Distributed Odor Source Localization

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Project Goal

• Find an odor source
  – with a team of robots
  – equipped with state-of-the-art odor sensors
  – in a collaborative fashion
Applications

• Humanitarian demining
  – Replace dogs/rats
  – Requires high sensitivity

• Search for leakages
  – E. g. pipelines, tanks
  – Appropriate sensor for leaking chemicals required
Challenges

• Air flow
  – turbulences, convection
  – changing wind directions
  – 3d flow, sensors move in 2d

• Odor propagation
  – plume packets (no “nice” gradient)

• Response times of odor sensors
  – 0.1 – 10 seconds
Experimental setup

• 10 Khepera robots with odor sensor, localization and communication modules

• Environments
  – Wind tunnel (reproducible)
  – Outdoor (not reproducible)

• Cameras
  – Track the robots (supervised localization)
  – Observe the plume
  – Observe the experiment (robot reaction to odor)
Experimental setup

- Camera
- Odor source
- Robot
Simulation

• Webots

• Odor plume
  – Measured in the wind tunnel
  – Simulated by air flow simulators
Current state, outlook

• Current state
  – Preparing the tools (wind tunnel, robots, cameras, odor sensor) and getting familiar with them

• 2006 Q1 / Q2
  – Wind tunnel experiments
  – Webots simulations