

MOBILE ROBOTS Case Studies 4

Prof. Francesco Mondada

Session ID: **993577**



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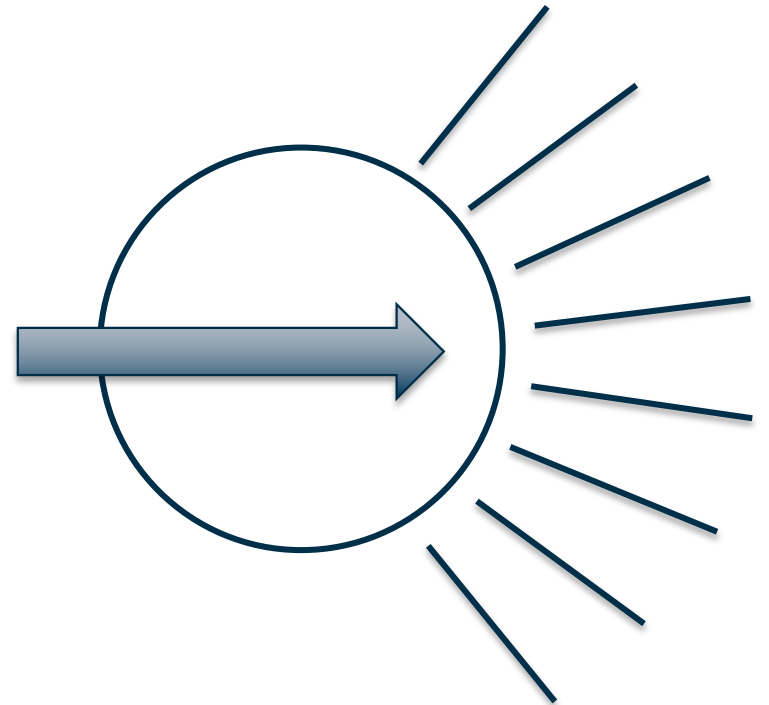
EPFL

2025-2026 1

Which sensors

You have to design a cheap sensor system (sensor + computation) of a circular robot (1m \emptyset) that moves indoors. The look of the robot allows only detection of obstacles from 8 holes in the body. Which sensors do you place there?

- A – Ultrasound**
- B – Laser TOF**
- C – Cameras**



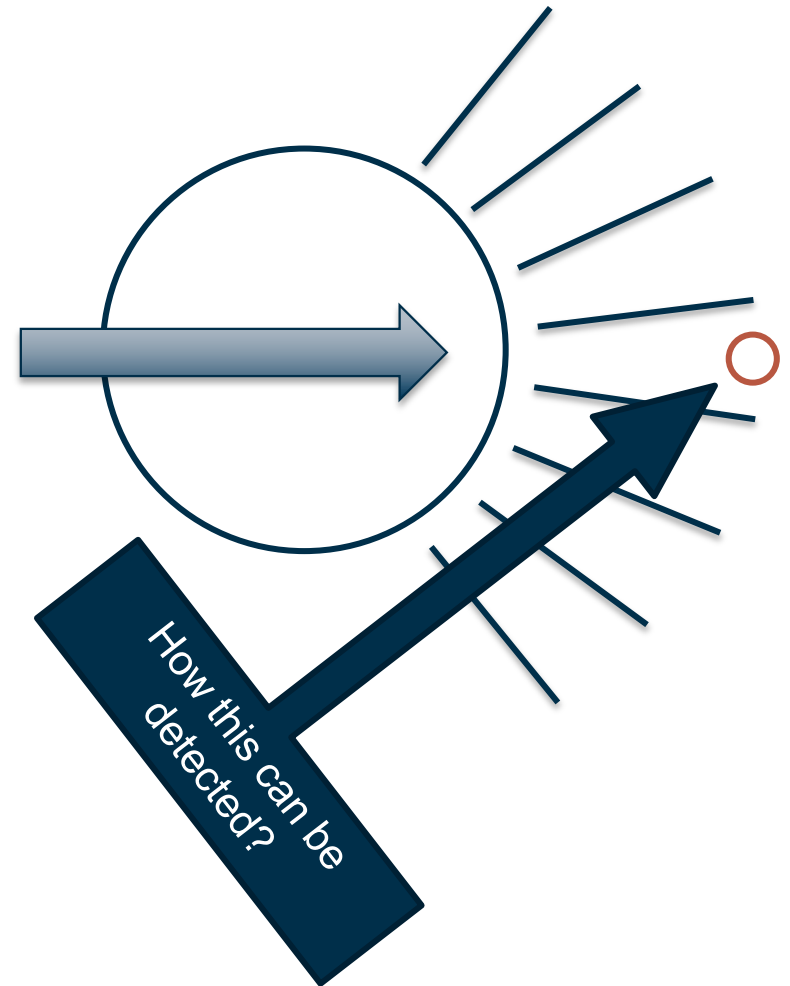
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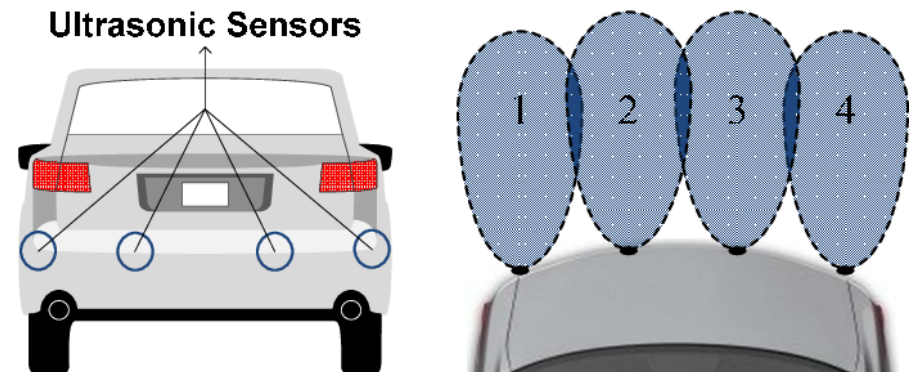
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Han, D., Choi, H.B., & Kim, Y.S. (2018). Design of Road Surface Lighting System for Rear Lamp using Automotive Ultrasonic Sensor. 2018 International SoC Design Conference (ISOCC), 249-250.

