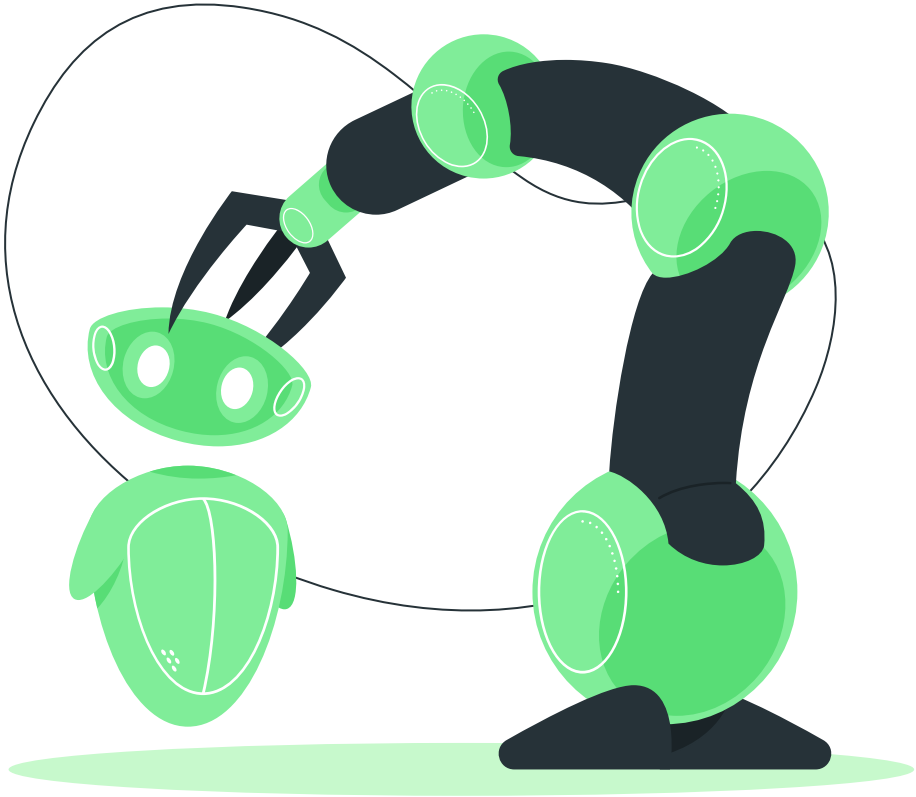
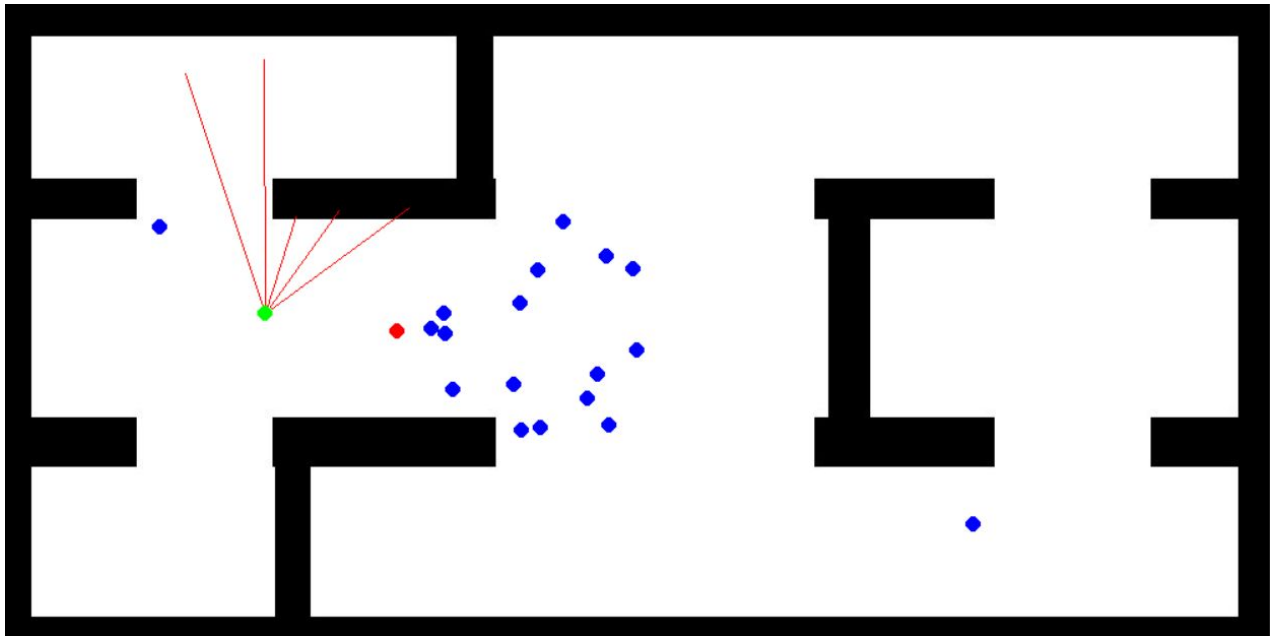
