

Sensing Odour Sources in Indoor Environments Without a Constant Airflow by a Mobile Robot

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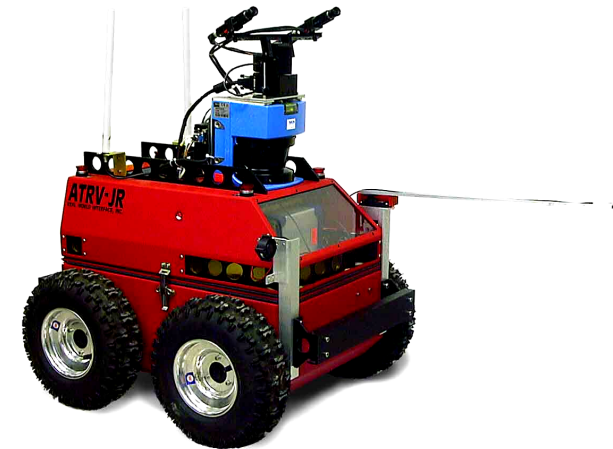
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Contents

- 1. Defining the Goal: An Electronic Watchman
- 2. Hardware Setup
 - electronic nose
 - the robot
- 3. Experimental Setup
- 4. Conclusion
- 5. Outlook





1. An Electronic Watchman

- Required Ability
 - **detection** of gases
- Desired Abilities
 - **localization** of the gas source
 - **identification** of the odour
- Environment
 - unmodified indoor environment



1. An Electronic Watchman

■ Detection

- drift of parameters
- in particular: varying air flows
- sufficient intensity ?

■ Localization

- detection of chemical concentration gradients ?

■ Identification

- sufficient intensity ?

■ Optimizing the system

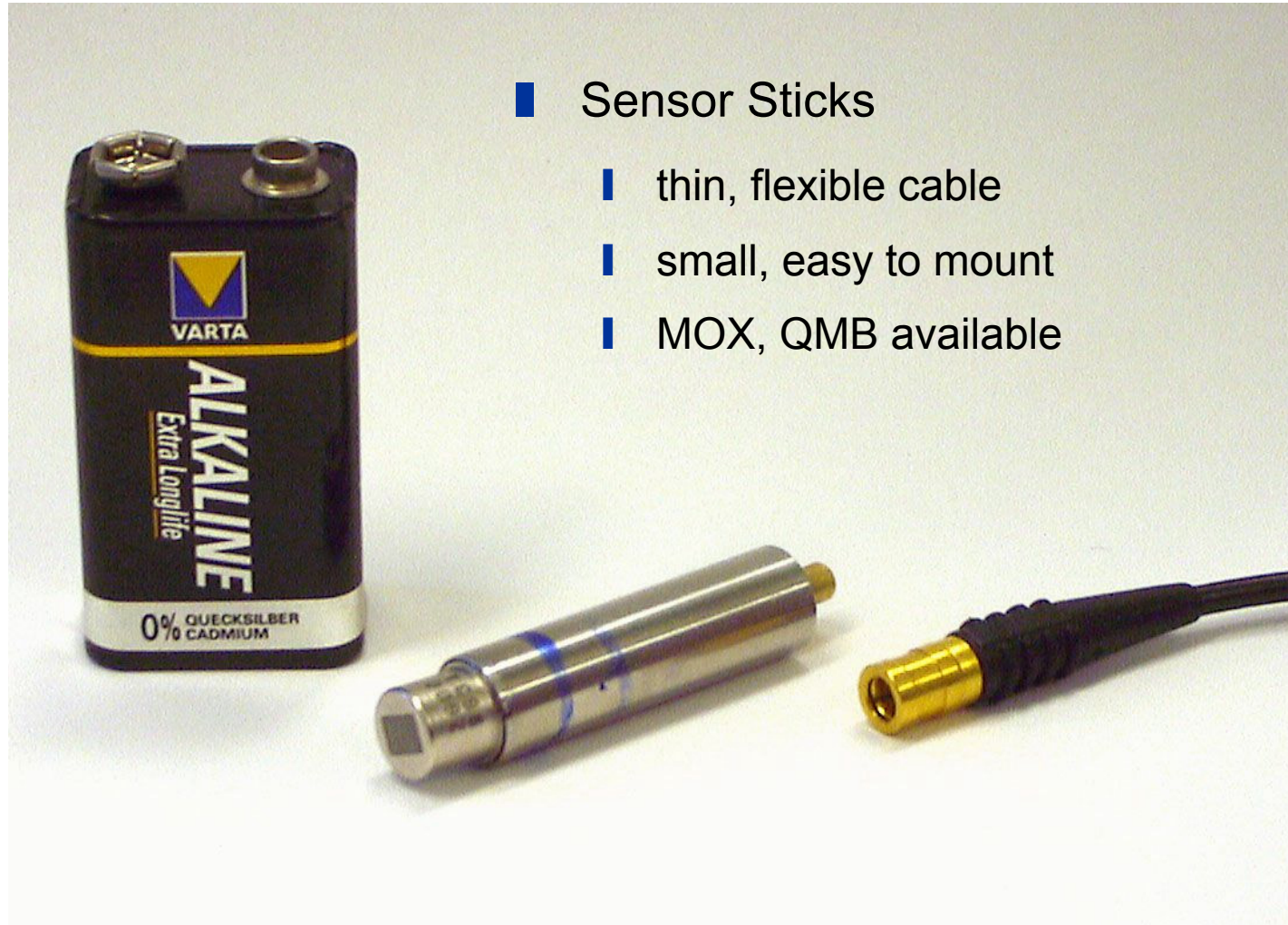
- mounting the sensors
- performing the measurement