Labyrinth

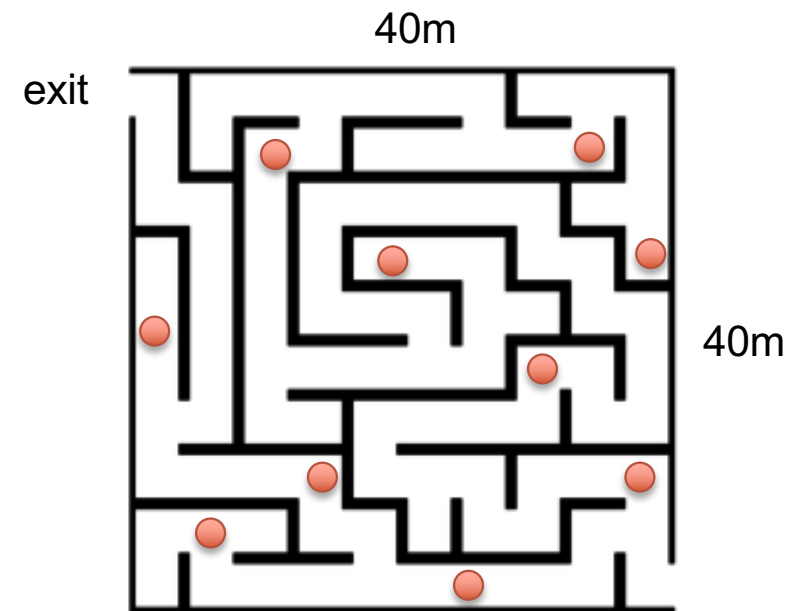
You have 10 small cylindrical robots ($\varnothing 50\text{cm}$) that need to escape at the same time from a labyrinth. They can perceive the direction of the exit. Which is the simplest, complete and more efficient navigation strategy you can use?

A – Left wall following

B – Left wall following + potential field when meeting another robot

C – Potential field (repulsion of walls and robot + attraction exit)

D – Wall following in the direction of exit (when starting)



