



POLITECNICO
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SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE

IoT Challenge #1, Exercise sink placement

INTERNET OF THINGS

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1 | Chapter one

COORDINATES 6.87168 7.65929 8.15501

1.1. Data

- 10 sensors
- $T_{transmission} = 10$ minutes
- $b = 2000$ bit
- $E_b = 5$ mJ
- $E_c = 50$ nJ/bit
- $E_{tx} = k \cdot d^2$ nJ/bit
- $k = 1$ nJ/bit/ m^2

Sensor	Position
1	(1, 2)
2	(10, 3)
3	(4, 8)
4	(15, 7)
5	(6, 1)
6	(9, 12)
7	(14, 4)
8	(3, 10)
9	(7, 7)
10	(12, 14)

Table 1.1: Sensor position table

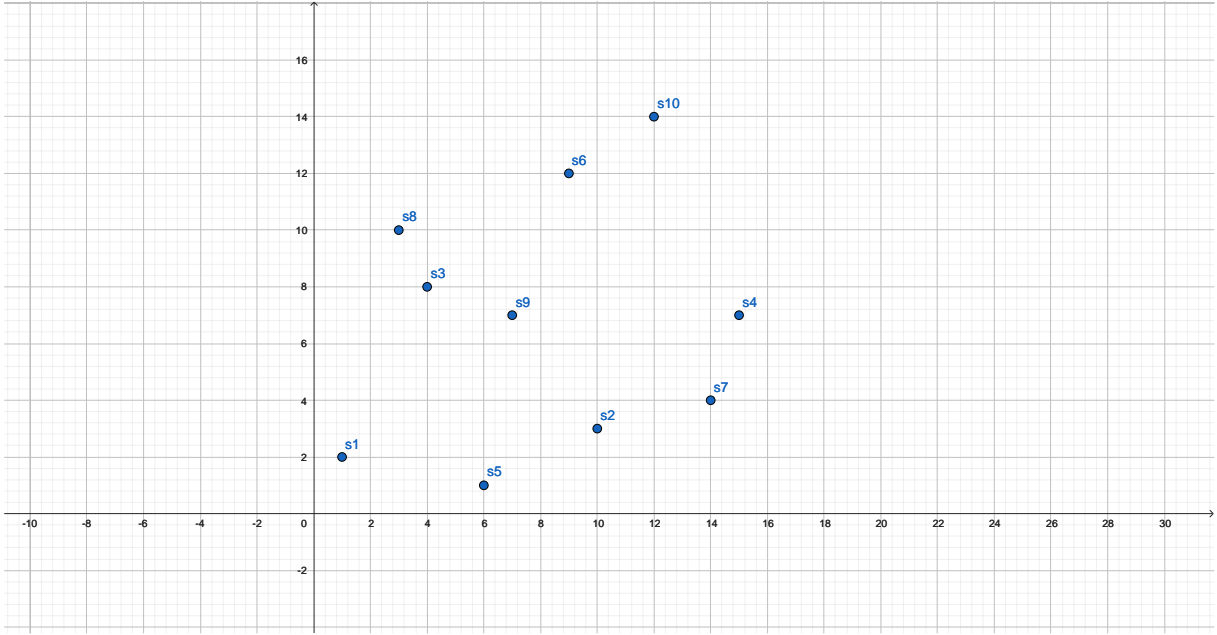


Figure 1.1: Sensor distribution

1.2. Point A

Sink position = $(x_s, y_s) = (20, 20)$

We calculated the distance of the farer sensor (sensor 1) from the sink using the cartesian distance:

$$distance_1 = d\{(1, 2), (20, 20)\} = \sqrt{(20 - 1)^2 + (20 - 2)^2} = \sqrt{685}m$$

$$E_{cycle,1} = E_c \cdot b + E_{tx(1)} = 50nJ/bit \cdot 2000 \text{ bit} + 1nJ/bit/m^2 \cdot 685m^2 \cdot 2000 \text{ bit} = 1.47 \cdot 10^{-3} J$$

$$n = \# \text{ cycles} = E_b / E_{cycle,1} = 3.4 \text{ cycles}$$

Assuming that each sensor transmits at the beginning of the ten minutes, the system will last for three cycles and during the fourth cycle the farer sensor will die.

1.3. Point B

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