

# **SENSING ODOUR WITH E-NOSE**

**The past and future trends of odour  
detection**

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# AGENDA

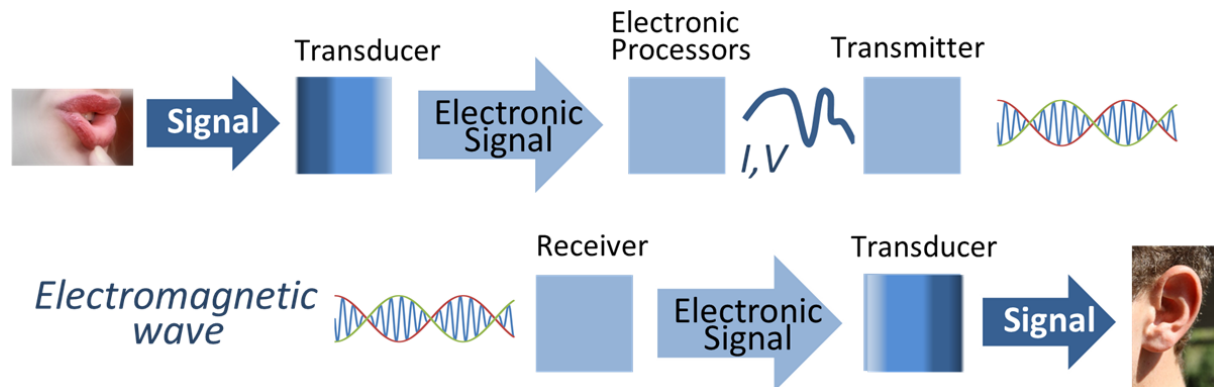
- Sensors
- Electronic nose
  - What is electronic nose?
  - Application areas
  - Wireless Sensor Networks Based Electronic-nose used for monitoring and improving air quality
  - Challenges and possible solutions
  - Future trends
- Conclusion



# SENSORS

- Considered as

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

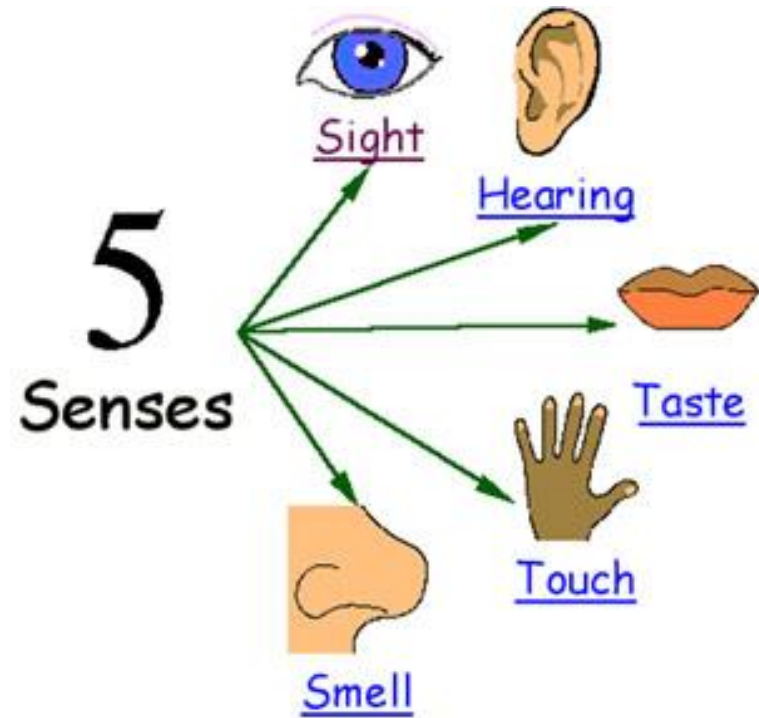


- Intelligent proactive devices part of a larger system bringing layer of control over human capabilities