Labyrinth

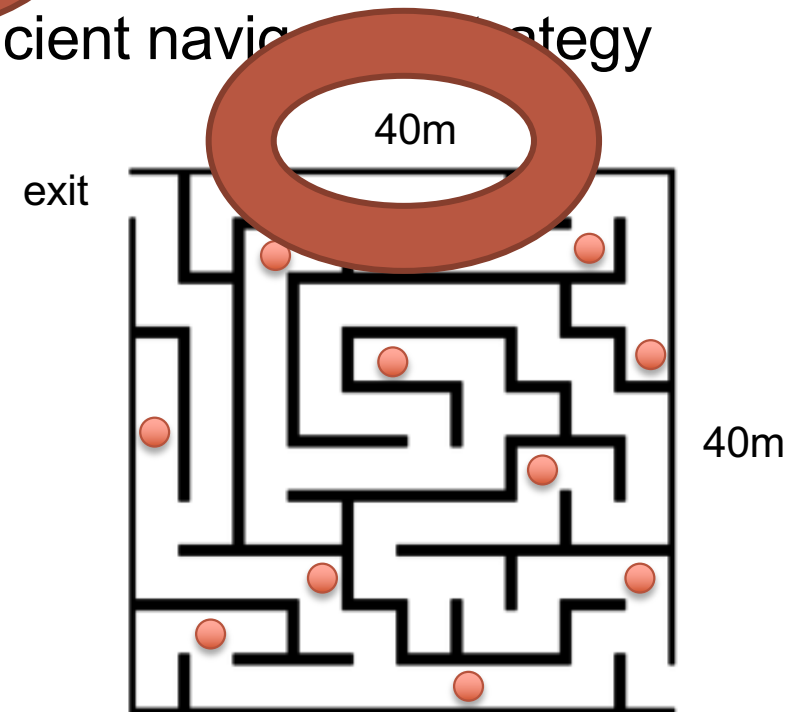
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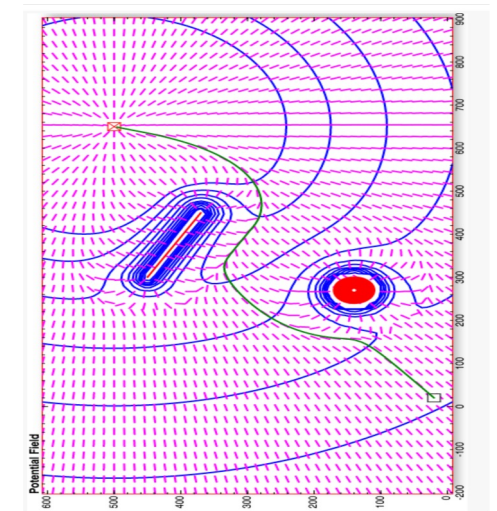
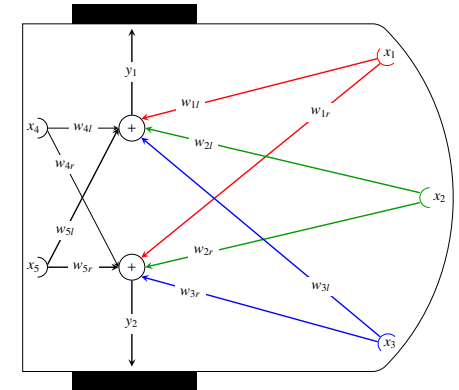
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Which obstacle avoidance approach

Using a robot equipped with a set of 8 ultrasound sensors for obstacle detection, you need to choose a smooth behavior for obstacle avoidance and you hesitate between two approaches, Artificial Neural Networks (on layer ANN) and potential field (PF). Which one is easier to implement and smoother?

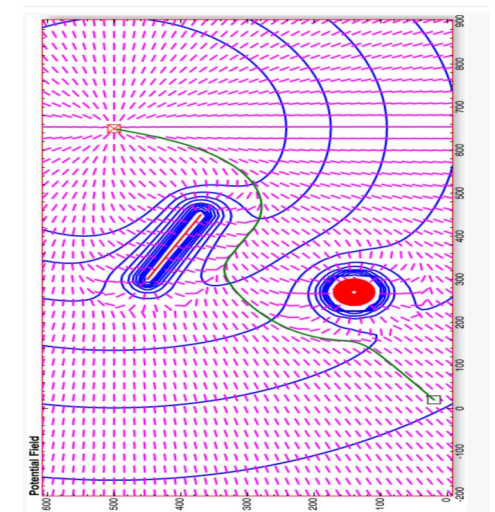
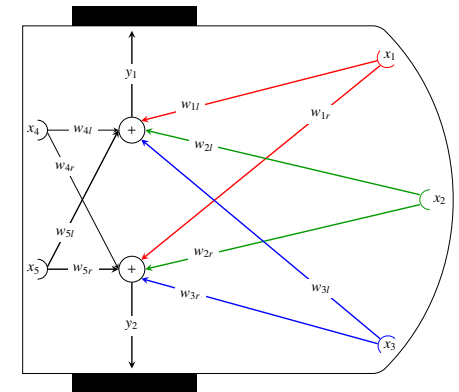
- A – ANN, is not subject to local minima**
- B – PF has less parameters to configure**
- C – Both approaches are nearly identical**



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Which obstacle avoidance approach

Weights of neuron

$w_l[7] = [40, 20, -20, -40, -40, 30, -10]$ # connection to left motor

$w_r[7] = [-40, -40, -20, 20, 40, -10, 30]$ # connection to right motor

