribute to safer driving practices.

System Architecture

1. Video Capture: Capturing live footage, including routine tasks and potential incidents.
2. Processing and Analysis: AI-driven analysis for crash detection and driver behavior assessment.
3. Server Updates: Real-time updates reflecting video analysis outcomes.
4. User Interface Updates: Dynamic adjustments based on server data, providing insights and alerts.
5. Emergency Assistance: Activation upon crash detection, notifying contacts and authorities with precise incident details.
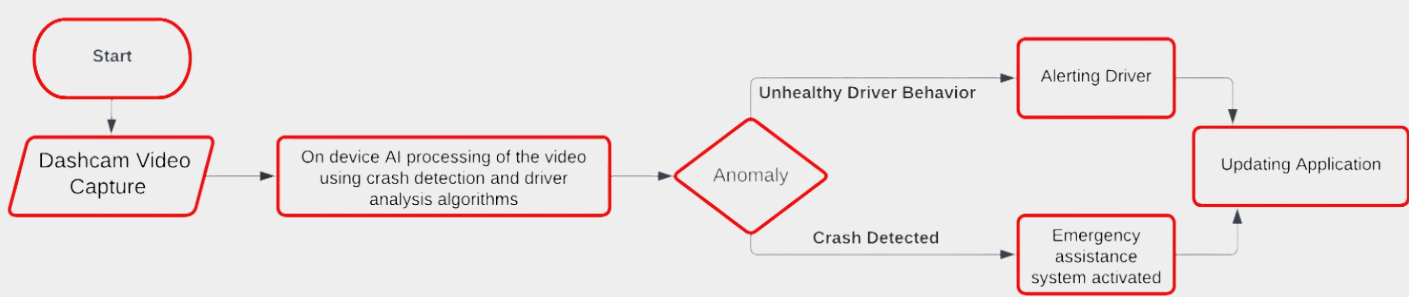
Methodology

This section explores the development and deployment of meticulously formulated AI models for crash detection and driver behavior analysis, showcasing their collaborative synergy crucial for achieving heightened accuracy levels and enhancing system performance.

Crash Detection

1. CNN (convolutional neural network) live training model
2. Midas depth estimation and object detection

Driver Analysis

1. Tailgating Detection
2. Driver Drowsiness Detection and Distracted Driver Detection
3. Rash Driving Detection
4. Driver Phone usage detection
5. Driver Seatbelt detection

Outcomes

- Swift Emergency Assistance at the Time of Crash
- Crash Video for Insurance Purposes
- Anti-Theft Feature
- Predictive Map Analysis
- Automated Driver Analysis and Ratings

S. NO.	Model	Purpose	Accuracy
1	CNN mobilenet_v2	Crash Detection	78.46%
2	Midas v3.1	Crash Detection, Rash Driving Detection, Tailgating Detection	74.4%
3	Yolov7 (Vehicle Detection)	Crash Detection, Rash Driving Detection, Tailgating Detection	90.4%
4	Haarcascade Shape predictor 68 face landmarks model	Driver Drowsiness Detection and Distracted Driver Detection	82.4%
5	Face Pose estimation Model	Driver Drowsiness Detection and Distracted Driver Detection	72.56%
6	Yolov7 (Human Detection)	Phone Usage Detection, Seatbelt Usage Detection	74.0%
7	Yolov7 (Phone Detection)	Mobile Phone Detection	72.8%
8	Yolov7 (Retrainable)	Seatbelt Detection	81.28%

Conclusion

In conclusion, ResQNotify stands as a pioneering solution in the realm of road safety, addressing the critical need for swift response and comprehensive analysis in the aftermath of vehicular collisions. By seamlessly integrating advanced AI algorithms for crash detection and driver behavior analysis into a multifunctional dashboard camera, ResQNotify not only reduces response time during the golden hour but also provides invaluable insights for fleet managers to enhance driving practices.

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