

Road sign recognition with the E-puck

ENG-366 - Signals, Instruments & Systems

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Outline

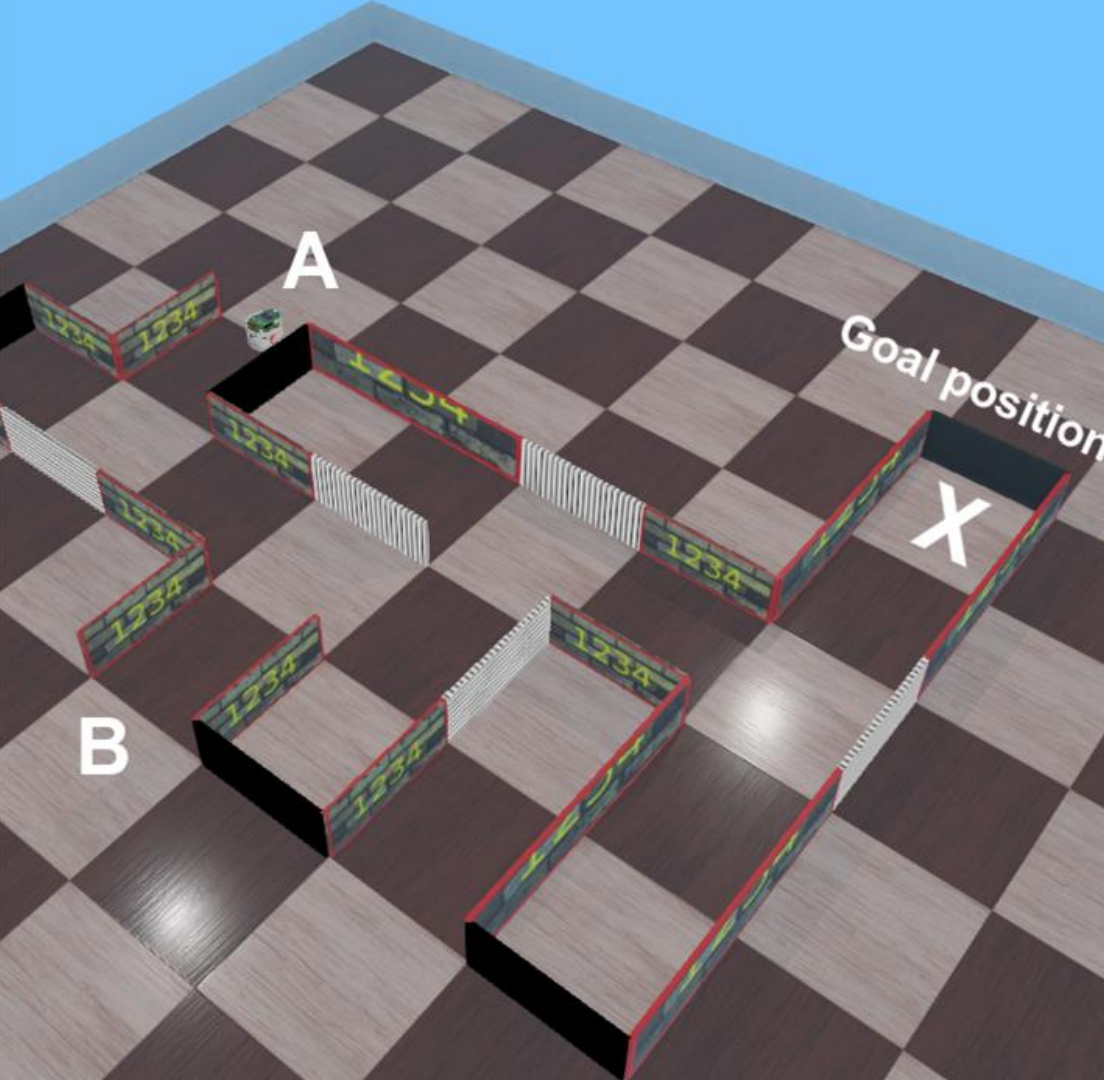
Introduction

Method

Experiment

Results

Conclusion



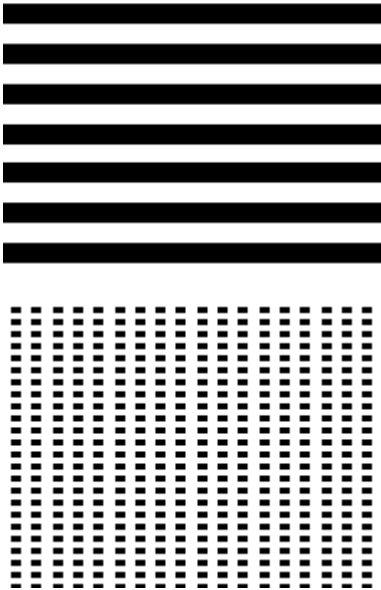
Goal

Get the e-puck robot out of a maze quickly

