Project 2: Road Sign Recognition

By Mohamed Amine Anjui & Naoufal Rhiss
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INTRODUCTION

**Project goals:** Program an E-puck able to get out of a maze.

- **Data:** 3 different road signs:
  - [Image of road signs: Turn left, Turn right, Turn around]

- **How?**
  - Taking a picture of the road sign with the camera
  - Analyze it with an FFT method
  - Take the right decision

- **Instruments:**
  - **MATLAB:** To see the resultant picture.
  - **Webots:** To elaborate a strategy
STRATEGY ON MATLAB

• Strategy based on the ratio of the magnitudes for the road sign 1 & 2

• For the black panel, it consists on calculating the average of the image
Webots (1)

Obstacle avoiding

→ Use braitenberg’s coefficient

```java
Main
while {1}
switch (mode)
    case = RUNAWAY
    - move forward,
    - get sensors value,
    - compute threshold and if threshold > 500
        mode = STOP
    case = STOP
    - Set motors to zero
    - take picture
    - compute FFT and mean of greyscale
    - take a decision:
        Turn left
        Turn right
        Turn 180°

    mode = RUNAWAY
```

EPFL
Webots (2)

- Implementation of our matlab strategy
- Simple recognition strategy based on if-else conditions
- Problem of blockage
  - If black: turn 180
  - Else: call the random function
- Modification of condition based on mean computation to determine whether it is black or not

If – else conditions based on the processing

```plaintext
If maxcol < 20 && maxrow < 20
    turn 180°
else if maxrow/maxcol > 10
    turn right
else if maxcol/maxrow > 10
    turn left
else
    if random > 0.5
        turn right
    else
        turn left
```
Experiments

- Exit the maze
- Varying pictures, noise and noise free
- Odometry
- Success recognition rate of 100%.
- The robot makes more time to exit the maze in the case of noisy pictures.
Results (2)

- Trajectory of the robot in the maze from odometry and from the robots onboard sensors
- Error accumulation in the odometry case
Conclusion

- It is a success! The e-puck is able to get out of the maze with good accuracy

- Great immersion in C programming

- An opportunity to improve our autonomy, rigorousness and the most important of all: the teamwork skills
THANKS FOR WATCHING