2. Hardware Setup, Electronic Nose

- VOCmeter Vario
 - commercially available
 - lightweight, small
 - low power consumption
 - operates up to 8 sensors
 - gathers readings with 4 Hz
 - RS-232 interface



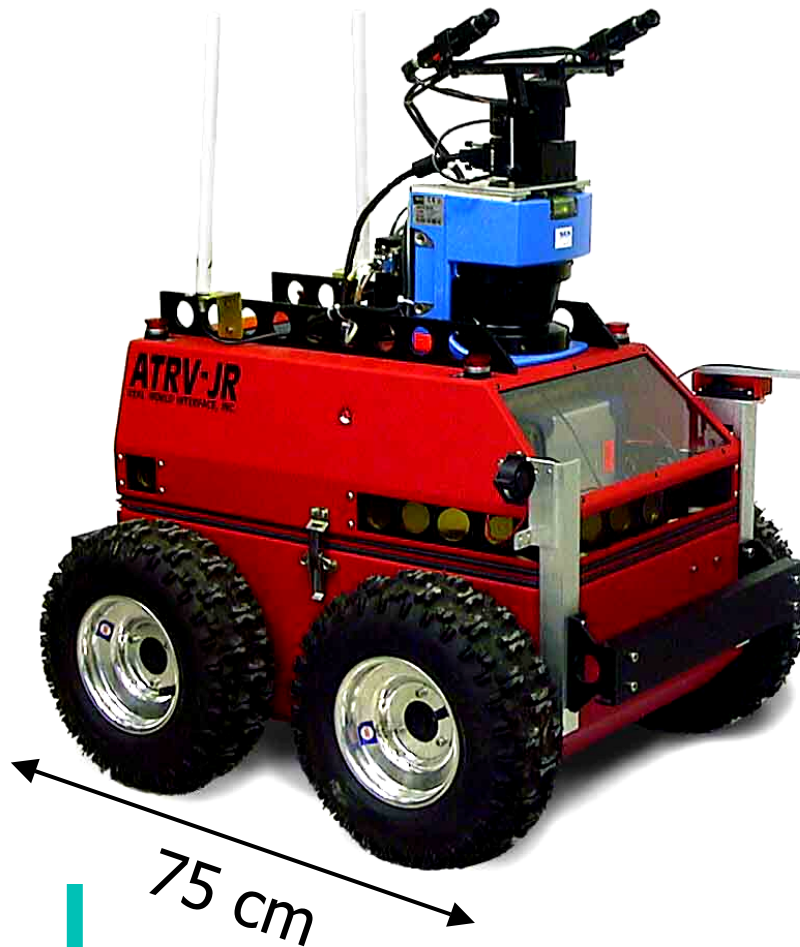
2. Hardware Setup, Electronic Nose



- Sensor Sticks

- thin, flexible cable
- small, easy to mount
- MOX, QMB available