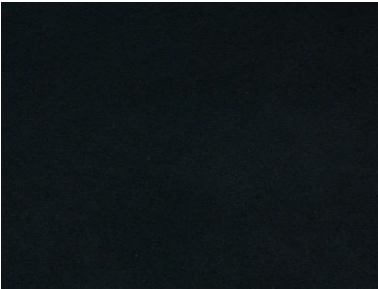
1. Programming to follow road signs
2. Fast Fourier Transform (FFT) image processing
3. Avoiding obstacles and stop in front of the walls

Road signs

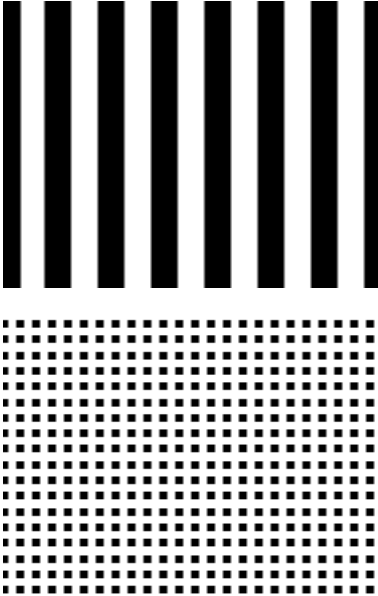
Turn left



Turn around



Turn right

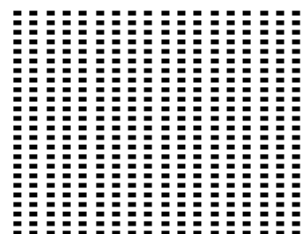
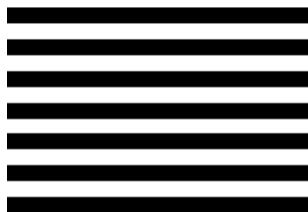


