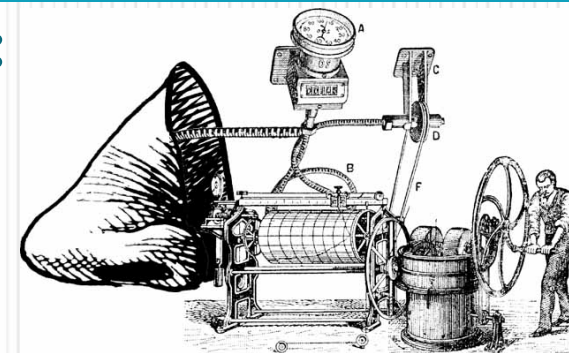




## Use of specific in-situ sensors:

### E-Nose

A-C Romain



30<sup>th</sup> january 2013

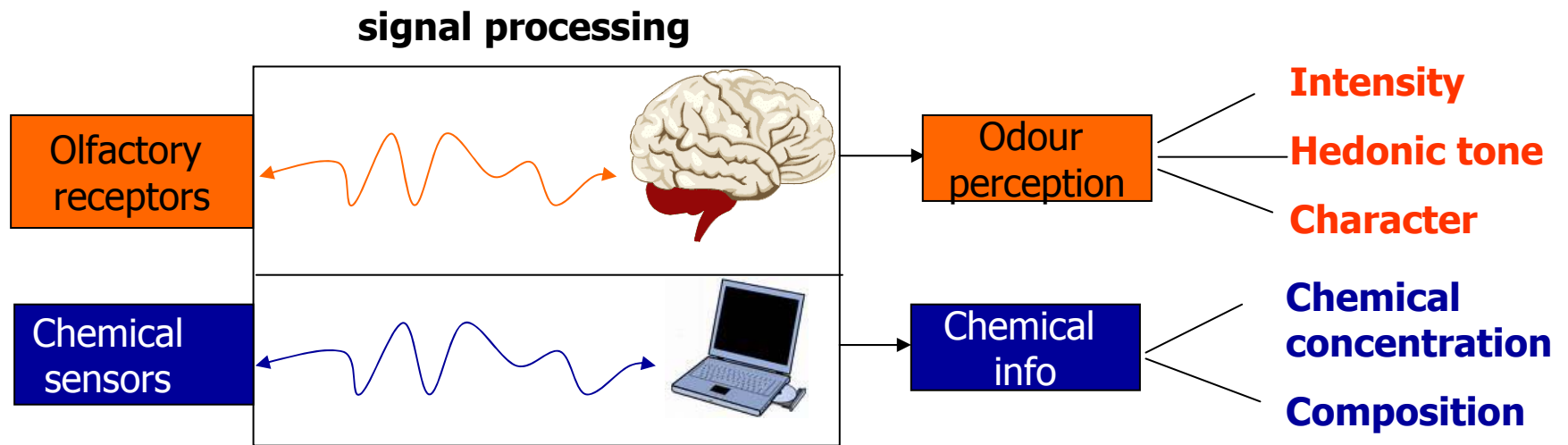
# Contents

- E-nose: a bioinspired instrument?
- Instrument
- Concept
- Data treatment
- In situ application: Landfill

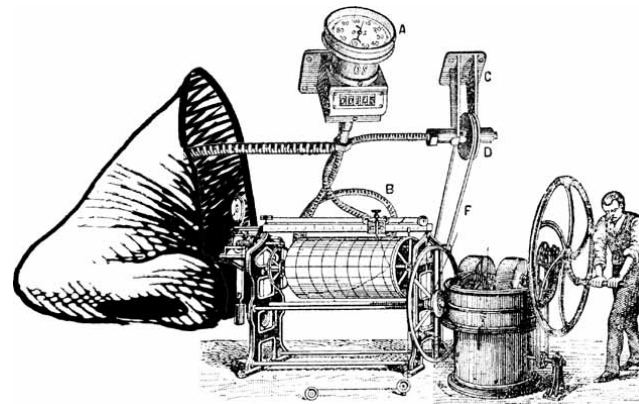


# E-nose: a bioinspired instrument ?

- Analogy with the biological system:



- E-nose = instrument with several potentials but with performances far behind the human olfactory system



