

Chapter 14

Smart Vehicle–Emissions Monitoring System Using Internet of Things (IoT)

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ABSTRACT

Eco-friendly environment concern contributes to the survival of life on earth. Monitoring chemicals produced by growth requires a multidisciplinary scientific approach. Climate change is a result of pollution and overuse, particularly in the air. Although government and industry have taken initiatives to limit air pollution, it is still necessary to check the quality of the air at ground level. The goal of this endeavour is to build intercommunication-based individual vehicle air pollution monitoring and identification by internet of things (IoT). Idling and accelerating conditions were recorded using tailpipe emission sensing. Authorities can act and assure upkeep if they are able to identify a car at a busy intersection; mobile connectivity enabled route and vehicle identification. In India, fewer people will die from air pollution because to data gathered in the cloud.

DOI: 10.4018/978-1-6684-8117-2.ch014

INTRODUCTION

The goal of this endeavour is to build intercommunication-based individual vehicle air pollution monitoring and identification systems. The input used to record the data for idle and accelerating conditions was the detection of tailpipe emissions. Finding the car near the main intersection will enable the responsible authorities to act right away and launch a campaign for the rest of the community on vehicle upkeep. The authority will be assisted in eliminating the gross fleet by the data gathered in the cloud, which will identify and track the vehicle with the largest pollutant. This might revolutionise the present risk of air pollution-related fatalities. Although research on wireless networking and vehicle density has been ongoing for a while, adoption of these technologies is difficult because of how mobile cars are on the road. To provide the greatest possible data transfer, researchers have given arbitrary motion patterns for vehicles with a limit on speed. Although there is no information on the pollution brought on by specific cars, the Pollution Control Board of State and Center indicated that transportation was the main contributor to air pollution. Even the government-maintained “Vahan” and “Sarathy” software provide information on registration, cases filed, and associated facts. There is no particular software available for the car to identify the emission levels(Vashisht & Rakshit, 2021).

The first stage of the job, which is to detect and remove the fleet of cars that create more pollution than the intended limit, was made possible by the construction of a microcontroller and a simplified version of the IoT module. With an emphasis on “fit for purpose” and an evaluation of network expansions and capacity increases, the NTDPC advised using a comprehensive approach to creating an integrated transport network. Although a logistical infrastructure must be constructed, there is no specialised software available to identify the fleet’s cars. Researchers have been able to determine the optimal path/route for cars in a fleet using the Global Positioning System (GPS) thanks to disruptive technical advancements in the automobile industry. However, new developments with high-resolution street maps and heterogeneous interoperability with standard interfaces have made this a promising study area. Most researchers have investigated route distance, multiple vehicle routing, and operation research methodologies(Lee & Yoo, 2000).

Network models that depict the spatial characteristics of transportation infrastructure have been developed as a result of quantitative approaches to transportation phenomena. Concave cost network flow issues are used to characterise behaviour patterns or normative attempts to use the transportation infrastructure efficiently, whereas the network equilibrium problem may be used to estimate an origin/destination matrix. The shortest path, assignment, and transportation are all optimised using the Minimum Cost Network Flow Problem. The Max-flow Min cut Algorithm was used to create a road map for parallel and distributed systems. To use the cores on a single computing node or a distributed memory technique, parallelization entails transforming sequential code into multi-threaded or “vectorized” code. When it comes to hardware, parallel computers may accommodate more than one core and processor on a single system. By consuming less power, multi-core CPUs with many processors aid in improving the effectiveness of processing through multitasking. A method for handling complicated calculations and multitasking is parallel processing. It entails giving the processor smaller jobs to do while putting together solutions using the same tool. The driver is verified to reveal information about vehicles in closer proximity in order to identify the individual user.

The conventional Mobile Adhoc routing methods offered include Proactive, Reactive, or Location-based. While reactive protocols only permit the new node to enter if the old node becomes disconnected, proactive protocols construct new routes or update existing ones in a set amount of time. In order to

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