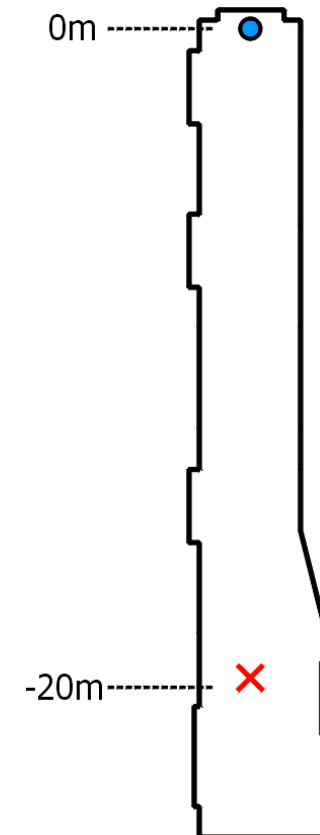
2. Hardware Setup, ARTHUR



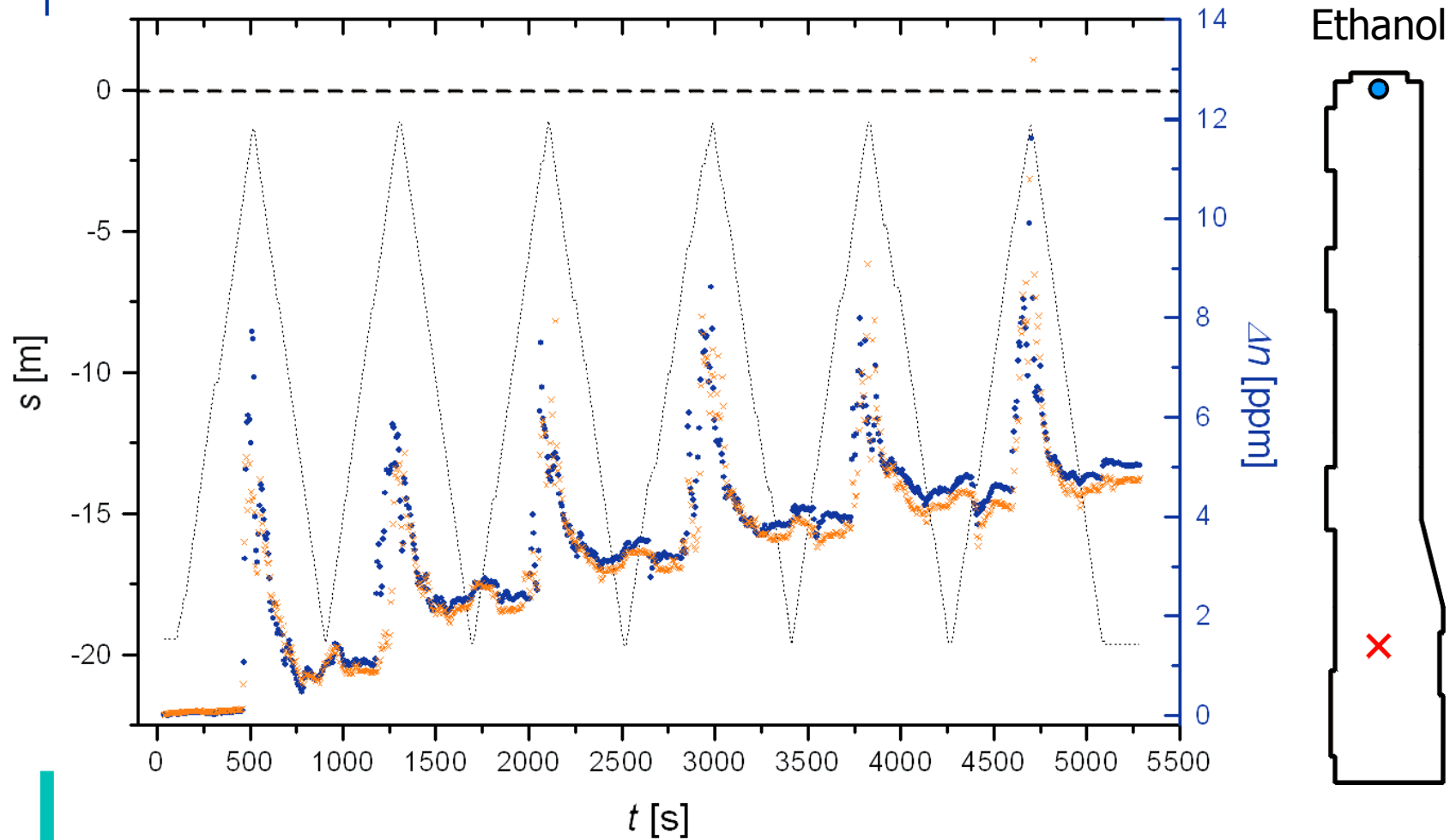
- Based on "ATRV-Jr" (RWI)
 - skid steering
 - 2x Pentium II, 333 MHz
 - wireless LAN (BreezeCOM)
 - sonar sensors
- Additional Sensors
 - laser scanner (SICK)
 - CCD cameras
- Electronic Nose
 - sensors: MOX
 - at an outstanding rotatable bar
 - at fixed positions

