SIGNALS, INSTRUMENTS AND SYSTEMS

Course project 2: Road sign recognition

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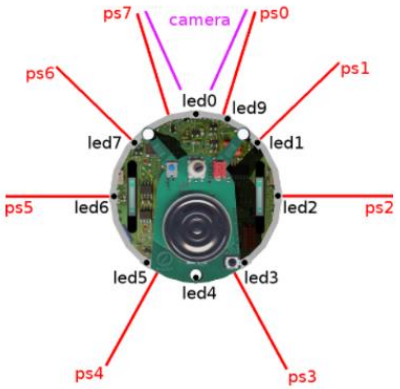
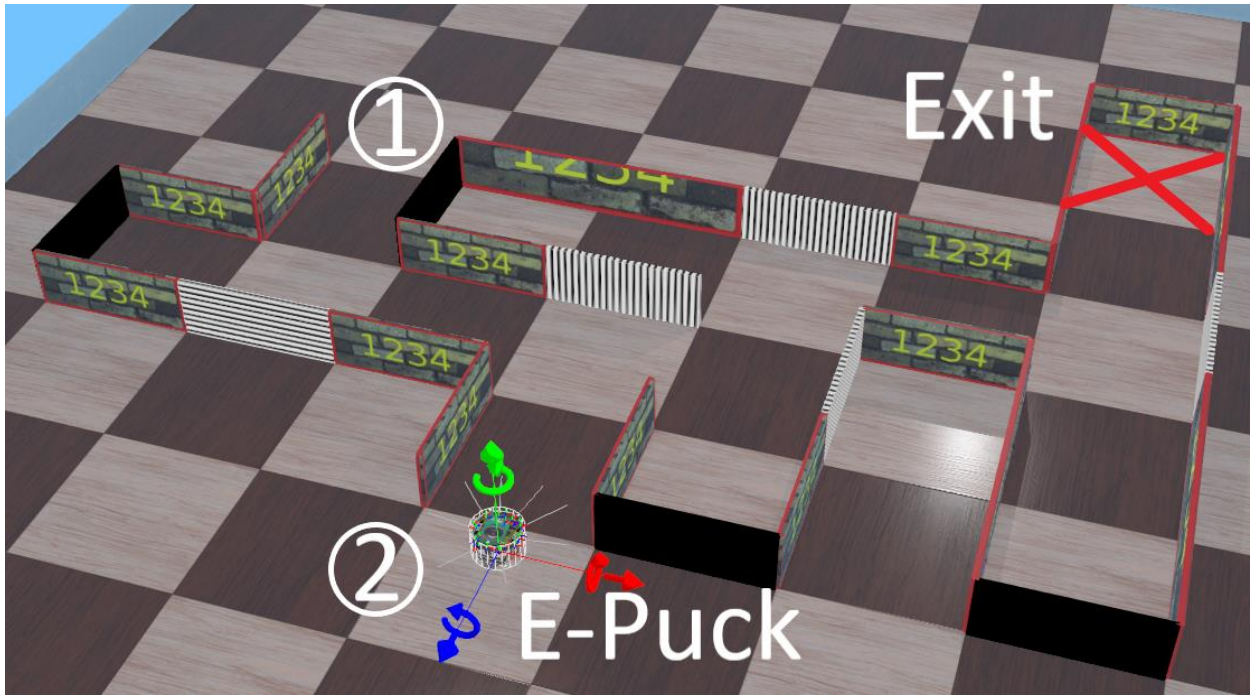
Introduction

