Distributed Intelligent Systems
Lab 2 Tutorial

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Feedback forms

• To allow us to improve, please fill them in. They are anonymous.
Why robotics simulation software?

- Hardware prototyping is lengthy and expensive
- Real commercial robots are expensive
- Quickly change the experimental set-up
- Sometimes easier for measuring physical quantities
- Sometimes faster than real-time
  - Numerical optimization methods (GA, PSO, etc.)
Robot prototyping and simulation software

- Can model virtually any type of robot:
  - Wheeled, legged, flying, swimming, etc.

- Programming interface to C, C++, Java, Matlab

- Accelerated OpenGL graphics

- Physics simulation using Open Dynamics Engine (ODE)
Physics-based simulation (ODE)

Mechanical systems that have:

- Rigid bodies (solid objects)
- Joints (like hinges)
- Contact and collisions
- Friction (keeps a tower of cards steady)
- Gadgets (like springs)
Many robot models: khepera, e-puck, aibo, bioloids, hoap2, khr2, etc.

Sensors: distance sensors, light sensors, cameras, touch sensors, GPSs, force sensors

Actuators: servo-motors, grippers, LEDs, connectors, etc.

Emitters and receivers (multi-agent systems)

And more ...
Using Webots @ Home

- Available for Linux Ubuntu 12.04 and 14.04 64bit
  - Support for the lab is only guaranteed for the computers in this room
- Download Webots installation package from
- See installation instructions on Moodle
- Windows and Mac versions also available, we cannot offer support
Reminder: Webots GUI

- Scene tree
- World view
- Editor
- Console
e-puck robot

- 8 proximity sensors
- 8 light sensors
- 1 color camera
- 3 axis accelerometers
- 3 microphones
- 1 speaker
- and more ...
Robot control – Rule based

- Read front distance sensor
- Is object too close?
  - Yes: Make a turn
  - No: Continue moving forward

Flowchart:

1. Read front distance sensor
2. Check if object is too close
   - If no: Continue moving forward
   - If yes: Make a turn
Robot control – Braitenberg
Finite State Machine (FSM)

- OBSTACLE AVOIDANCE
- LIGHT FOLLOWING

- distance < 5
- distance >= 5
- distance > 15
- distance <= 15
And now: let's start ...