# 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



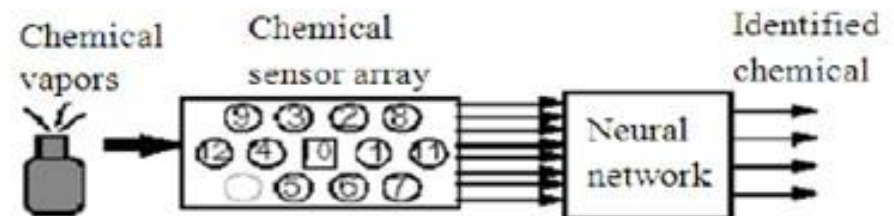
# ELECTRONIC NOSE

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

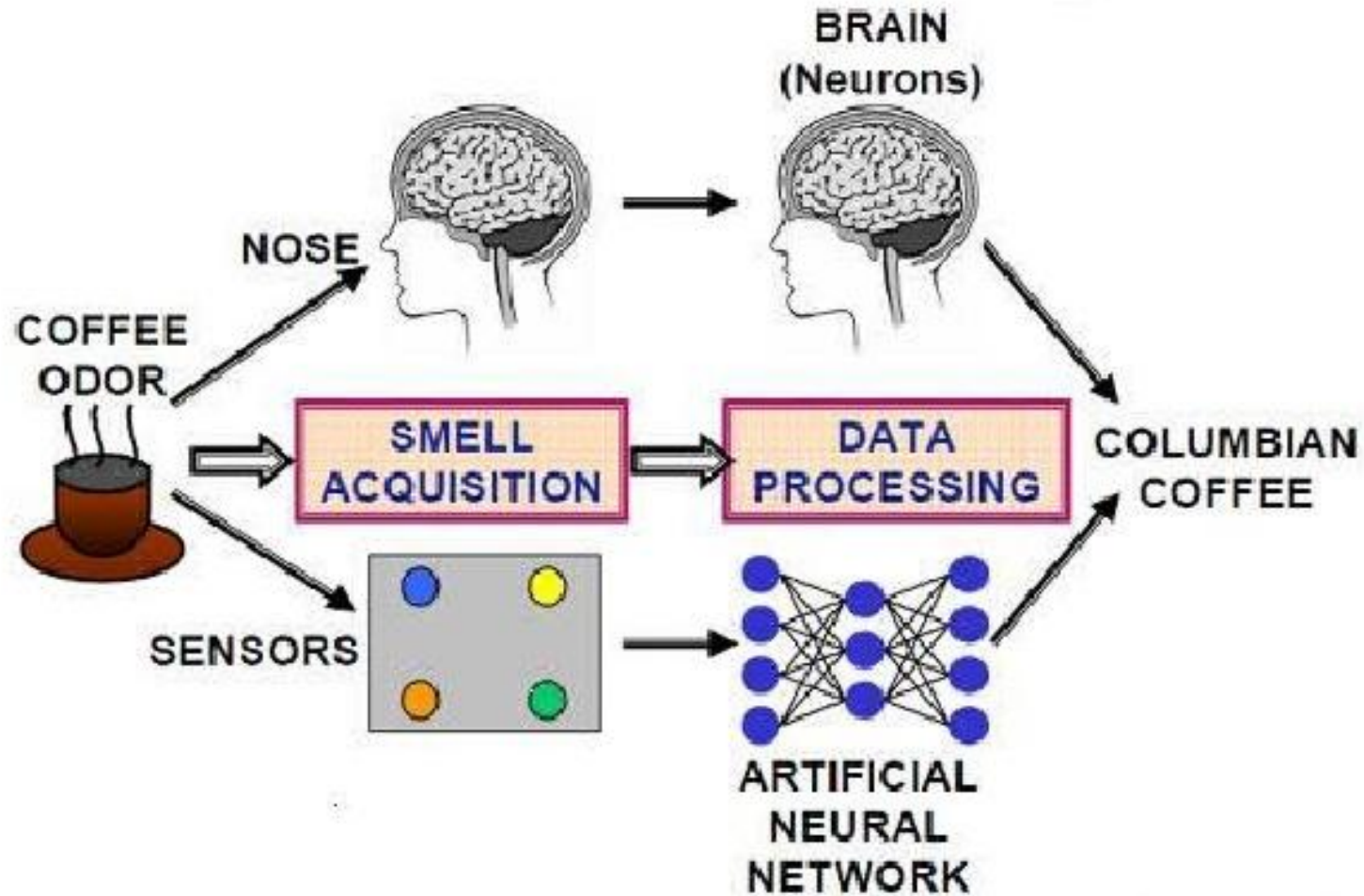


# COMPARING THE BIOLOGICAL NOSE TO THE E-NOSE

- E nose is compared to the olfactory system
- Human lungs → 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



