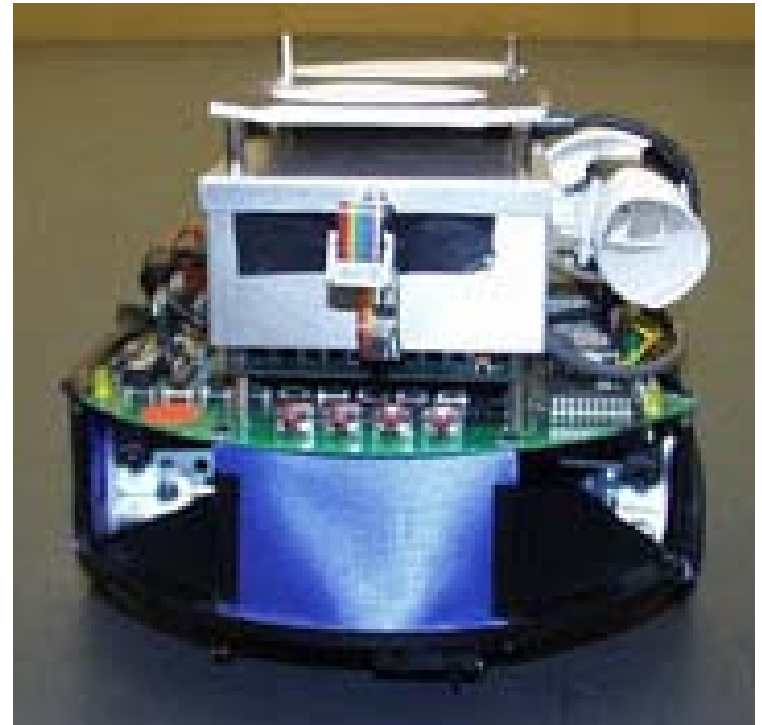# Distributed Odor Source Localization

Thomas Lochmatter, Xavier Raemy

Prof. Alcherio Martinoli

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
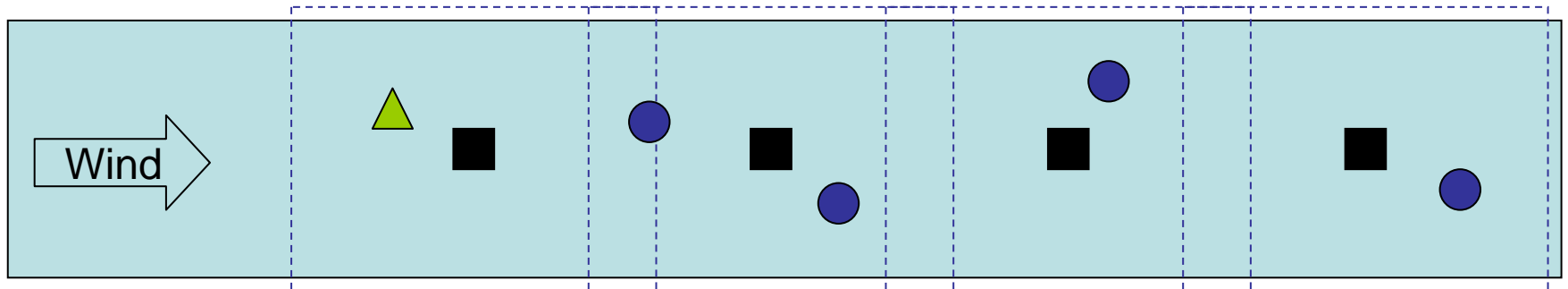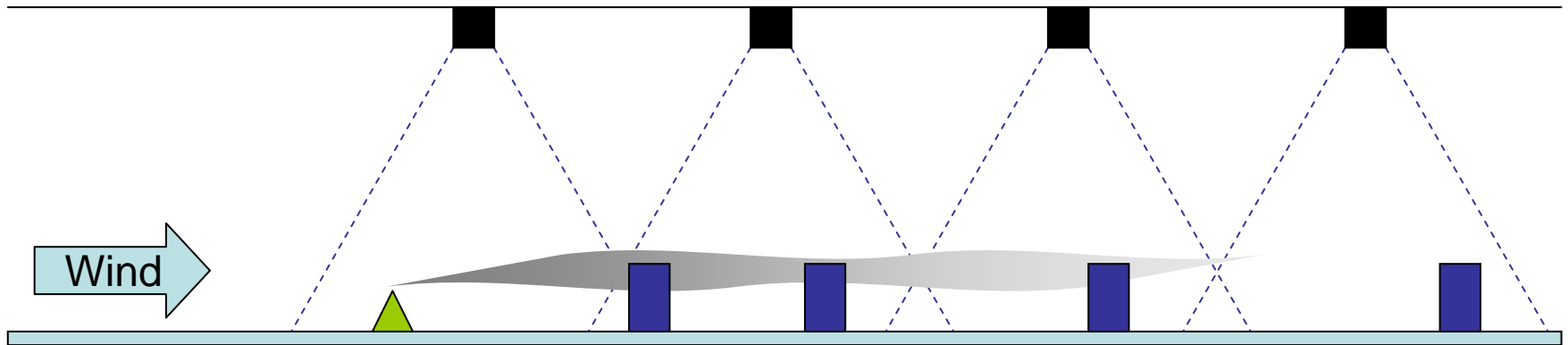
Wind

Wind

■ 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