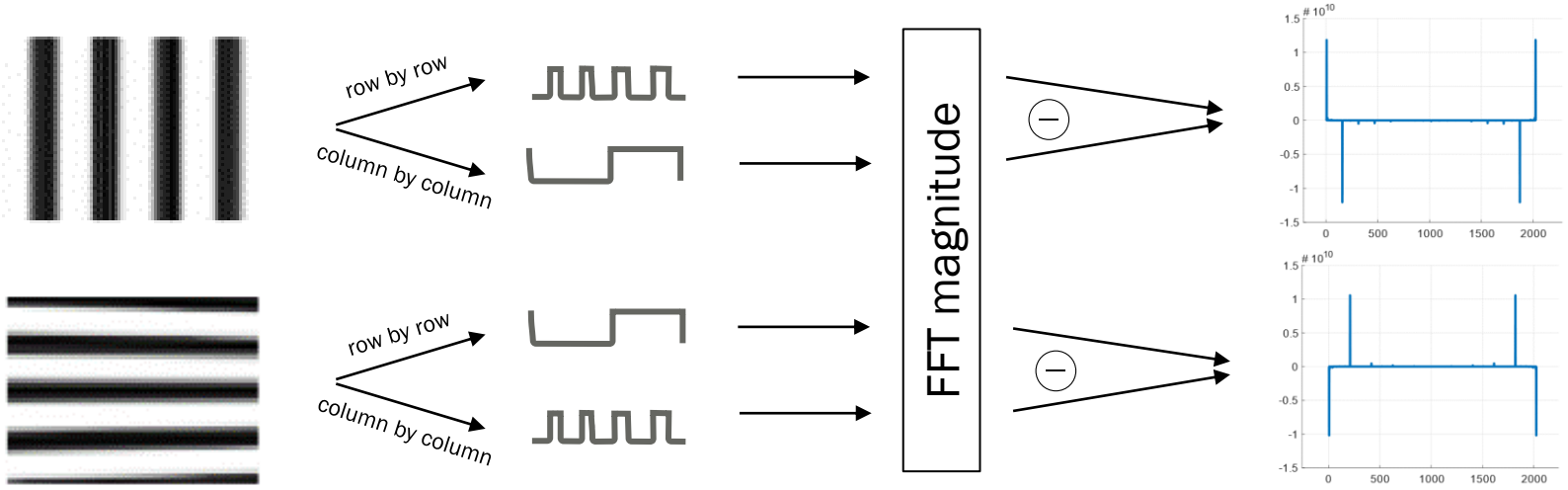
- Simulated environment
- Leading the E-Puck out of the maze as rapidly as possible with the help of road signs pointing towards the exit.
- Compare an odometry-based with an absolute localization.
- Towards autonomous vehicle…





