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Data-Driven Air Filter Performance Tracker

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Abstract

This project introduces a smart air filter monitoring system for vehicle cabins and engines, leveraging airflow sensor technology to ensure optimal filter performance. The system continuously measures airflow through the filter, detecting blockages or reduced efficiency caused by dirt accumulation. Sensor data is processed by a Bluetooth-enabled microcontroller, sending real-time updates to a dashboard LED and a mobile application. Drivers receive timely notifications for filter replacement, helping maintain vehicle efficiency and passenger health. Additionally, a fleet management dashboard aggregates airflow data from multiple vehicles, assisting fleet operators in proactive maintenance scheduling. By predicting filter replacements and minimizing vehicle downtime, the platform enhances fleet productivity and reduces operational costs. This integrated system offers a scalable, cost-effective solution, promoting sustainability through optimized filter usage and improved air quality in vehicles.

Keywords

Air Filter Monitoring, Airflow Sensors, Maintenance Alerts, Bluetooth Enabled Data Transmission, Fleet Maintenance Management

Biographies

Jabir Ibn Bashar is an ongoing undergraduate student in Industrial & Production Engineering at American International University-Bangladesh. He has completed his HSC from Golam Mostafa Model College with a GPA of 5.00. Jabir's enthusiasm for science and technology earned him first place in SGHSC Inter College science competition for his project on artificial intelligence and a leadership role as Senior Executive at the Gregorian Science Club. He participated in IEEE Day with a project on 'E-Waste Recycling Hubs.' Currently he is doing an internship at the Operations Management department in YSSE (Youth School for Social Entrepreneurs). He is also a gold award nominee for the Duke of Edinburgh's Award. He also has a record of excellence in public speaking by winning accolades such as the champion title in the JDC Inter School Debate. With aspirations in industrial development and policymaking, Jabir is focused on sustainability-driven engineering projects that have real-world impact.

Rafia Jannat Raka is an undergraduate in the Department of Industrial and Production Engineering at American International University Bangladesh (AIUB). She excels academically and is passionate about human factors and ergonomics. She focuses on designing efficient, safe, and comfortable workplaces, with a keen interest in cognitive ergonomics and human-machine interaction. Raka's journey extends far beyond academics. As a participant in the prestigious 'Girl Guides International Camping' program in Penang, Malaysia, she demonstrated her leadership skills and developed a global perspective on teamwork and community service. She aims to meaningfully contribute to a future where technology and humanity advance together, fostering progress and harmony in both industrial and societal realms.