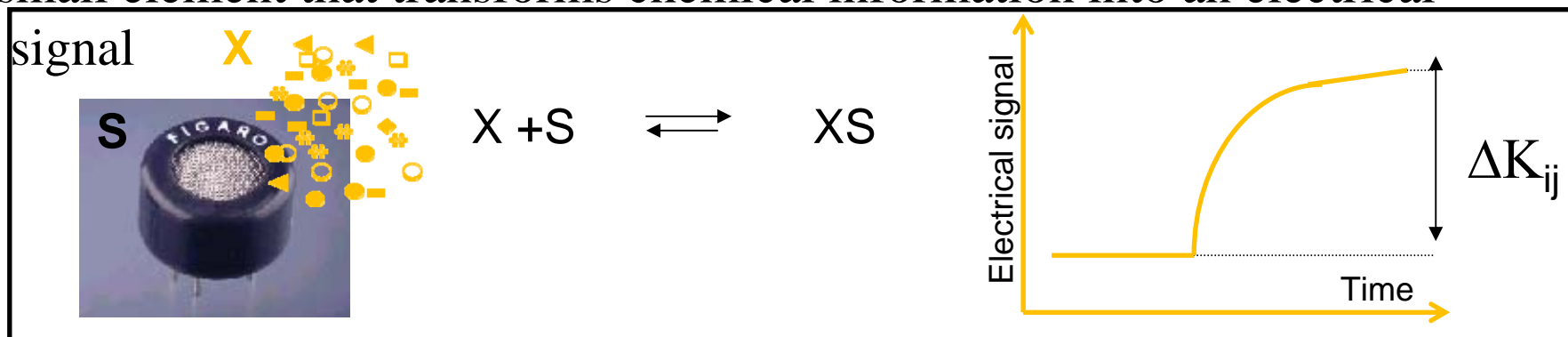
- **Definition**

“instrument which comprises an **array** of **chemical sensors** with partial specificity and an appropriate **pattern recognition system**, capable of recognizing simple or complex odours”

[Gardner and Bartlett, 1993]

- **Chemical sensors**

a small element that transforms chemical information into an electrical



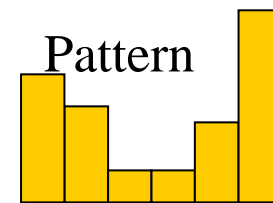
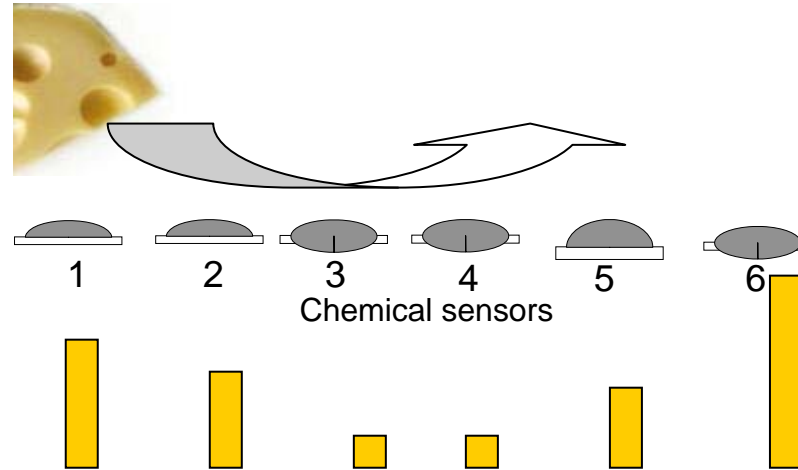
# Concept

Odour (j)

Sensors array (i)

Signal of each sensor  
( $\Delta k_{ij}$ )

Combination of all the signals

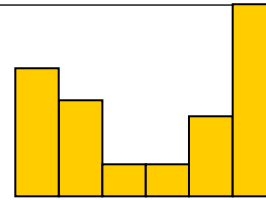


Cheese ?