Monte Carlo Localization

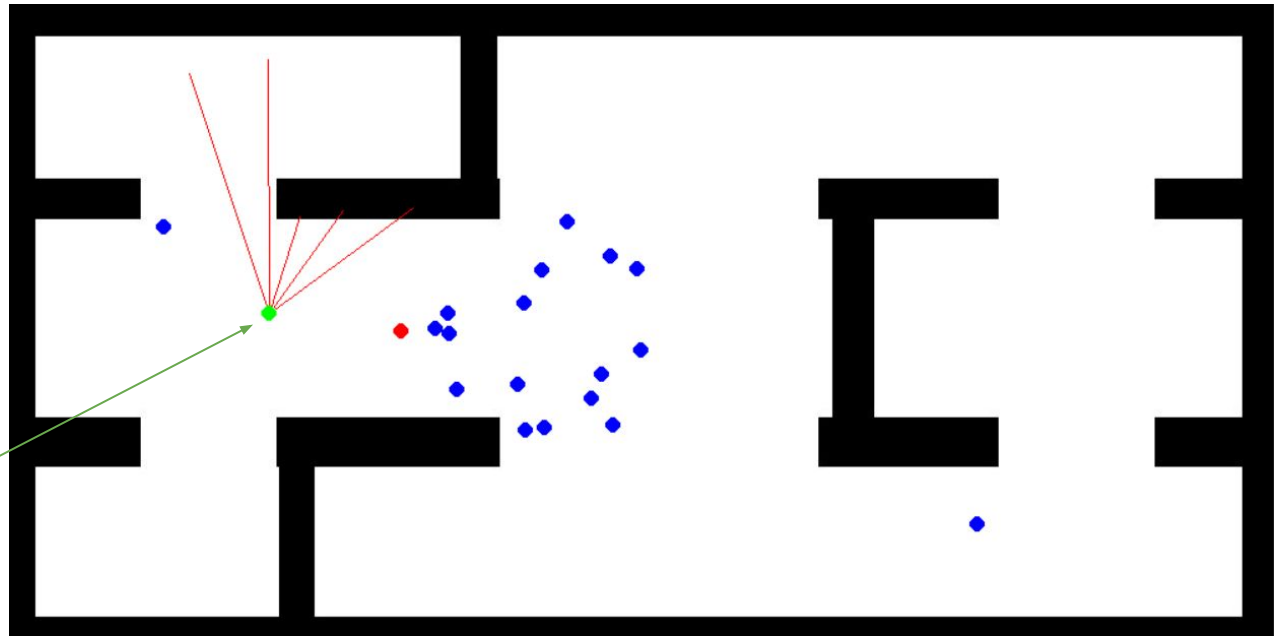
Roba 2022 - Kavinkumar