IoT BASED VEHICLE EMISSION MONITORING SYSTEM

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Introduction

The increase in automobiles significantly contributes to air pollution through emissions of nitrogen oxides (NOx), carbon monoxide (CO), and hydrocarbons (HC). Vehicles are responsible for about half of NOx, CO, and a quarter of HC emissions, worsening global warming. Neglected maintenance and ignition defects exacerbate these emissions.

Motivation

The increase in automobiles significantly contributes to air pollution through emissions of nitrogen oxides (NOx), carbon monoxide (CO), and hydrocarbons (HC). Vehicles are responsible for about half of NOx, CO, and a quarter of HC emissions, worsening global warming. Neglected maintenance and ignition defects exacerbate these emissions. To tackle this issue, a system is proposed: exceeding government-set emission limits triggers an engine service alert and displays emission levels on an LCD which is placed in the instrument cluster using IoT. If ignored, a report is automatically sent to the transport office. Controlled by a Node MCU microcontroller, this system aims to mitigate pollution and extend vehicle lifespan.

Scope of the Project

The scope of this project included :

➢ Integration with Vehicle Fleet Management

➢ Public Awareness and Engagement

➢ Partnerships with Automotive Industry

➢ International Expansion and Collaboration

Methodology

The following steps are included to develop the project : -

- The first step is to create the circuit design.
- Private channel creation for Vehicle Emission Detection using Thingspeak.
- Thingspeak allows you to aggregate, visualize and analyze live data streams in the cloud.
- With Thingspeak, your data is stored in channels. Each channel stores up to 8 fields of data. You can create as many channels as you need for your application.
- Then the Display that shows the user real time emission level in the sequential order.
- It will be placed in the instrument cluster of the motorcycle which will help the user to view the real time emission of his motorcycle.
- The system we described utilizes Mq2, Mq7, and Mq135 sensors to monitor emissions from vehicle exhaust, transmitting analog data to a controller with wiFi connectivity.
- The controller updates values to an LCD and cloud, triggering alerts when emissions surpass threshold limits.
- IoT integration facilitates cloud updates, with Node MCU enabling data transmission when wiFi is available.
- Alerts prompt vehicle owners to take action, with non-compliance leading to data sharing with transport authorities.
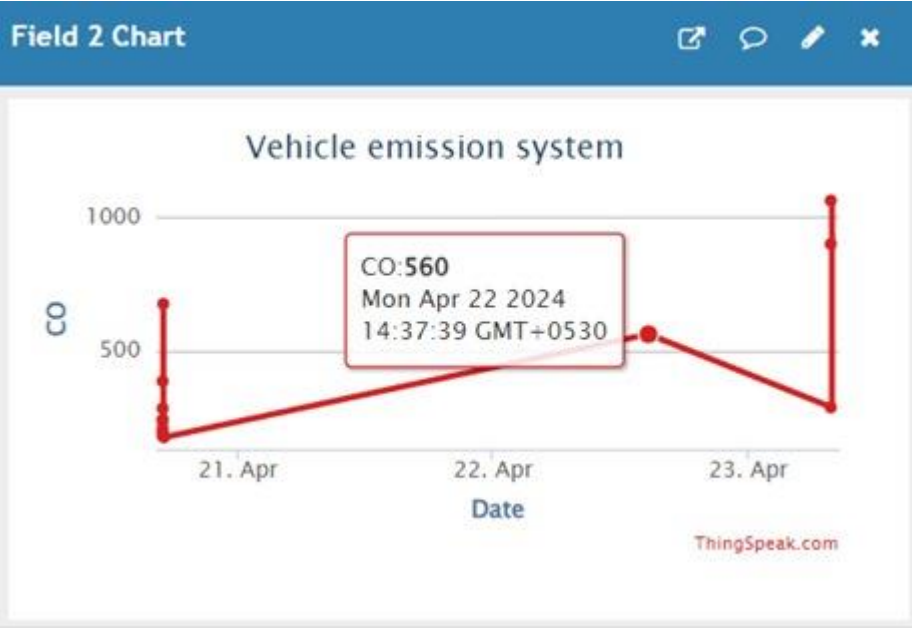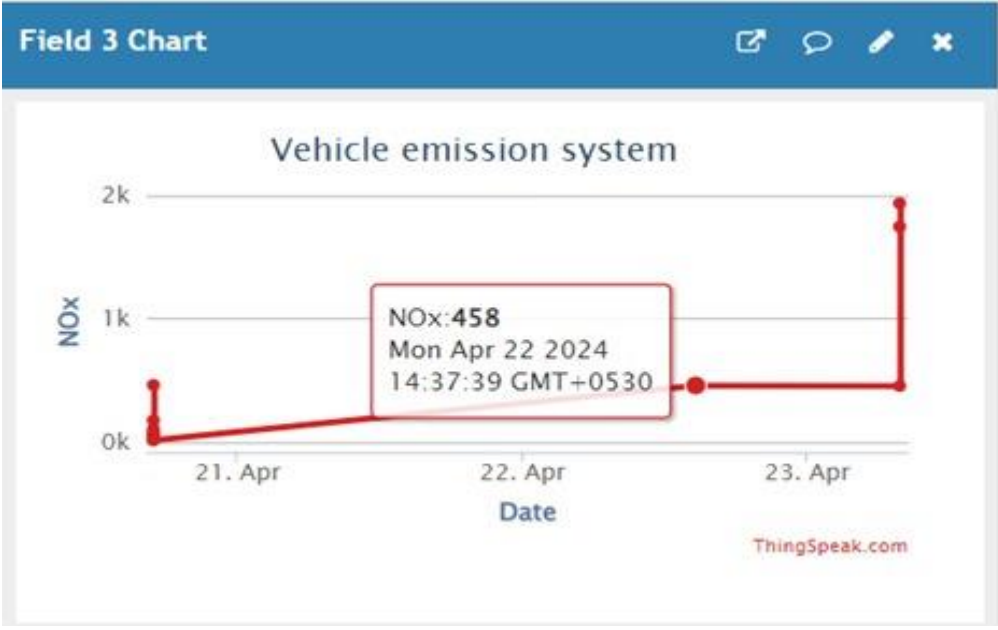
Block diagram
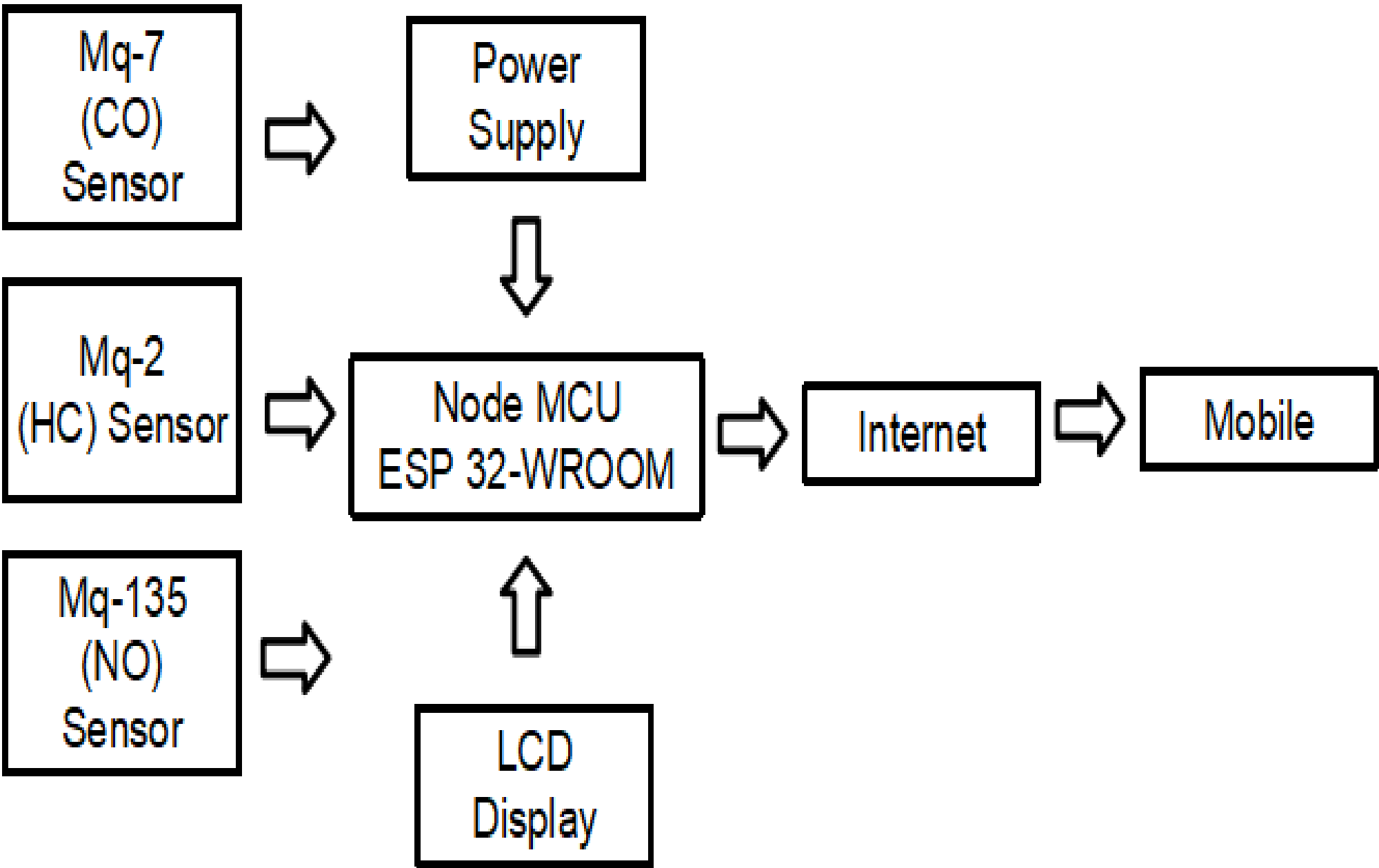
Results