3. Experimental Setup, No Ventilation

- Experimental Conditions
 - no ventilation
 - no people passing by
- Odour Source
 - ethanol
 - placed at the end of the corridor
 - different intensities: 130 cm^2 , 60 cm^2 , 20 cm^2
- Driving Modes
 - stop-measure-and-go
 - constant velocity
- Gas Sensors
 - mounted on the stiff extension

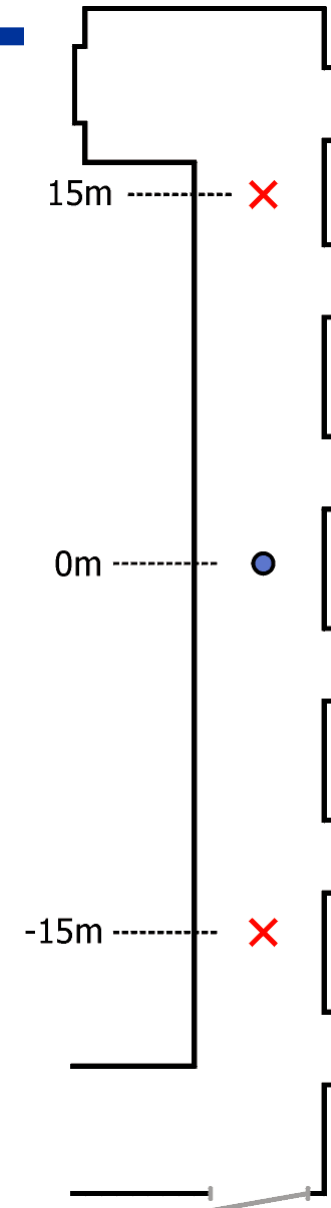


3. Experimental Setup, No Ventilation

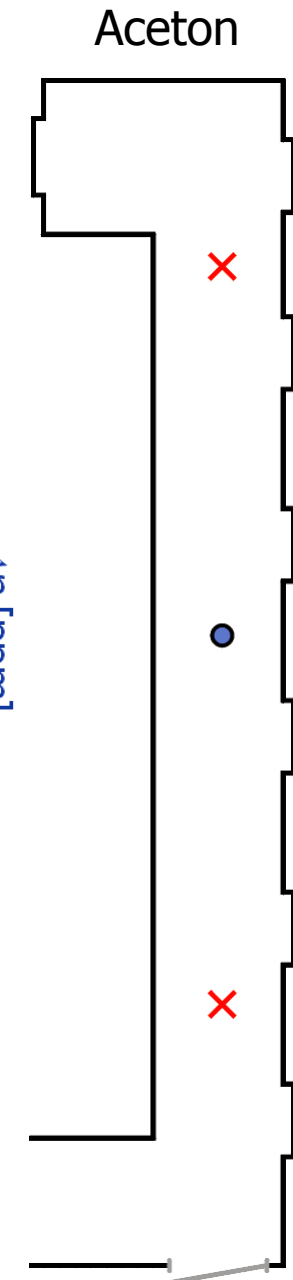
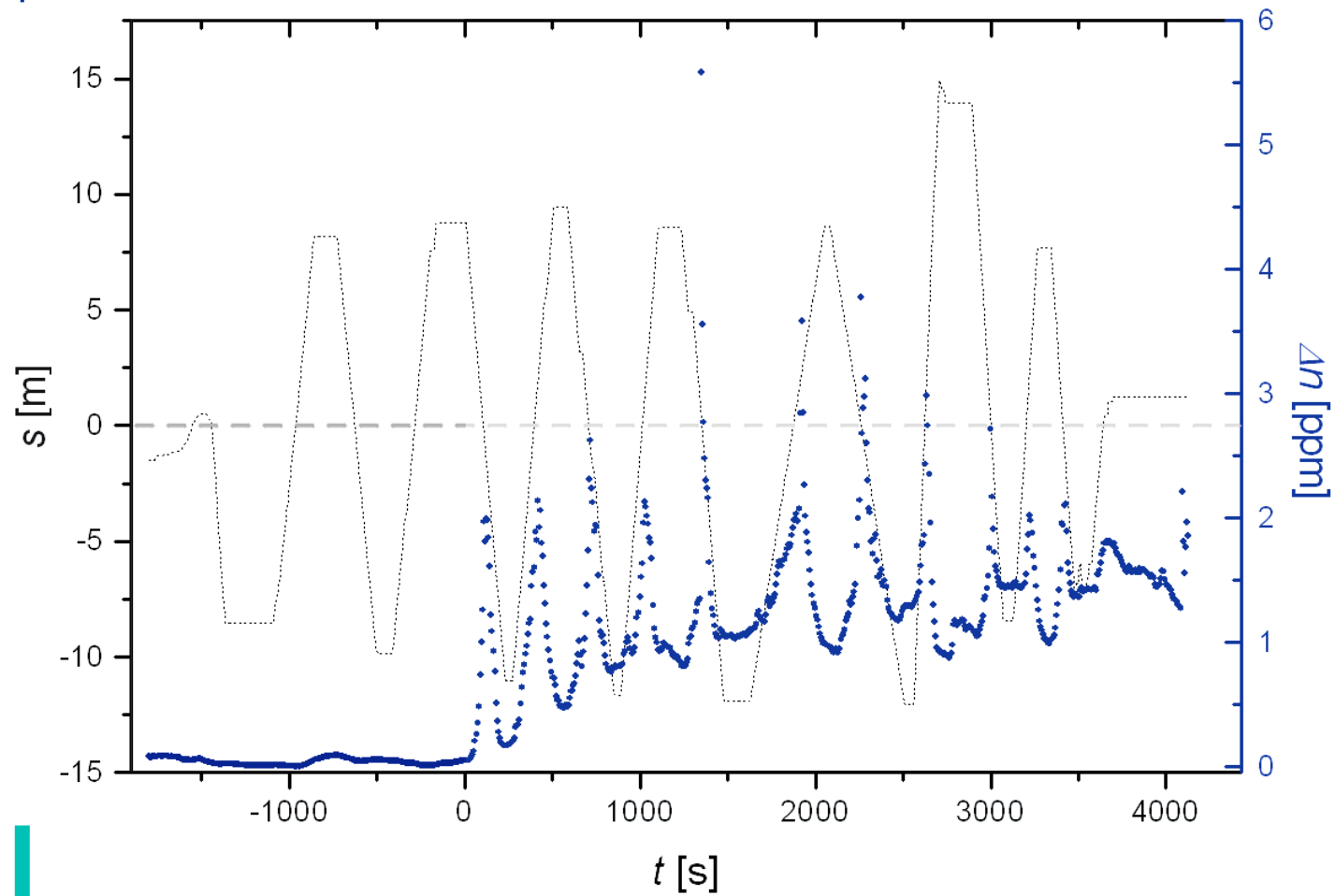


3. Experimental Setup, Weakly Ventilated Environment

- Experimental Conditions
 - weak ventilation
 - few people passing by
- Odour Source
 - low intensity (20 cm^2)
 - placed in the middle of the corridor
 - ethanol, acetone
- Driving Mode
 - stop-measure-and-go
 - constant velocity
- Gas Sensors
 - mounted on the stiff extension



3. Experimental Setup, Weakly Ventilated Environment





4. Results

■ Detection

- low intensities
- distance: several meters
- unventilated or weakly ventilated rooms
- with weak personal traffic

