SENSING ODOUR WITH E-NOSE

The past and future trends of odour detection

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AGENDA

• Sensors
• Electronic nose
  • What is electronic nose?
  • Application areas
  • Wireless Sensor Networks Based Electronic-nose used for monitoring and improving air quality
  • Challenges and possible solutions
  • Future trends
• Conclusion
SENSORS

- Considering as
  - Transducers --> converts a signal or data from one form to another

- Intelligent proactive devices part of a larger system bringing layer of control over human capabilities
HUMAN SENSORY SYSTEM

- Seeing (Camera)
- Hearing (Microphone)
- Tasting (E-tounge)
- Touch (Thermometer)
- Smell (E-nose)
**GAS DETECTION METHODS**

- Different existing gas detection methods such as
  - Gas chromatography (GC)
  - Mass spectrometry (MS)
  - GC-MS Method
  - Ion mobility spectrometry (IMS)
  - Near-Infrared spectroscopy
ELECTRONIC NOSE

- First E-nose device made in the 1980s
- A smart instrument designed to detect and distinguish complex odours
COMPARING THE BIOLOGICAL NOSE TO THE E-NOSE

- E nose is compared to the olfactory system
- Human loungs → pump
- Biological detecting gas → sensors detecting gas
- Olfactory system performs pattern recognition → artificial nose uses a intelligent pattern classification algorithm
COMPARING THE BIOLOGICAL NOSE TO THE E-NOSE
ELECTRONIC NOSE

- Typical E-nose device includes
  - a sampling system
  - an array of chemical gas sensors
  - a analog to digital converter (ADC)
  - a computer microprocessor with sample classification method (pattern-classification algorithm)
APPLICATIONS
E-NOSE DEVICES

- SensorFreshQ
- Cyranose 320
- JPL Electronic Nose
Wireless Sensor Networks Based Electronic-nose used for monitoring and improving air quality

- Using a fuzzy neural network based on RBF algorithm
- Using ZigBee which enables low complexity and ultra low power consumption.
CHALLENGES WITH CURRENT E-NOSE

- High cost
- Complexity of signature detection and matching
- To broad range of application area
  - e.g. Cyranose 320 used to sniff out explosives, chemicals, food contaminates and even cancers.
POSSIBLE SOLUTIONS

- E-Nose that are more targetable at detecting and discriminating a small range of analytes
- Printed organic conductors
FUTURE TRENDS

- Current price of e nose same as in 1998 (from $5000 – $100 000)
- Experts predict that within a decade e-noses will cost only tens of dollars
CONCLUSION
QUESTIONS?