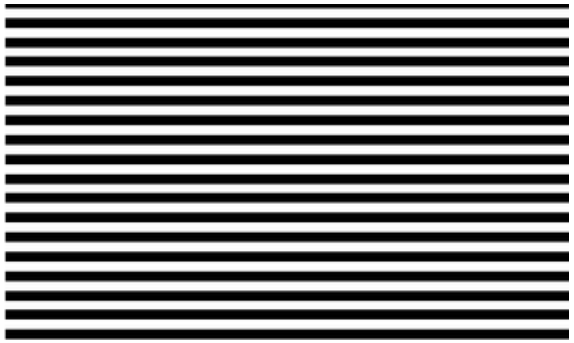
Methods

- FFT based strategy to decide which direction to turn

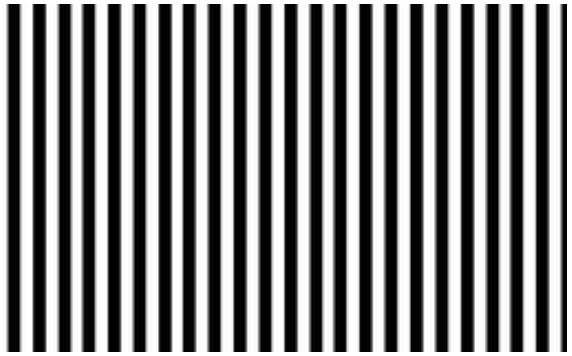


Experiments & results

- Sharp road signs



horizontal



vertical

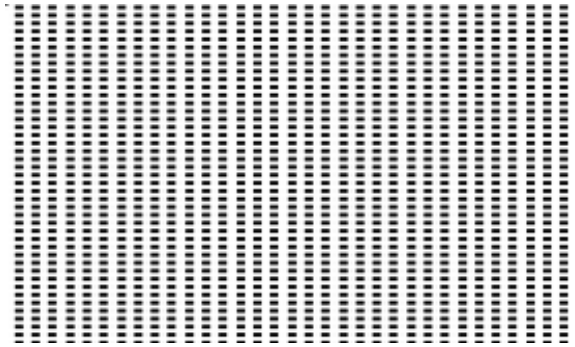
- 50 trials from each entry
- Success (escape without mistake): 100%
- Average time :

Entry 1	Entry 2
29.9 ± 0.5 s	25.1 ± 0.3 s

→ *With these conditions, the E-Puck performs well !*

Experiments & results

- Noisy road signs



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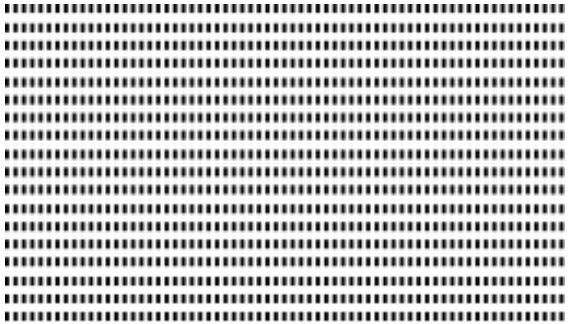


vertical

- 30 trials from each entry
- Success (escape without mistake): 23%
- Average time :

Entry 1	Entry 2
40.6 ± 7.4 s	36.4 ± 8.4 s

- Error distribution:

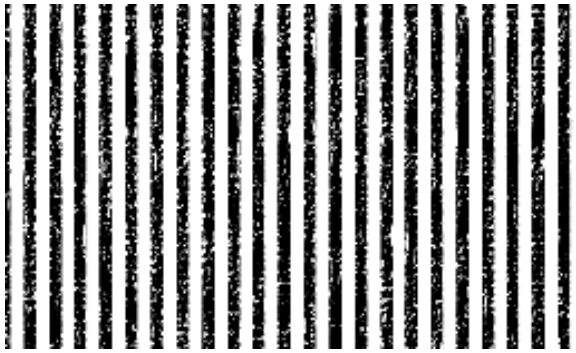
Error at horizontal stripes (noisy)	Error at vertical stripes (noisy)	Error at both noisy panel	Error at black panel	No error
16/60	14/60	16/60	0/60	14/60
~26.6%	~23.3%	~26.6%	0%	~23.3%