■ Driving Mode

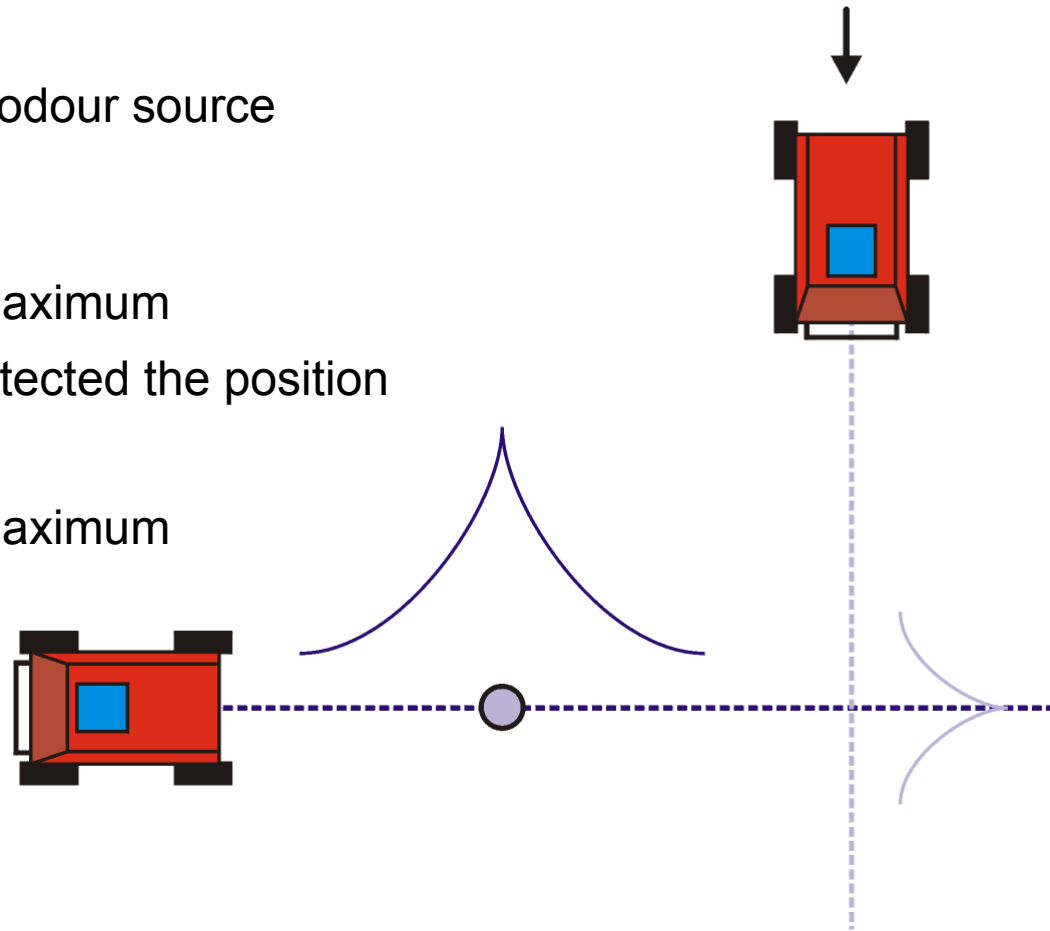
- constant speed, not too slow
- stop-measure-and-go strategy not suitable

■ Localization

- seems to be possible

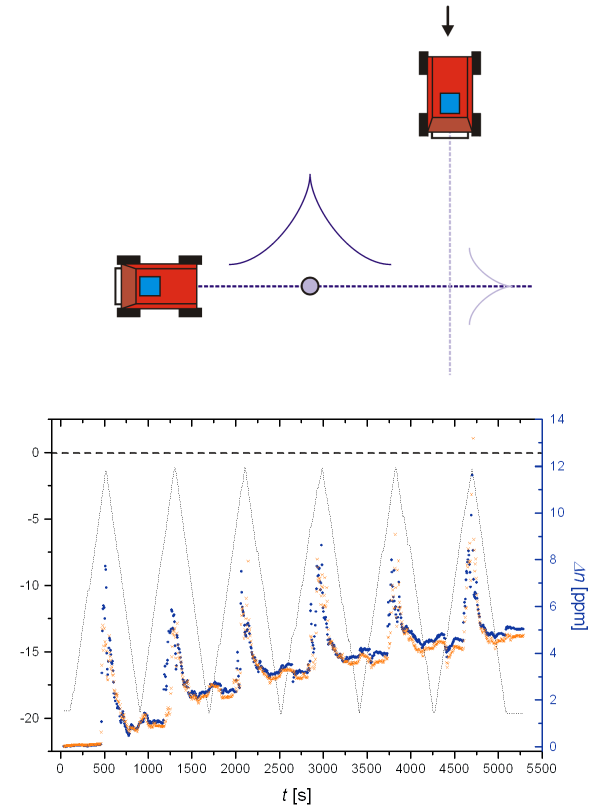
5. Outlook, Localization Strategy

- 2D -Experiments
 - passing by the odour source
- Localization
 - detecting the maximum
 - return to the detected the position
 - turn 90°
 - detecting the maximum



5. Outlook

- Localization Strategy
 - implementation
- Investigate the "Moving Effect"
- Improving the Setup
 - pumped cell (trunk)
- **Identification**
 - using sensor array: MOX and QMB
- Environment
 - outdoor conditions



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