THIRUNAVUKKARASU



Simulation Environment

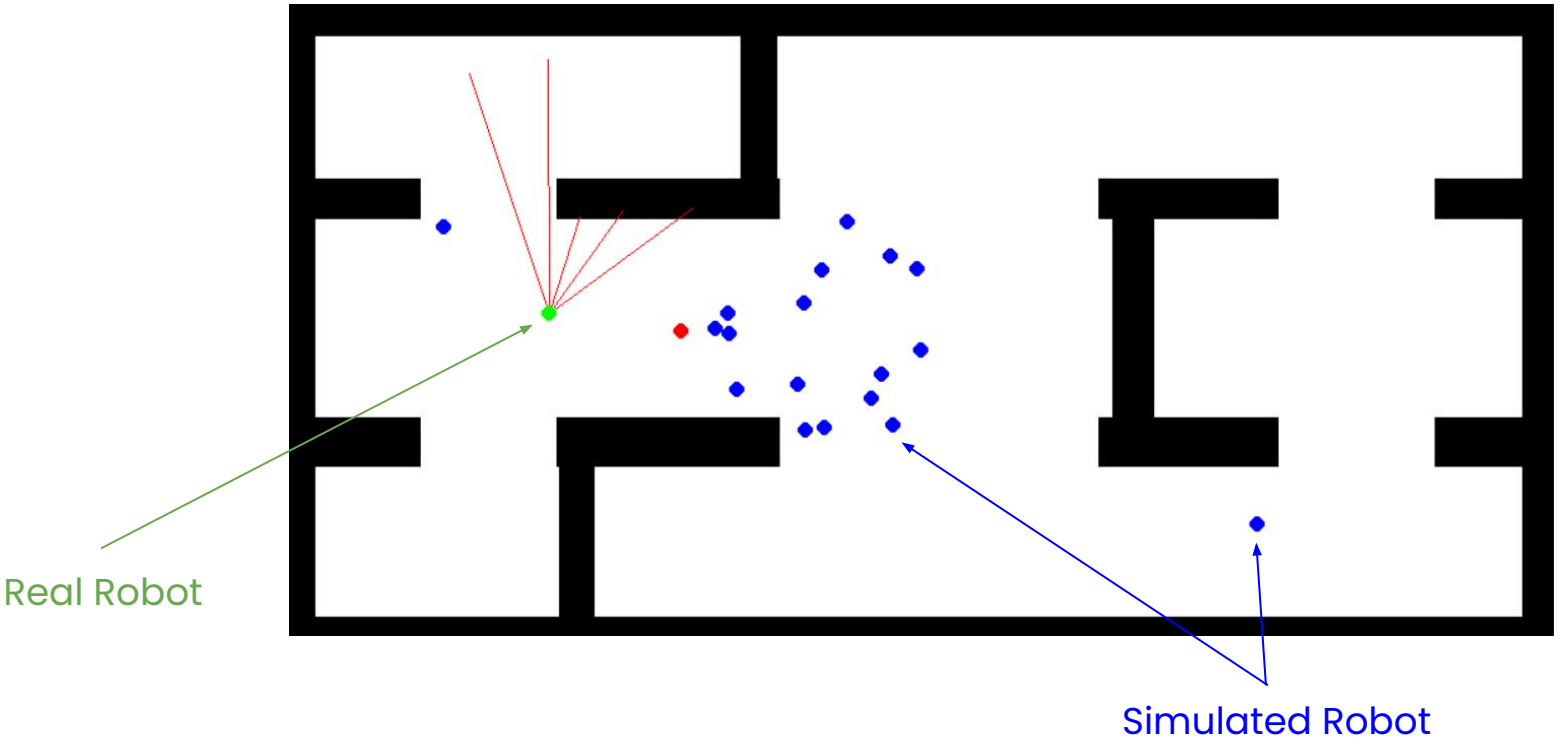