PATTERN RECOGNITION SYSTEM  
(PARC)

(data treatment)

# Data treatment

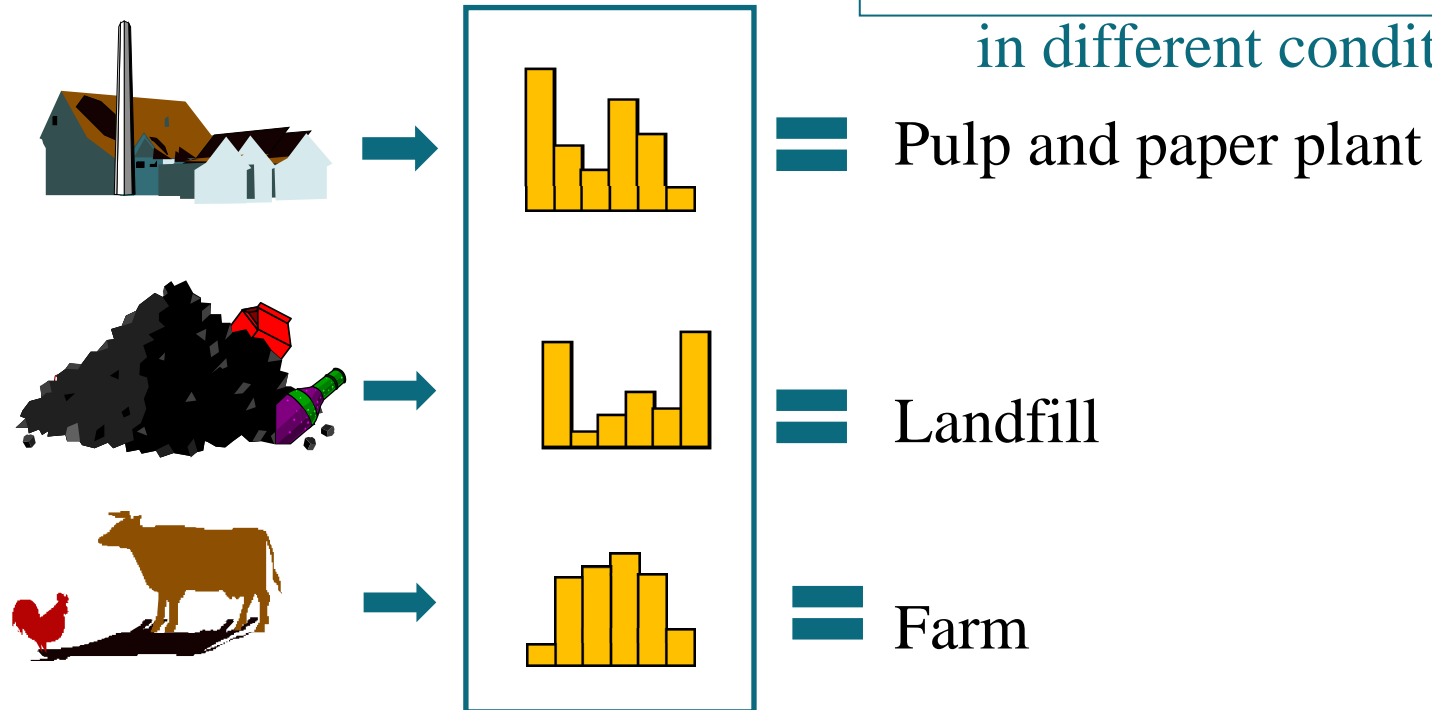


- Relationships between the “pattern” and the input (gaseous mixture): Multivariate analyses (mathematical and statistical models)
- **Identification**

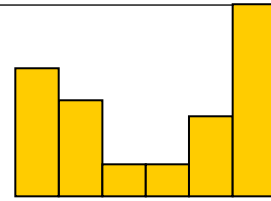
Use of the model to identify the pattern

many samples of the same source

in different conditions



# Data treatment



- Relationships between the “pattern” and the input (gaseous mixture): Multivariate analyses (mathematical and statistical models)
- Quantification**