Thingspeek reading of HC
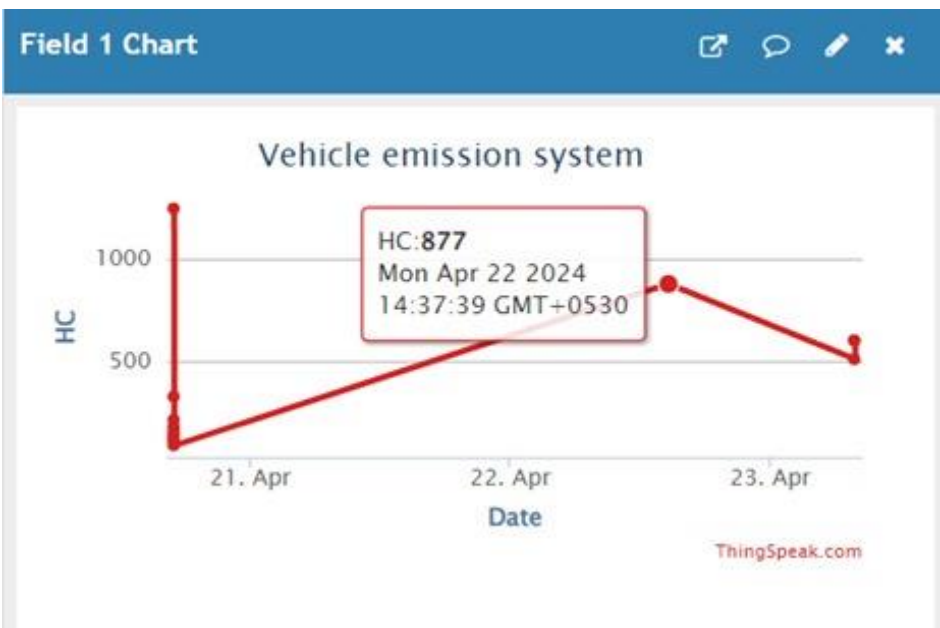
Thingspeek reading of CO

Thingspeek reading of NOx

Message received by RTO Through GSM

User – ASHWIN BASKARAN
Engine No – 0987654321
Vehicle No – TN38x1234
NOx :16 ppm
CO :1407 ppm
HC :319 ppm

