



Project I: distributed localization with CPSs  
Modeling and control of cyberphysical systems  
01UDSOV

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# 1 Introduction

In this project, we simulate an indoor localization/tracking system through a wireless sensor network (WSN). The sensor acquire the received signal strength (RSS) on a signal broadcast by a target to be located.

## 1.1 Aims of the project

1. Simulation of a localization/tracking problem in WSNs
2. Implementation of a localization/tracking distributed algorithm
3. Analysis of the results

## 1.2 Physical setting

- Environment: square room of  $100 \text{ m}^2$
- Grid:  $p = 100$  square cells of  $1 \text{ m}^2$
- Reference points: centers of the cells
- RSS model: indoor empirical model defined by the IEEE 802.15.4 standard

$$RSS(d) = \begin{cases} P_t - 40.2 - 20 \log d + \eta & , \text{if } d \leq 8 \text{ m} \\ P_t - 58.5 - 33 \log d + \eta & , \text{if } d > 8 \text{ m} \end{cases} \quad (1)$$

where  $P_t = 25$ ,  $\eta$  is a Gaussian noise  $\eta \sim \mathcal{N}(0, \sigma^2)$ ,  $\sigma = 0.5$ .

## 1.3 WSN

- $n = 25$  sensors
- Deployment:
  - uniformly at random positions; each sensor is connected with sensors at distance  $\leq r$ .
  - grid topology: the sensors are deployed on a grid  $5 \times 5$ ; sensors are connected to 4 closest sensors (3 or 2 on the boundaries)