Method : 3 steps

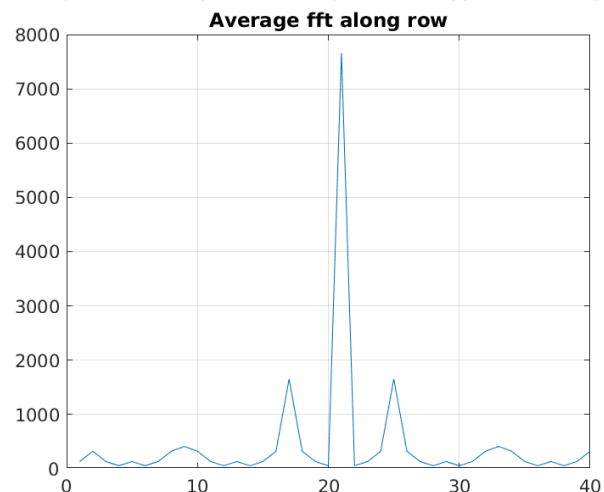
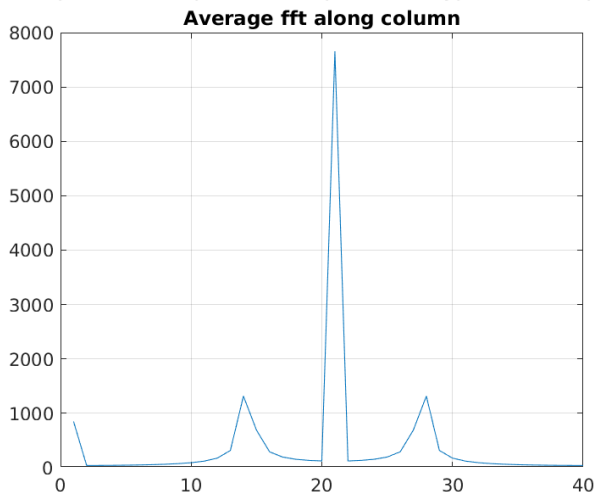
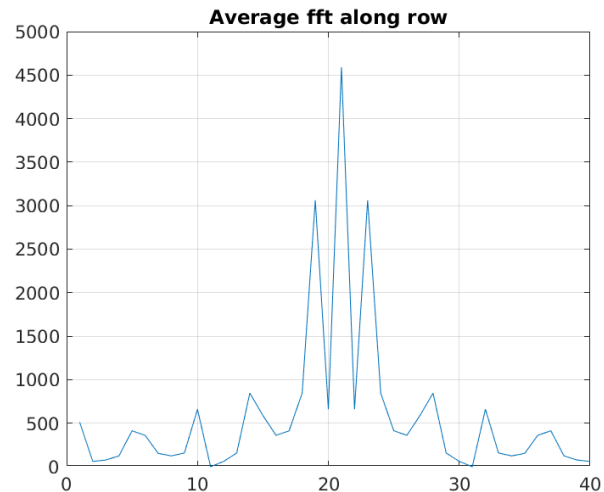
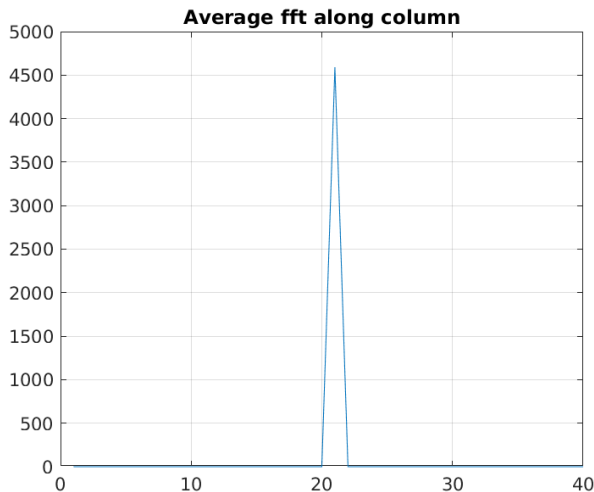
- Matlab :
 - Define the strategy of detection and recognition based on FFT
- Webots :
 - Implementation of strategy in webots
 - Simulation environment