→ *With these very noisy road signs, the E-Puck takes random decisions*

More experiments

- Salt-and-pepper noise

horizontal

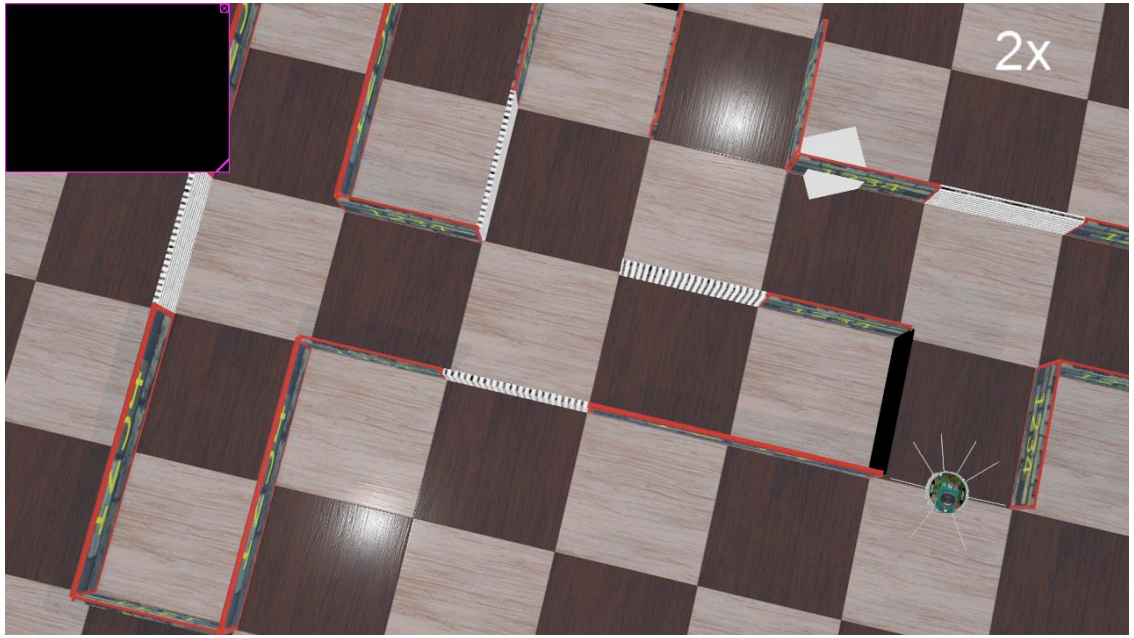


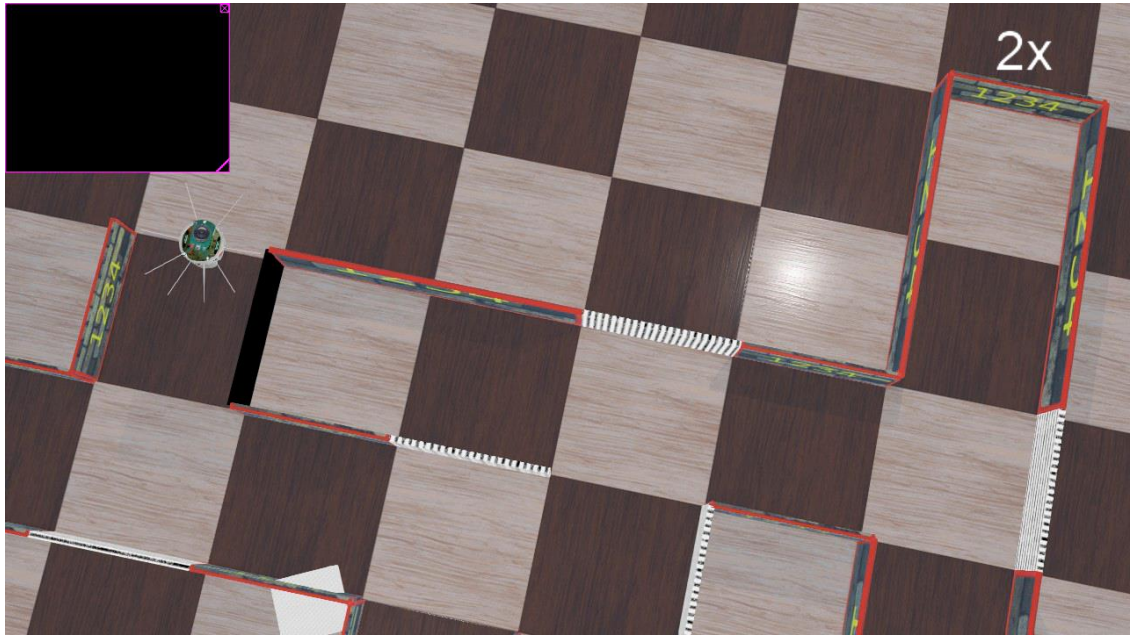
vertical

- 100 road signs analysed
- Correct decision: 97%

→ *With these other noisy road signs, the E-Puck takes rarely wrong decisions*