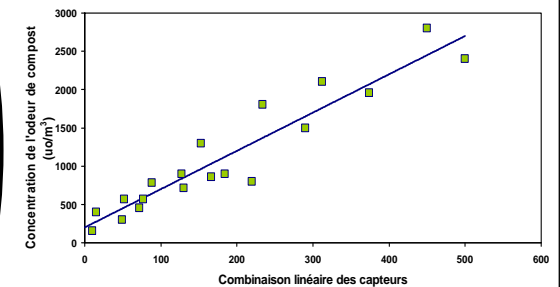
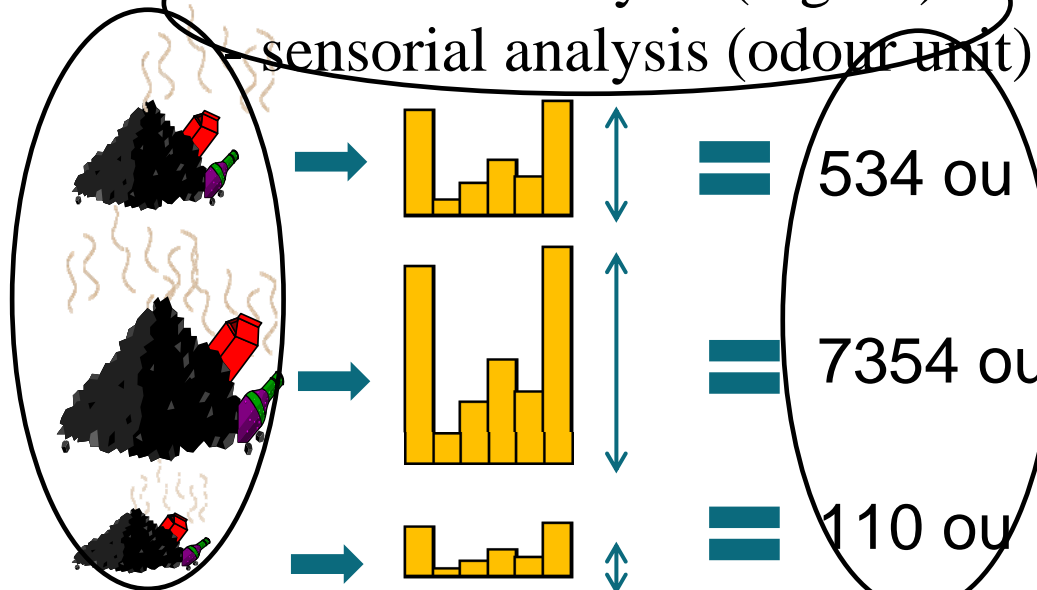
Landfill odour : various concentrations

