

Lab 6

*School of Architecture, Civil and
Environmental Engineering*

EPFL, SS 2020-2021

http://disal.epfl.ch/teaching/signals_instruments_systems/

What this lab is about

- Mini tutorial on Webots
- Understanding sensors
 - examples of sensors on-board the e-puck
 - notion of ‘noise’
 - how Webots simulates sensors
- Understanding how to use sensor data
 - input for actuation (example: robot control)
 - manipulation of data (logging and plotting)

Reminder: Webots GUI

scene tree

world view

editor

The screenshot displays the Webots GUI interface. On the left is the 'E-puck' scene tree, listing various objects like 'WorldInfo', 'Viewpoint', and 'DEF short_rock_1 Solid'. The central 'world view' shows a 3D simulation of an E-puck robot on a yellow arena with several grey rocks. On the right is the 'e-puck.c' code editor, showing C code for robot initialization and sensor enablement. The code includes headers for robot, differential wheels, distance sensor, light sensor, camera, and accelerometer, and defines constants for the number of sensors and time step. The main function sets up the robot and enables the specified sensors.

The console window shows the following output:

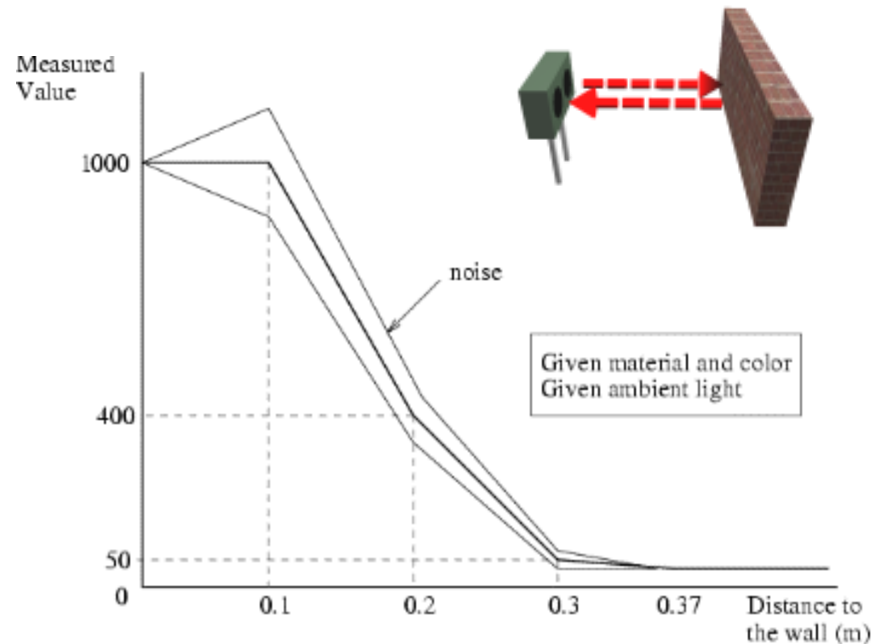
```

make
gcc -I. -I"/home/mansolin/Downloads/webots73/include/controller/c" -Wall -O3 -DLINUX -MM e-puck.c -MT build/release/e-puck.o > build/release/e-puck.d
gcc -c -Wall -O3 -DLINUX -I. -I"/home/mansolin/Downloads/webots73/include/controller/c" e-puck.c -o build/release/e-puck.o
gcc -s -o build/release/e-puck build/release/*.* -lm -L"/home/mansolin/Downloads/webots73/lib" -lController
cp build/release/e-puck e-puck > /dev/null 2>&1 || :
done.
INFO: e-puck: Starting: "/home/mansolin/Desktop/SIS/Lab_hwk07/New/lab_05/controllers/e-puck/e-puck"
  
```

console

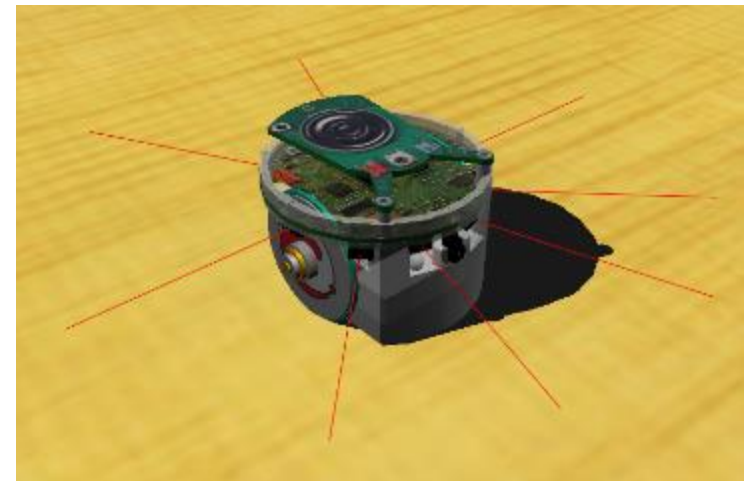
Reminder: Modeling sensors

- Capture **non-linearities** and **noise** of sensors.
- However, **calibration** is often approximative.
- Most often, sensor response is defined by a lookup table (here a proximity sensor):