LCD Display
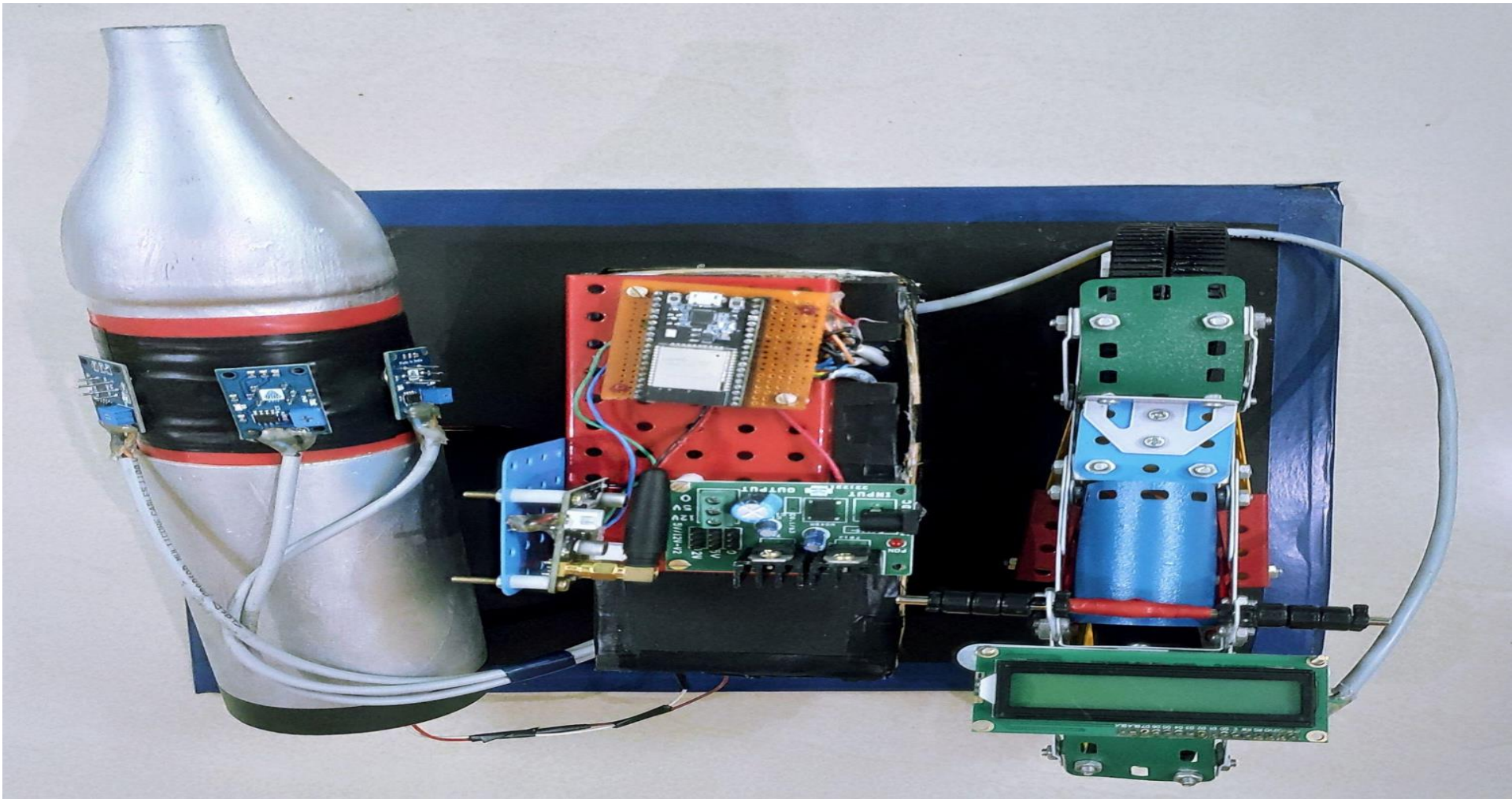

Level of Carbon monoxide in LCD Display

Level of Nitrogen oxide in LCD Display

Level of HydroCarbon in LCD Display

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Conclusion

The system's low-cost design and minimal maintenance requirements make it accessible for widespread adoption, contributing to its feasibility as an effective solution. With real-time monitoring capabilities, it targets the reduction of harmful gases emitted from vehicle exhaust, aligning with the urgent need to combat environmental pollution. Integrating GPS technology in future iterations could amplify its impact by enabling seamless data transmission to regional transport authorities, enhancing regulatory oversight and fostering a cleaner, healthier environment. Through these advancements, the system not only extends vehicle lifespan but also plays a vital role in promoting sustainable transportation practices..

References

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2. Suvitha Vani P., Karthika S., Nabhanya K., Gowtham Ram S., Aishwarya Lakshmi N., "Vehicle Pollution Monitoring Using IoT", Int. J. Recent Technol. Eng. (IJRTE), ISSN: 2277-3878, Vol. 9, Issue 1, May 2020
3. Joseph Mathew Skaria Maliyekal, Shancy Elizabeth Shaji, Vandana H., Divya R. S., "Vehicular Pollution Monitoring with IoT", J. Commun. Eng. Innov., DOI: 10.5281/zenodo.3570505, Vol. 5, Issue 3, 2019