many samples of the same source

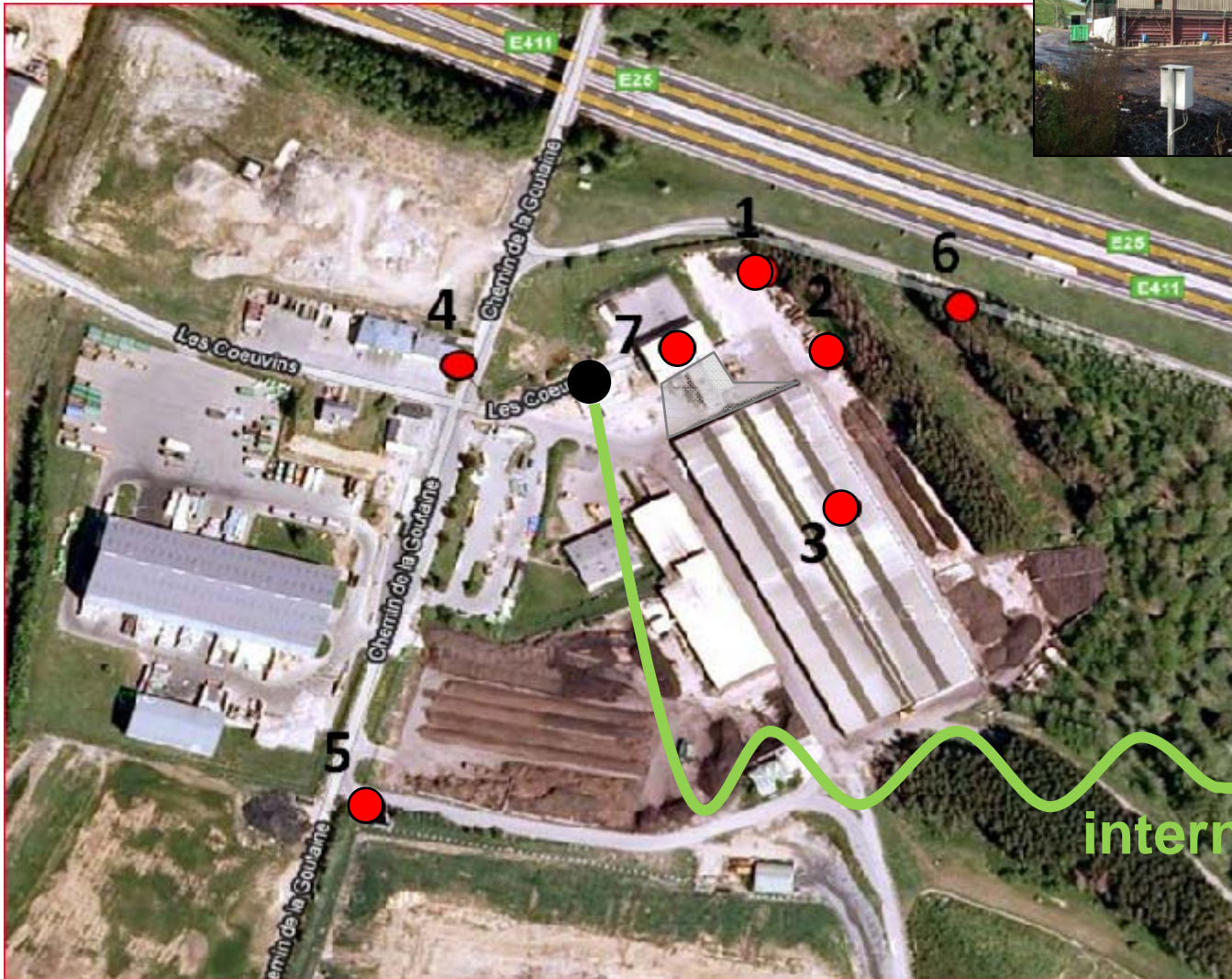
Calibration (Learning) in different concentrations



