Air Pollutant Mapping System Written Report

Cadets: Nathan Vu, Ben Davis, Jack Myhre

HRS: Chat GPT – Researching into air pollutant types

Air pollution has become a significant environmental and public health issue, particularly in urban and industrial areas. Monitoring air quality effectively requires innovative solutions that can provide real-time, high-resolution data on pollutant concentrations. Traditional air monitoring stations, while accurate, are limited by their stationary nature and high costs. To address these challenges, we propose an Air Pollutant Mapping System utilizing aerial drones, that will integrate gas sensors and camera technology to detect, analyze, and visualize the air quality over a specified vicinity. The system will leverage drones for mobility, allowing efficient data collection over wide areas, and a user interface (UI) for comprehensive analysis and reporting.

Current air quality monitoring methods rely on fixed stations that provide limited spatial coverage and may not effectively capture pollution variations in different locations. Additionally, there is a need to correlate pollutant levels with human presence and activity to assess health risks better. A drone-based solution equipped with gas sensors and imaging technology can offer real-time, high-resolution data while identifying affected individuals in each vicinity. This project aims to bridge the gap between traditional air monitoring techniques and modern, mobile data collection methods to improve air quality assessment and response strategies.

The Air Pollutant Mapping System utilizing aerial drones aims to achieve the following objectives:

* Design and implement a drone-based system equipped with gas sensors to detect various air pollutants such as Carbon Monoxide (CO), Nitrogen Oxide (NO), and Sulfur Dioxide (SO₂).
* Integrate a camera system to identify human presence in the monitored area and correlate it with pollutant exposure levels.
* Develop a real-time data transmission and processing framework for efficient pollutant mapping.
* Create an intuitive UI that allows users to analyze collected data, visualize pollution patterns, and interpret results in a meaningful context.
* Ensure the system provides tailored insights for specified client needs.

**Timetable:**

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| **Phase** | **Task** | **Duration** |
| **Phase 1: Research & Planning** | Literature review on air pollutants, drone technology, and sensor integration | 2 weeks |
|  | Selection of appropriate sensors and camera system | 1 week |
| **Phase 2: Hardware & Software Development** | Design and assemble the drone with sensor and camera integration | 2 weeks |
|  | Develop sensor data acquisition and wireless transmission framework as well as incorporate human detection algorithm using camera data | 2 weeks |
| **Phase 3: UI and Data Processing Development** | Design UI for data visualization and analysis | 1 weeks |
| **Phase 4: Testing & Optimization** | Field testing and calibration of sensors | 1 weeks |
|  | Optimize drone flight paths and data accuracy | 1 weeks |
| **Phase 5: Final Integration & Deployment** | Final system testing, bug fixing, and user feedback integration | 1 weeks |
|  | Project documentation and report preparation | 1 weeks |
| **Estimated Duration** | 13 weeks or ~ less than 3 Months |  |

Sources:

[Atmospheric CO2 Level Measurement and Discomfort Index Calculation with the use of Low-Cost Drones | Engineering, Technology & Applied Science Research](https://www.etasr.com/index.php/ETASR/article/view/6230)

[Environmental chemical sensing using small drones: A review - ScienceDirect](https://www.sciencedirect.com/science/article/abs/pii/S004896972034701X)

[Present and future emissions of air pollutants in China:: SO2, NOx, and CO - ScienceDirect](https://www.sciencedirect.com/science/article/abs/pii/S1352231099001673)