

# Air Quality Monitoring using Integrated Secure Wireless Sensor and Vehicular Networks

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# Outline

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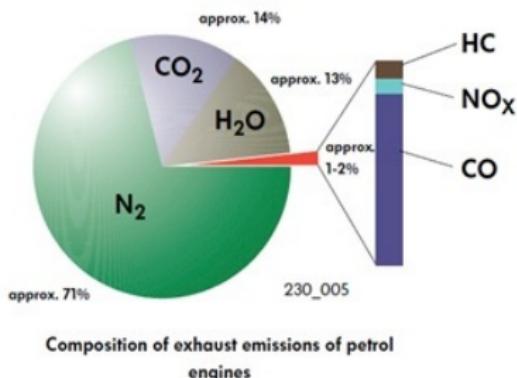
- Calibration Setup
- Data Integrity Verification
- Data Visualization
- Project Progress

## 3 Collaborations



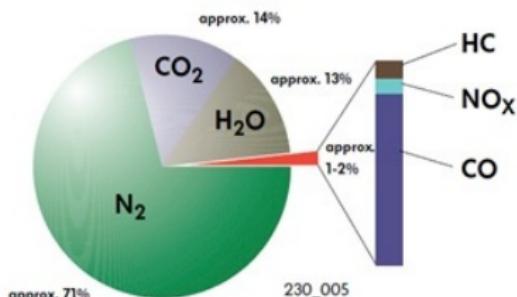
# Introduction

- Gas emissions from automobile engines <sup>1</sup>

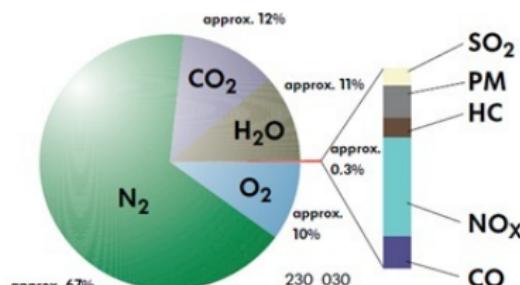


# Introduction

- Gas emissions from automobile engines <sup>1</sup>



Composition of exhaust emissions of petrol engines



Composition of exhaust emissions of diesel engines

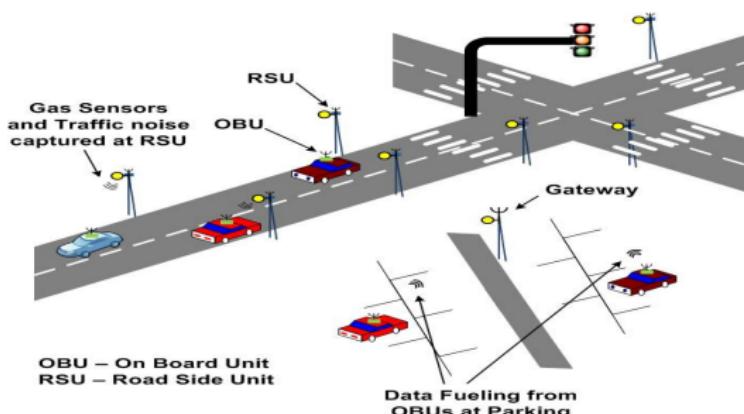


# Introduction

- Monitoring of gas concentrations along the roadside
- Large number of sensing nodes required for higher spatial and temporal resolution
- Available sensing solutions:
  - *Infrared Gas Sensors*: Reference method, expensive, highly accurate
  - *Electrochemical Gas Sensors*: Non-reference method, relatively expensive, accurate, small life
  - *Semiconductor Gas Sensors*: Non-reference method, inexpensive, acceptable accuracy
- Due to low cost and acceptable accuracy, we selected Metal Oxide Semiconductor gas sensors