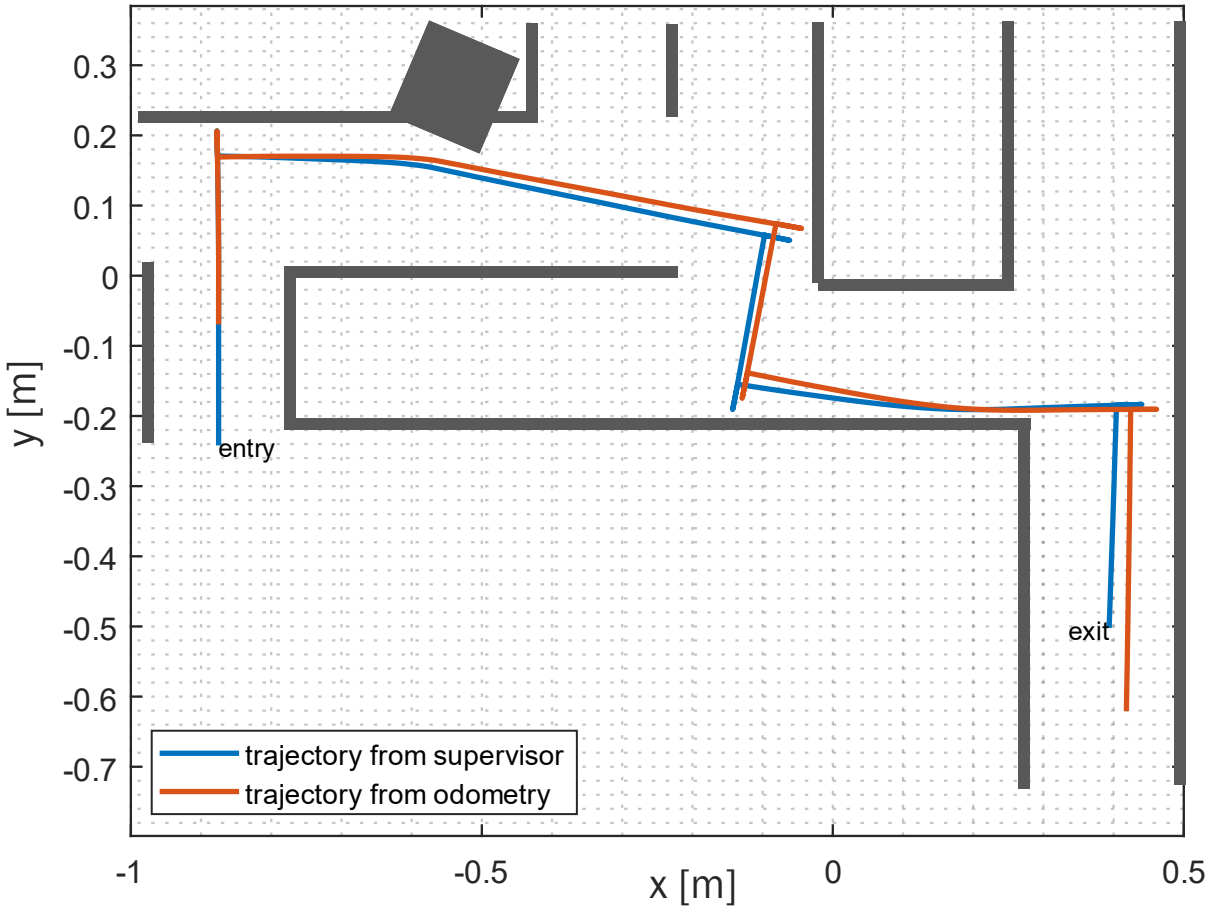
Odometry





Odometry

- errors are of the order of some centimeters and the maximal error is approximately 5 cm
- the further the E-Puck travels, the more uncertain its position will be
- The errors could be due to:
  - inexact axel length and wheel radius
  - no slipping hypothesis unverified
  - unprecise 90°/180° turns