- chemical analysis ( $\text{mg}/\text{m}^3$ )  
- sensorial analysis (odour unit)



# In Situ application: odour monitoring Landfill



E-nose

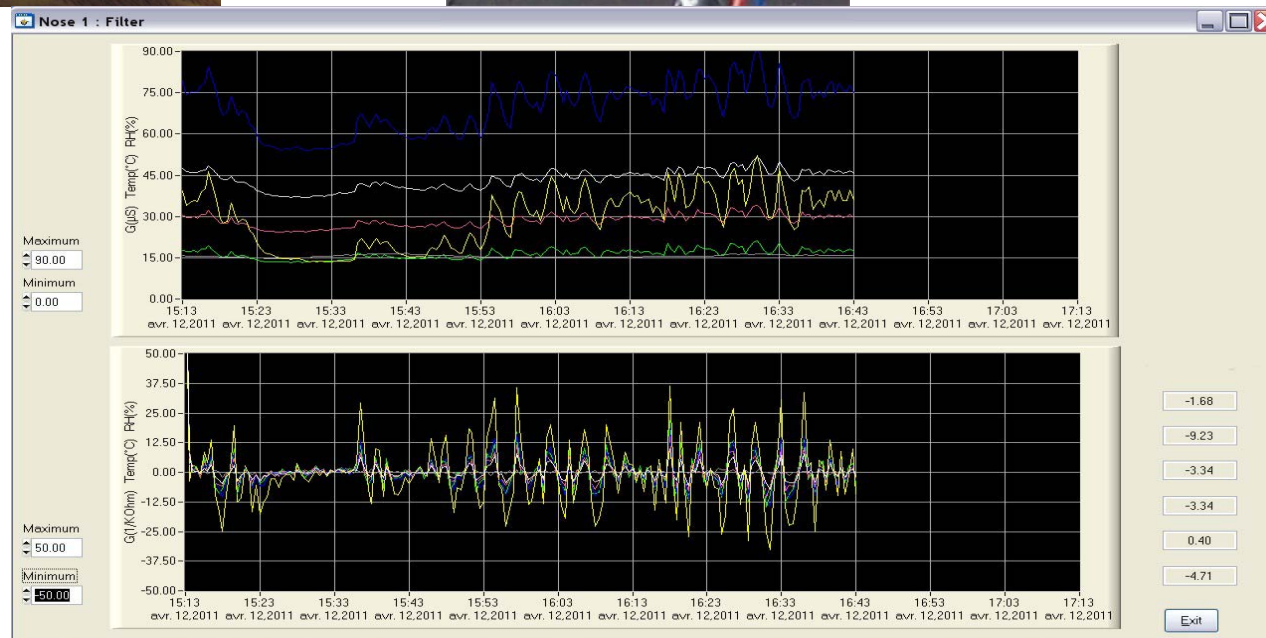
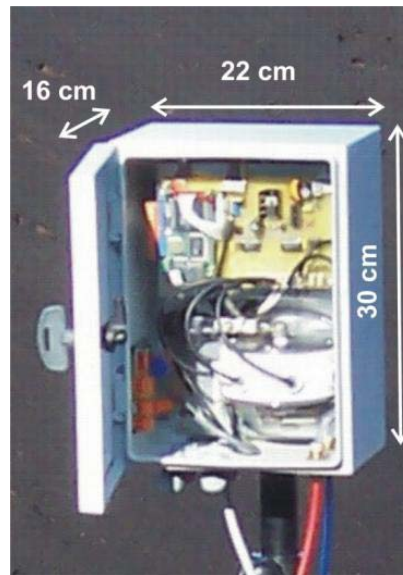
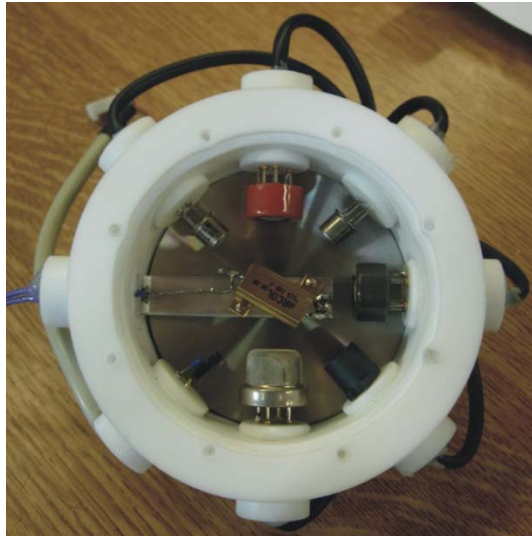
Computer