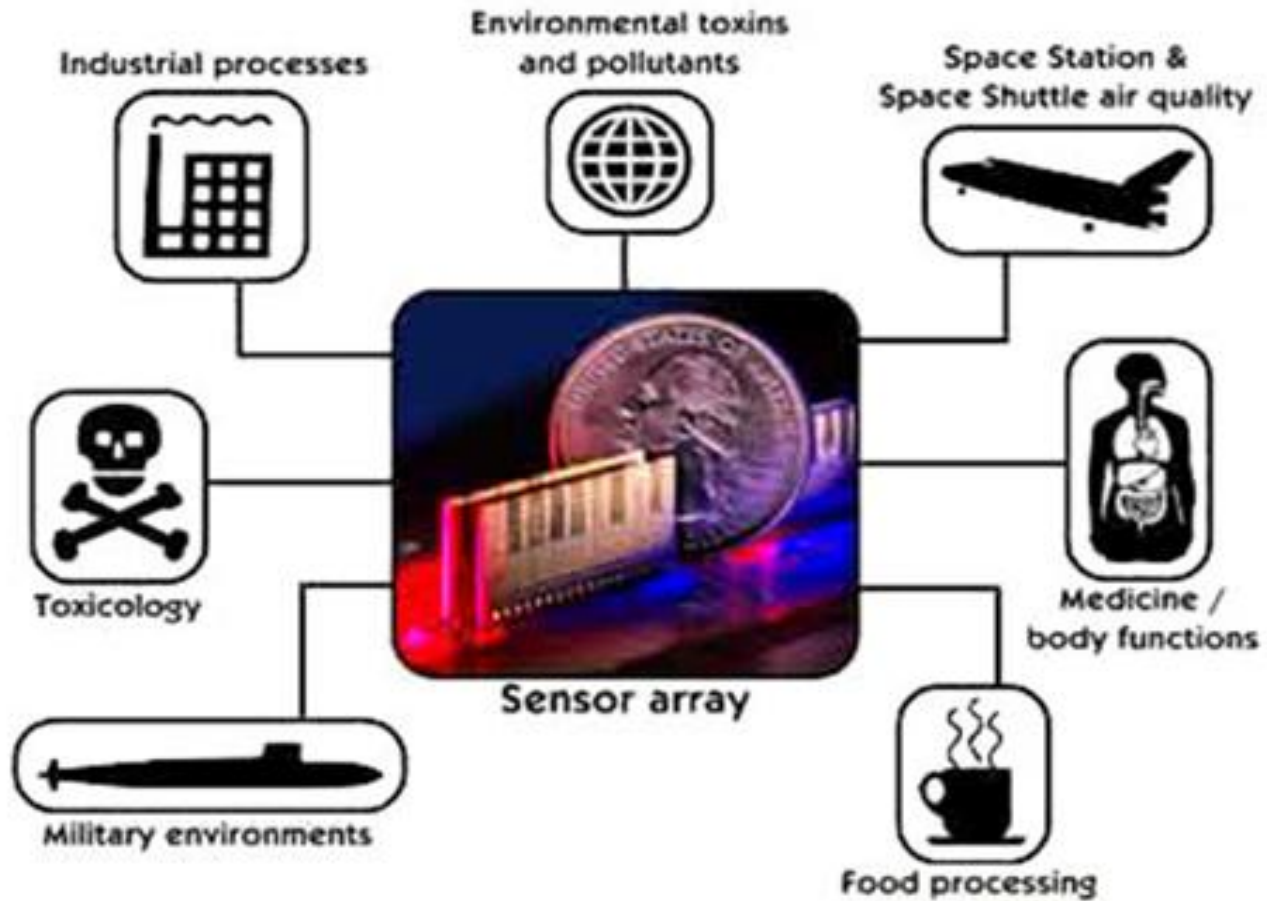


# ELECTRONIC NOSE

- 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



Cyranose 320



SensorFreshQ

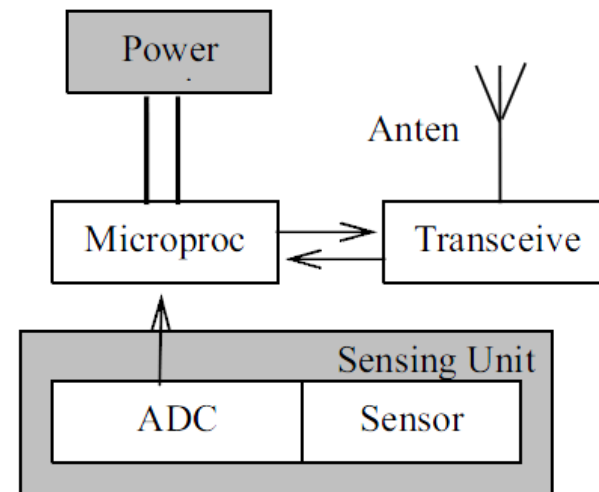
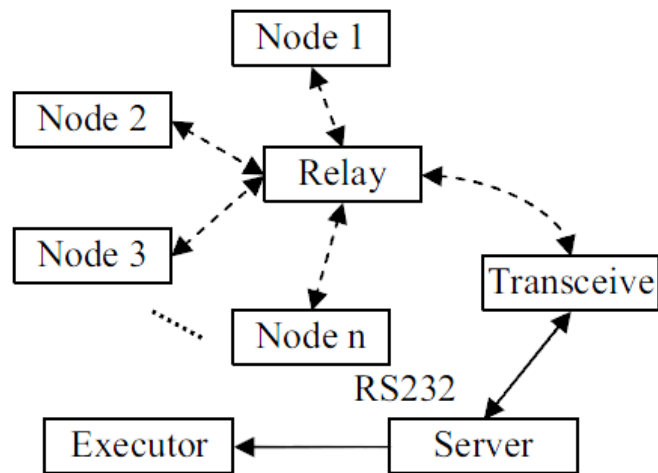


JPL Electronic Nose



## 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

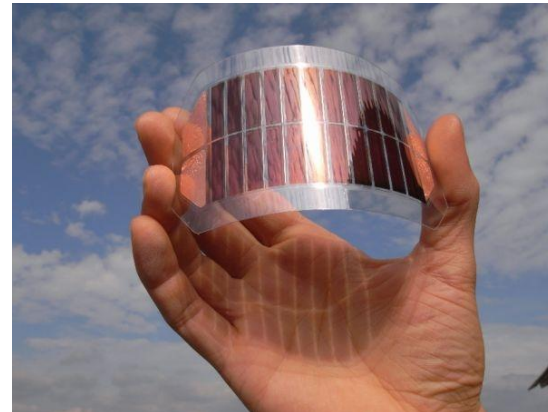
- High cost
- Complexity of signature detection and matching
- To broad range of application area
  - e.g Cyranose 320 used to sniff out explosives, chemicals, food contaminates and even cancers.



# 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?