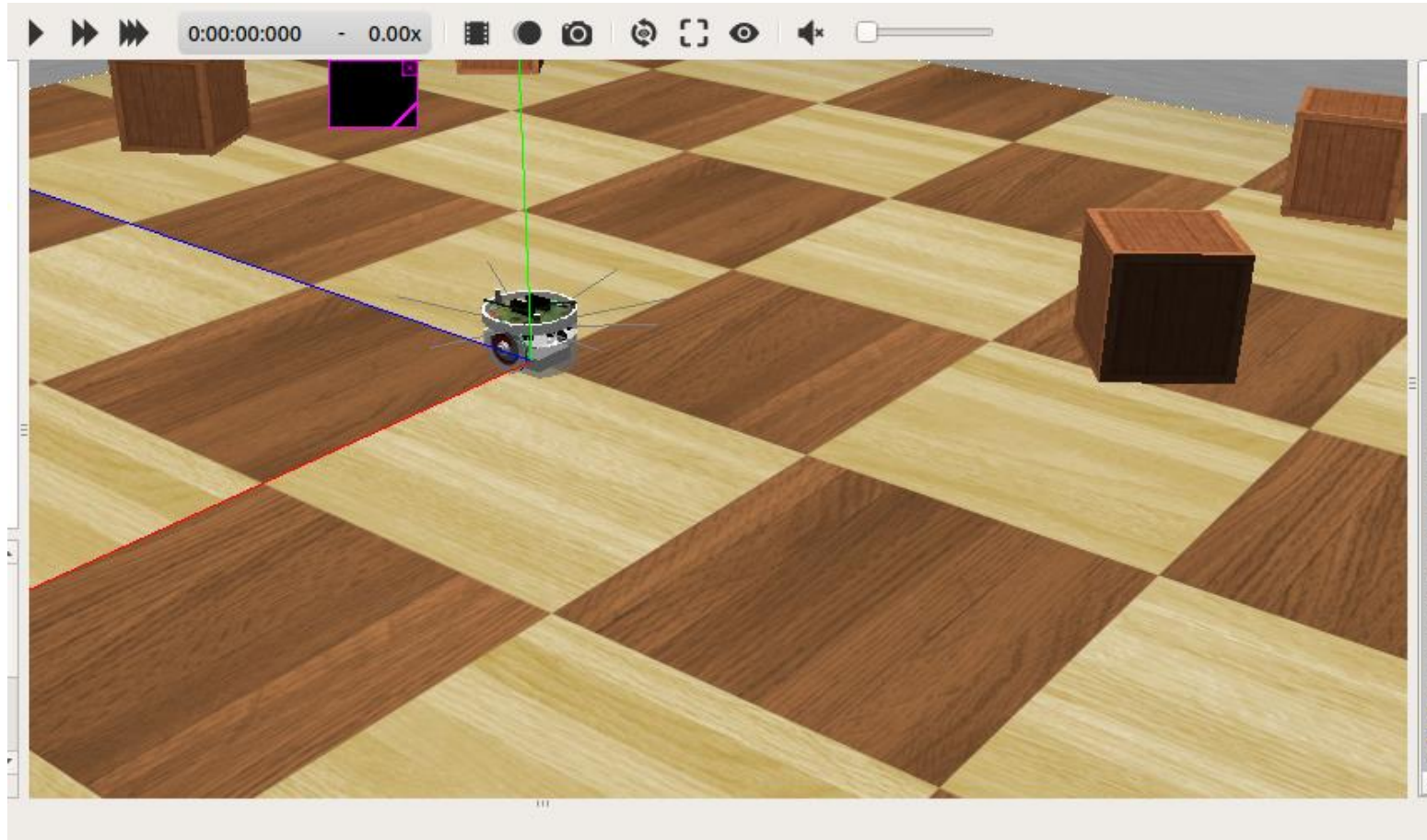


```
lookupTable [
  0
  0.1
  0.2
  0.3
  0.37
]
[
  1000
  1000
  400
  50
  30
]
[
  0,
  0.1,
  0.1,
  0.1,
  0
]
```

distance value noise



Robot control – Obstacle avoidance



Robot control – Braitenberg