Matlab : FFT

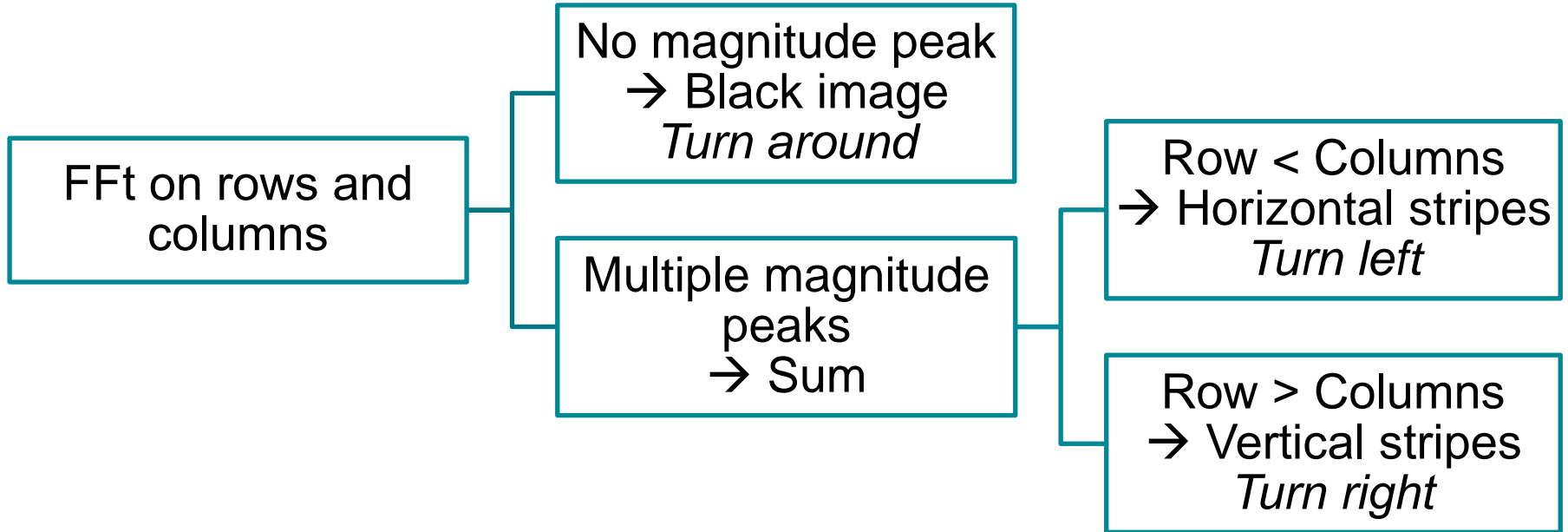
Horizontal stripes



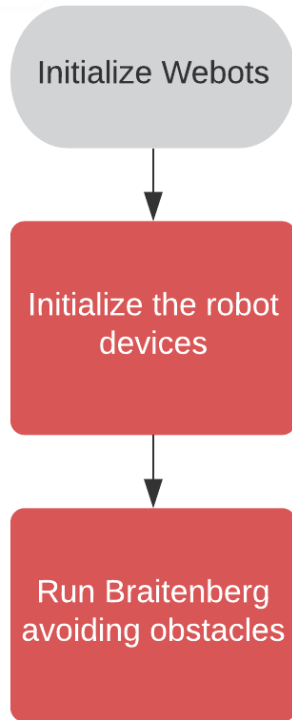
With noise



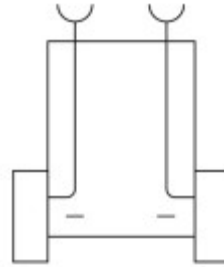
Matlab : FFT on rows and columns



Webots



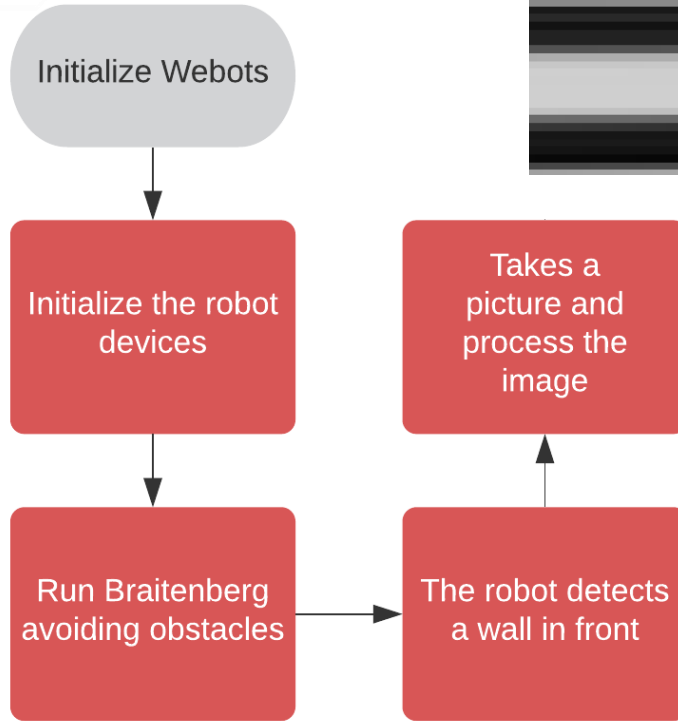
Braitenberg 3a vehicle concept



Obstacle on the right → left wheel slows down

Braitenberg vehicle's weight increased 4 times
→ move faster while not exceeding the maximum speed