# Architecture

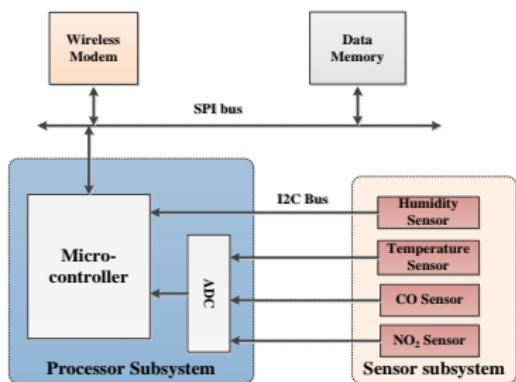


Integrated network architecture



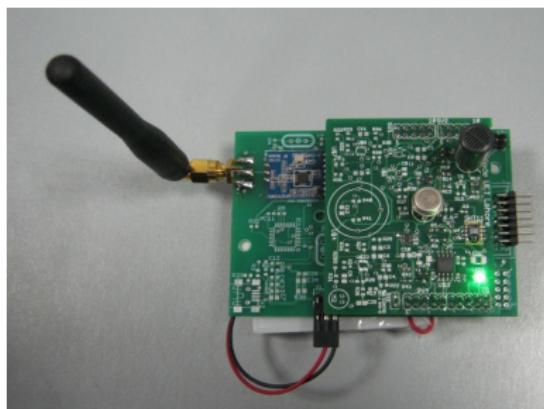
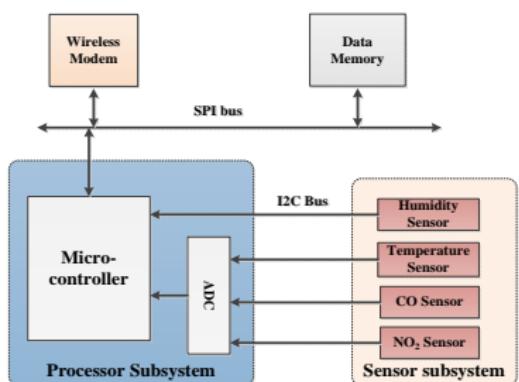
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- Block diagram showing sensing, processing and communication blocks



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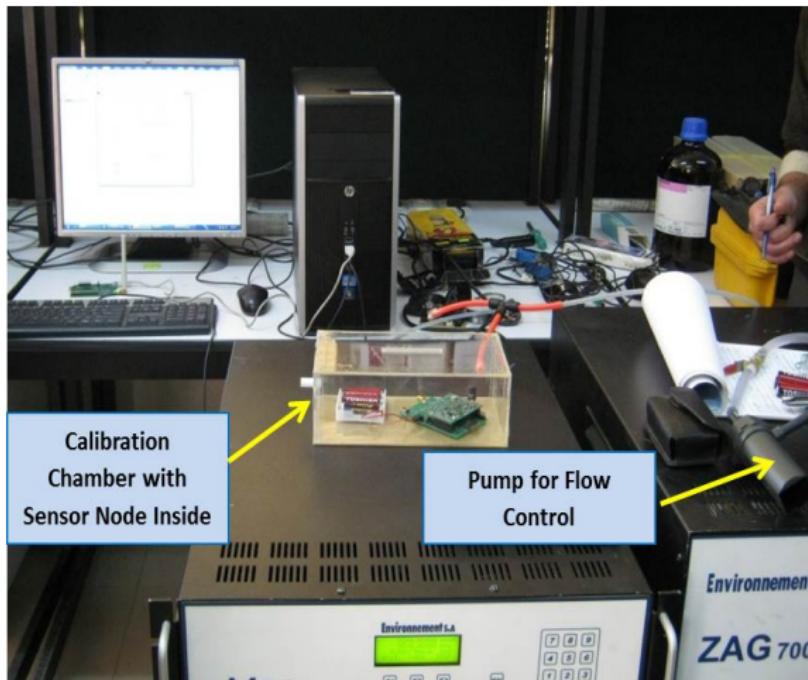


Sensor node block diagram and platform



## Calibration Setup

- Calibration setup at SUPARCO.
- Calibration being carried out under controlled conditions.



CO sensor calibration setup

# Data Data Integrity Verification

- An ambient sensing-centric based data integrity verification



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  - **Temporal ambient signature can be used to for data integrity verification**



# Data Visualization

- A simple graphical user interface for data visualization, data storage and online accessibility

**plotter**

File

COM3	Open Port	Start		
115200	Close Port	Stop		
Node ID	5	2	3	4
Temperature (°C)	18	19	19	19
CO (PPM)	2	2	3	2
NO2 (PPM)	0.1	0.2	0.1	0.2
Humidity (%)	55	54	58	55



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- Two undergrad groups and one grad student have finished their thesis working on this project.



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- The developed solution can also be integrated with existing infrastructure for automated flood forecasting etc.