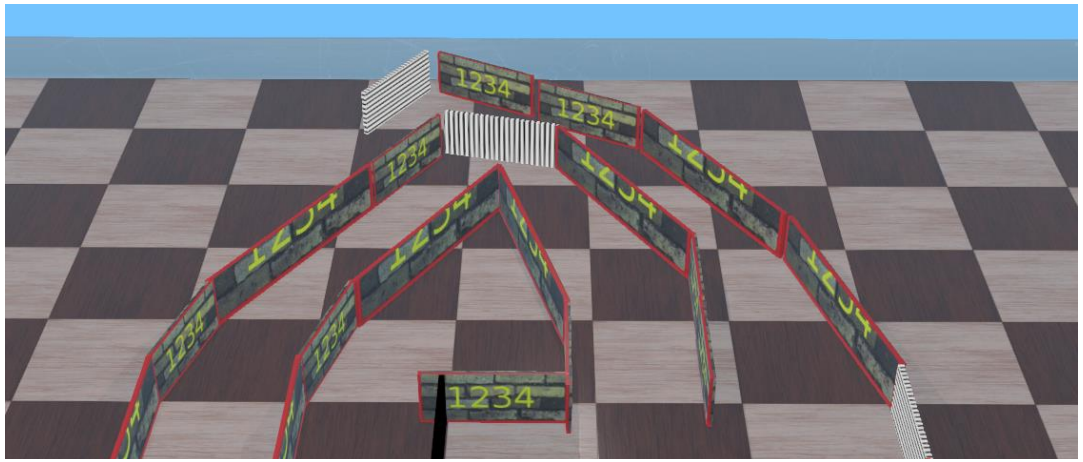


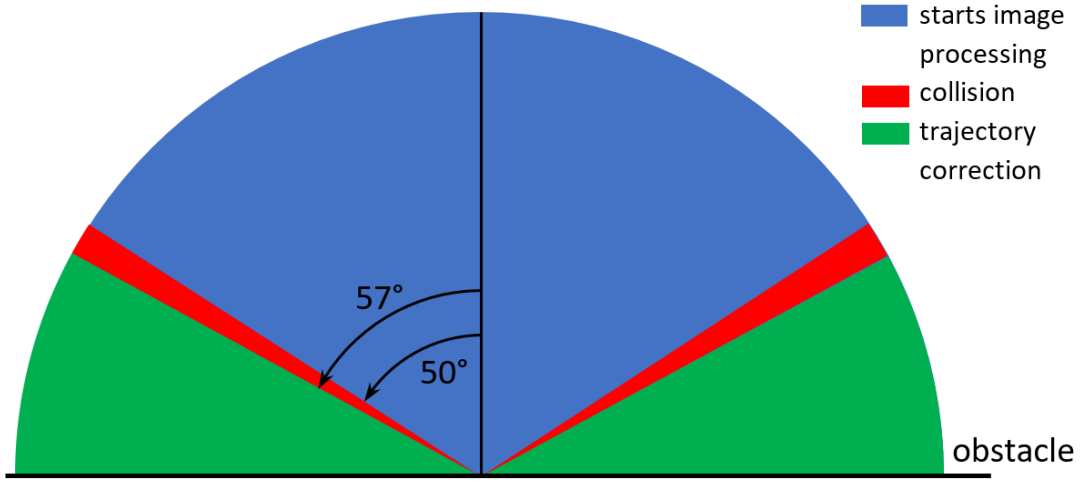
More experiments

- Modified maze

-> Further testing of the obstacle avoidance and trajectory modification capability

- Speed had to be reduced
- Different incidence angles were tested





Conclusion

Sharp road signs	→	100% success
Noisy road signs	→	Success is very noise dependant
Obstacle avoidance capability	→	With reduced speed, collision course over a circular arc of 7 °
Odometry	→	Accuracy in the order of a few centimeters along the path

Thank you for listening

- Do you have some questions?