E-nose network  
control



# In Situ application : odour monitoring Landfill

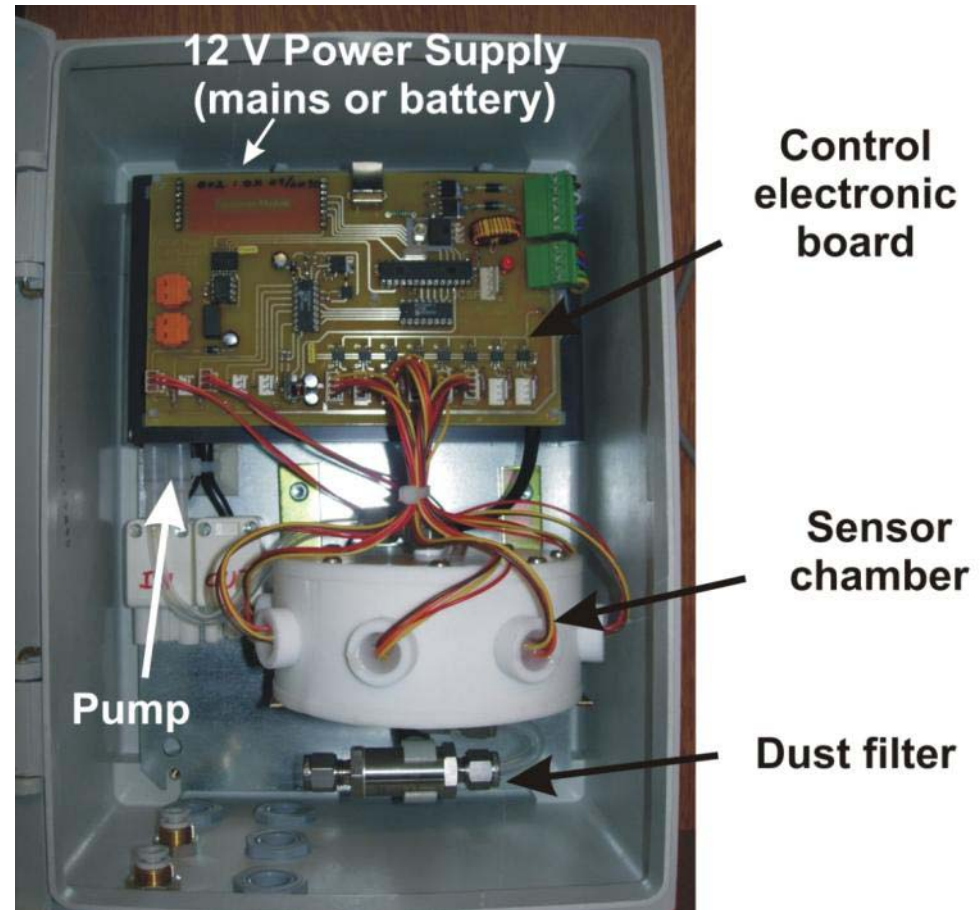


6 TGS (Figaro<sup>®</sup>) sensors  
TGS822, TGS842, TGS880,  
TGS2610, TGS2620 and  
TGS2180

+ temperature and humidity.

Simple box, easily  
accessible for  
maintenance

Remote sampling pipe



Continuous measurement of sensor conductance (no cycling  
air/sample)

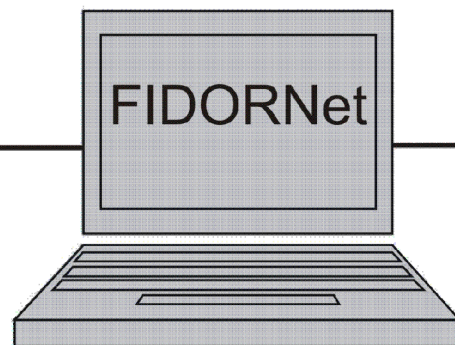
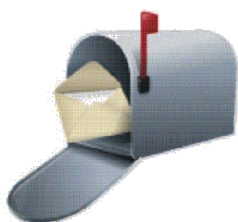
# Communication

**Remote computer**



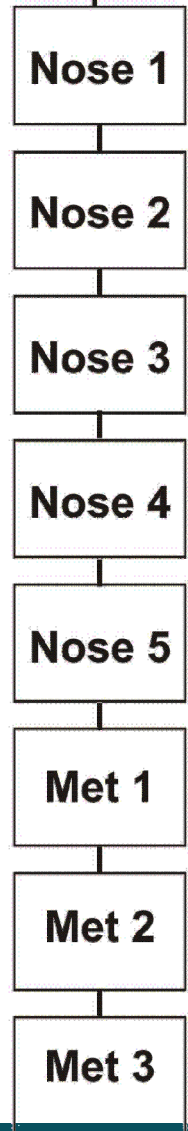
Internet

URL's  
dstp://...



**Local computer**

**FIDORBus**



## Showing the 5 dimensions of the **FIDOR** concept of annoyance

**Offensiveness = odour source**  
(compost, biodrying, odourless, ...)

**Intensity (odour "level")**

The screenshot shows a software interface titled "General analysis". It features a central map of an industrial area with several odour sensors marked as blue and red cylinders. Each sensor has a data label: "Conc: 0 uo/m^3 Odourless", "Conc: 961 uo/m^3 Source: trashes", "Conc: 811 uo/m^3 Source: trashes", and "Conc: 195 uo/m^3 Odourless".

On the left side, there are several data input fields: Temperature (7.6 °C), Wind Speed (4.1 m/s), R. Hum. (40%), Wind Direction (50°), Barometer (1021 hPa), and Distance (185 m). Below these is a compass rose and a "Mean wind Speed (m/s)" field (4.1). Further down are "Absolute Humidity (g/m^3)" (2.6) and "Solar radiation (W/m^2)" (280). A status box indicates "Lightly unstable".

