PROJECT ABSTRACT

Electronic Nose (E-Nose) Gas Sensor Array Demo

A bench demonstration of an electronic nose: four MQ-series gas sensors in a sealed acrylic chamber, Arduino readout with live LCD bar graphs, syringe sampling and a pattern-recording procedure. Delivered built-to-order with working prototype, report, PPT and viva kit.

01. Title

Electronic Nose (E-Nose) Gas Sensor Array Demo

02. Introduction / Background

An electronic nose mimics the biological sense of smell: instead of one selective sensor, an array of broadly-tuned sensors produces a response pattern, and the pattern identifies the odor. Students usually meet this idea only in research papers. This project makes it a bench demo: four MQ-series gas sensors (MQ-2, MQ-3, MQ-7, MQ-135) on a board inside a sealed acrylic chamber, read continuously by an Arduino, with all four responses shown as live bar graphs on an LCD. Injecting a sample makes the bars jump in visibly different combinations per odor.

03. Problem Statement

Gas sensing is taught one sensor at a time, so the array-and-pattern concept at the heart of the electronic nose never becomes intuitive. The project addresses this with a sealed chamber, a syringe injection port and a live four-channel display: the student injects samples (fruit scent, alcohol vapor, clean air), watches distinct response patterns form, and builds a small reference library of odor fingerprints with the documented procedure.

04. Objectives

- Build a four-sensor MQ array (MQ-2, MQ-3, MQ-7, MQ-135) for overlapping odor sensitivities.
- House the array in a sealed acrylic chamber with a syringe injection port.
- Read all sensors continuously with an Arduino and display live bar graphs on an LCD.
- Enable repeatable sampling with a syringe and safe sample vials.
- Deliver a pattern-recording procedure with blank fingerprint tables.
- Deliver the complete student kit: prototype, firmware, report, PPT and viva Q&A.;

05. Proposed Methodology

The build proceeds in three stages. (1) Array: the four MQ sensors are mounted on a perforated board with labeled positions and wired to the Arduino analog inputs. (2) Chamber: the acrylic box is sealed around the board with the injection port fitted; warm-up and baseline stabilization are characterized. (3) Demonstration: the procedure guides baseline recording, controlled sample injection, pattern table entry, and a nearest-pattern comparison on normalized readings to identify an unknown sample.

06. System Architecture / Working

The sensor array warms up in the sealed chamber until LCD baselines stabilize on clean air. The student records the four baseline levels, then injects a sample through the port with the syringe. Each MQ sensor responds per its sensitivity profile, and the LCD bar graphs jump in a sample-specific combination — the odor fingerprint. Repeating with different samples builds the reference library; an unknown sample is identified by nearest-pattern comparison against the student's own recorded table. All readings are relative response levels (indicative, not calibrated ppm).

07. Hardware / Software Requirements

- MQ-2, MQ-3, MQ-7, MQ-135 gas sensors (datasheet parts)
- Sealed acrylic test chamber with injection port
- Arduino controller board
- Character LCD with bar-graph firmware
- Syringe sample injector and sample vials
- Perforated sensor mounting board
- Arduino C firmware (sampling, display, pattern tables)
- Pattern-recording procedure with blank tables

08. Expected Outcomes

- A working e-nose demo showing visibly distinct response patterns per odor sample.
- A student-built reference library of odor fingerprints from self-taken readings.
- A demonstrated nearest-pattern identification of an unknown sample.
- A complete report, PPT and viva Q&A; covering gas-sensor physics and e-nose principles.

09. Applications

- Teaching aid for sensor arrays and pattern recognition in instrumentation courses.
- Demonstration of food-spoilage, air-quality and industrial odor-monitoring concepts.
- Base platform for student extensions into machine-learning classifiers on logged data.

10. Future Scope

- Log array data to a PC and train a k-NN/SVM classifier on the fingerprints.
- Add temperature/humidity compensation to the sensor readings.
- Expand the array with additional selective sensors and a pump-driven sampling system.