Webots

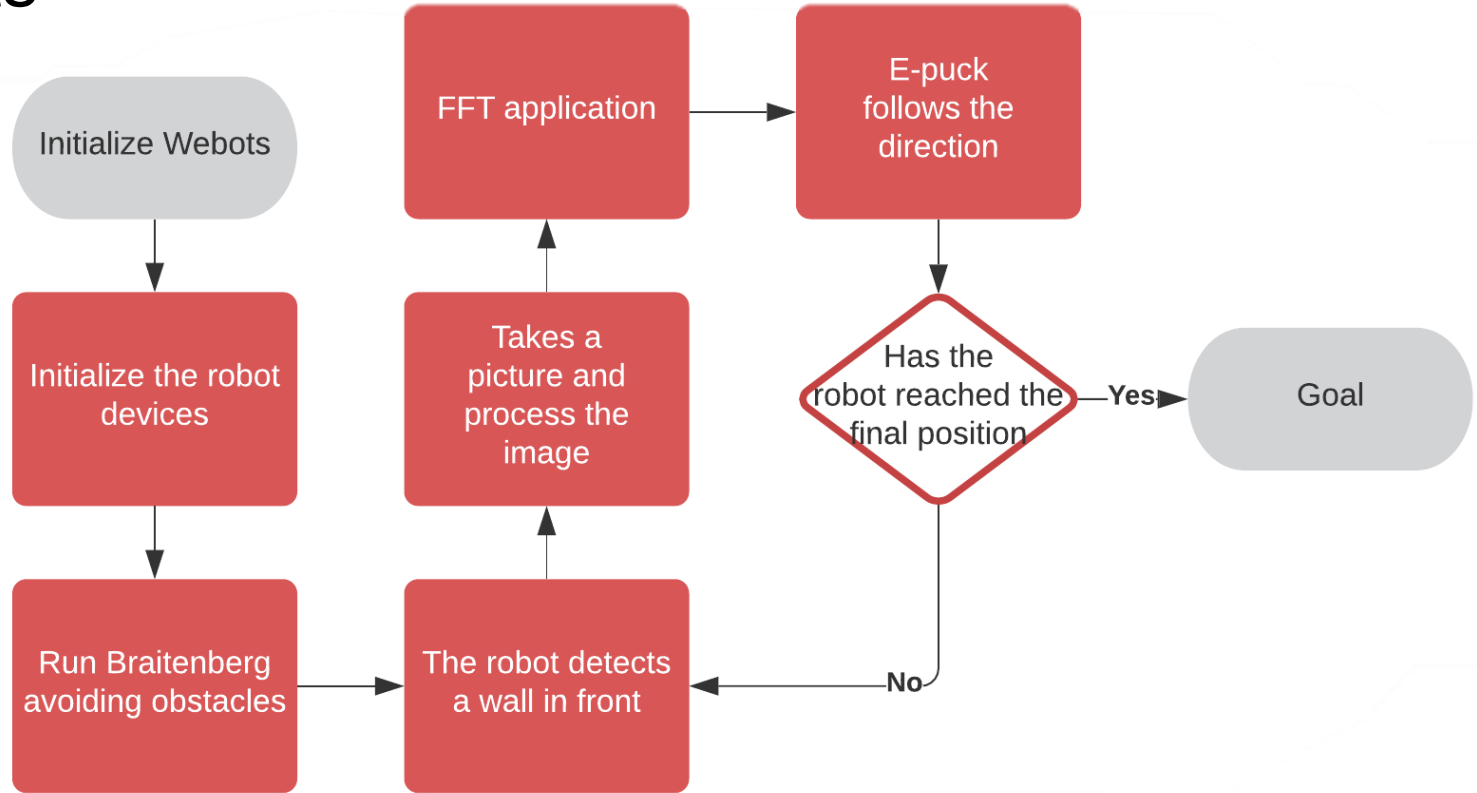


Filter : *white or black pixel*

- Pixel below the average → 0 value → white
- Pixel above the average → 255 value → black