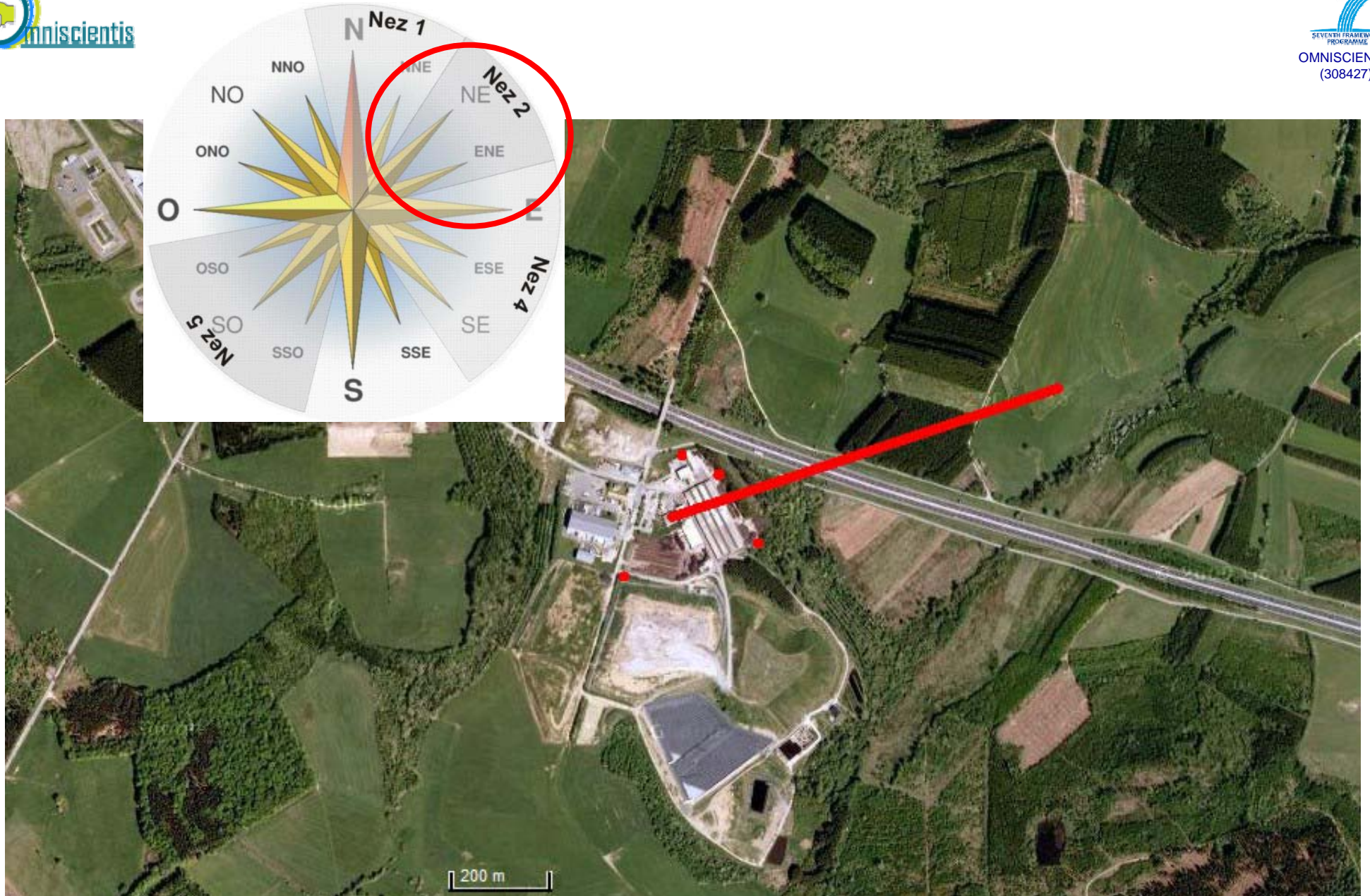
At the bottom left, a log shows: "13/04/2010 15:45 Nose 2 - signal increasing", "13/04/2010 15:50 Nose 2 - signal decreasing", and "13/04/2010 16:02 Nose 3 - signal increasing".

At the bottom right, a table shows the "Number of events the last six hours" for five sensors:

	Nose 1	Nose 2	Nose 3	Nose 4	Nose 5
Number of events the last six hours	2	3	4	0	0

An "Exit" button is located at the bottom right of the interface.

**Frequency and Duration of odour events**



# Thanks for your attention



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