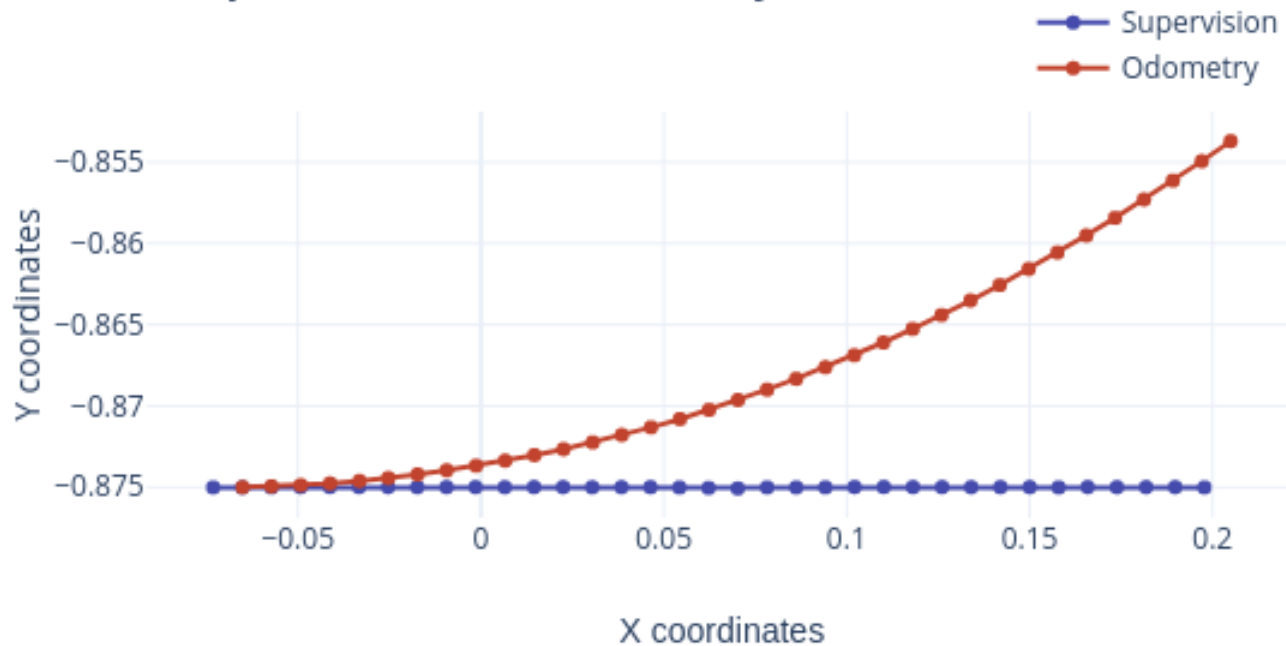
Distance : 8.5 cm

Webots



Webots : Supervisor and Odometry

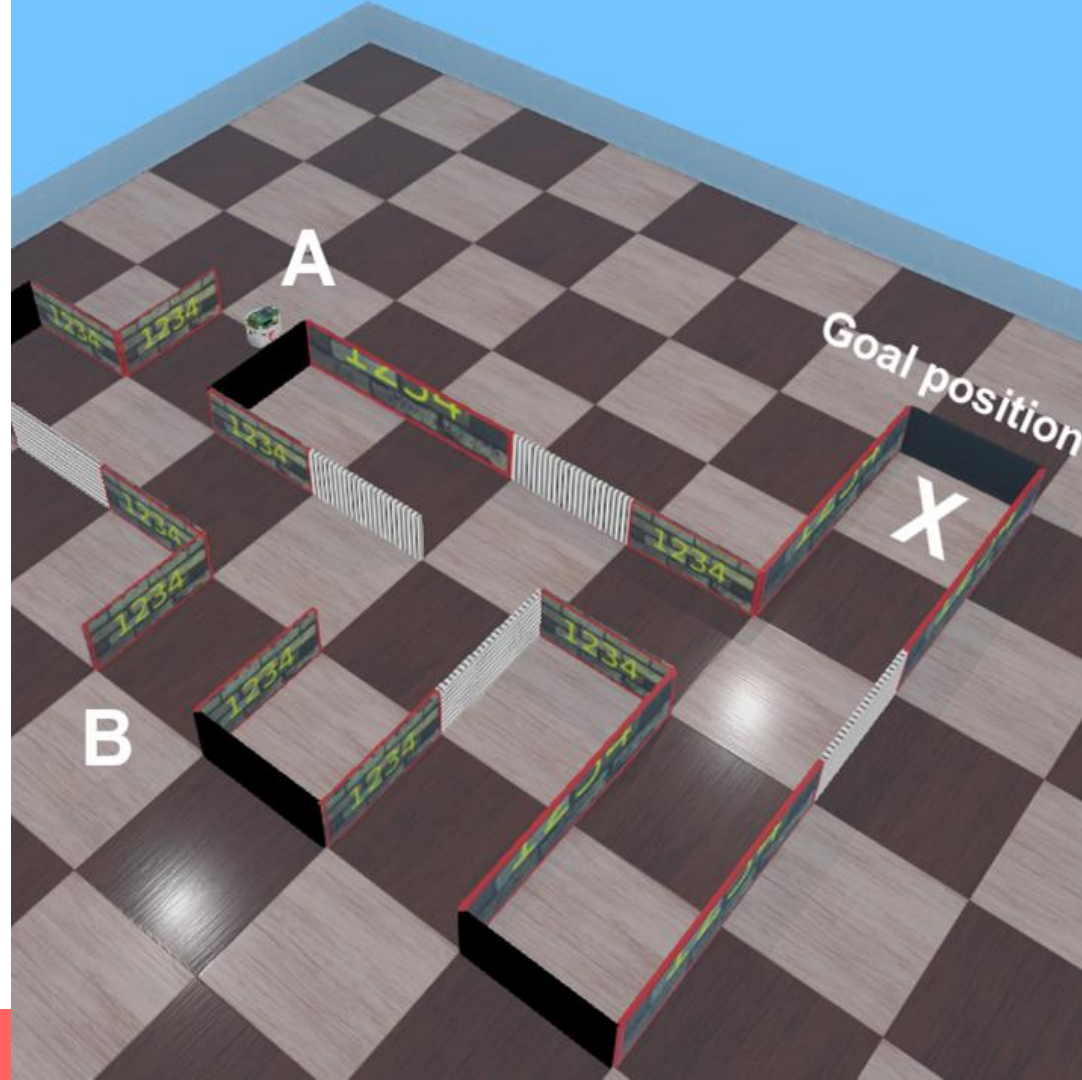
Supervision versus Odometry localization



Odometry location :
Exponential propagation error

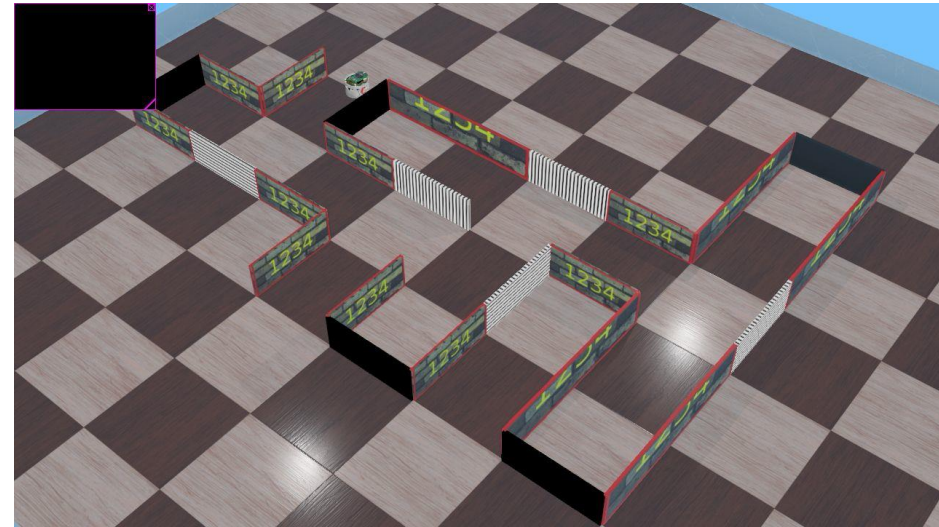
Experience

- Several simulation from the 2 different entries
 - New starting position each entrance
- Different lightning conditions



Results

Entry position	Success rate
A	8/10
B	4/10
Total mean	6/10



Success rate A \gg success rate B

→ Modify the Braitenberg coefficients ??

Conclusion

- Theoretical application
- Implementation on Webots seemed great
 - Unfortunately not able to use DISAL Arduino Xbeet nor implement on real E-puck
 - Not able to test in real world conditions
 - Probably limitations of the E-puck's memory

Conclusion

- Improve in simulation :
 - Perform supervisory measurements
 - Compare : Supervisor to Odometry localization
- Odometry :
 - **Straightforward and low-cost technique**
 - **Less accurate : cumulative errors**

Thank you for your attention

Questions ?