Simulation Environment

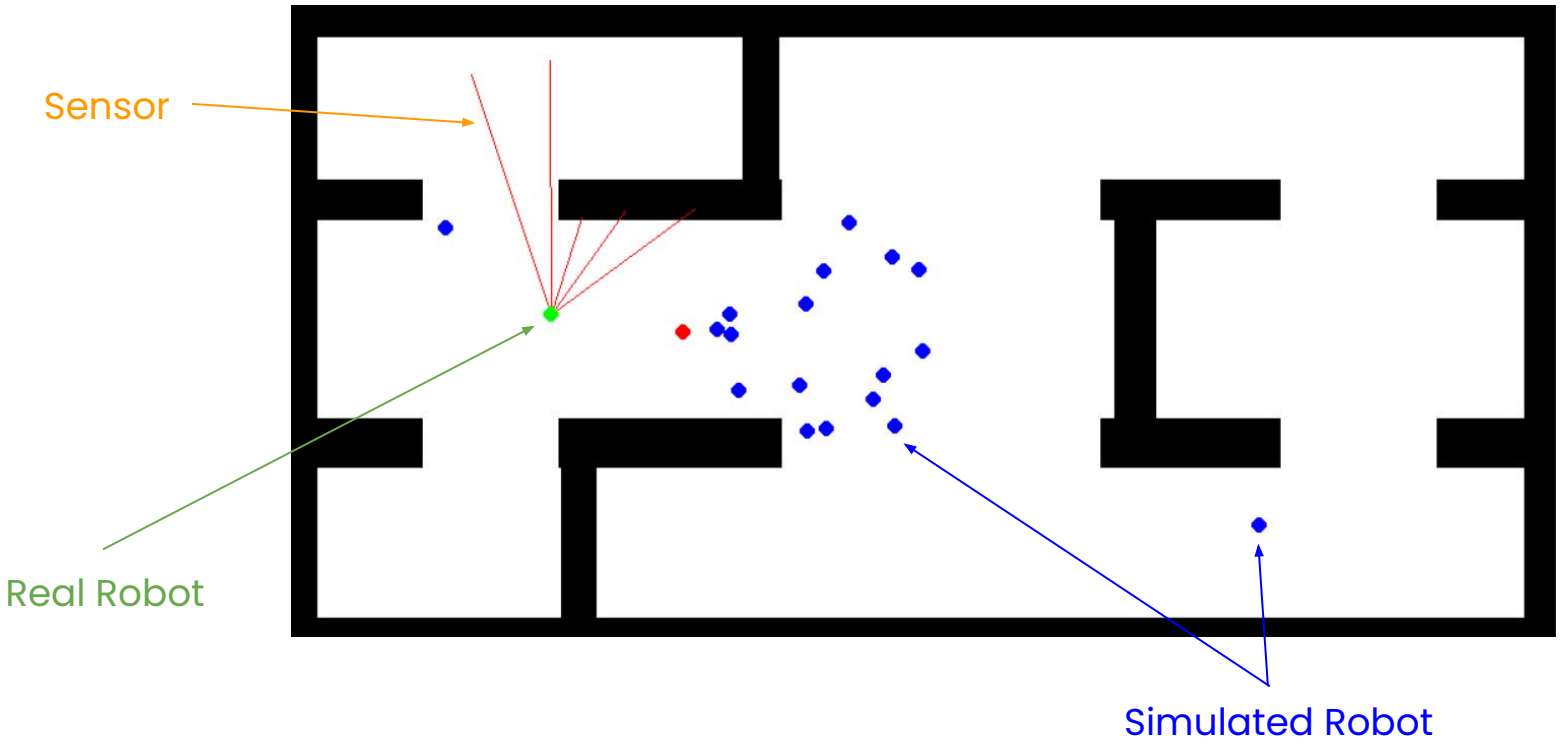


Real Robot

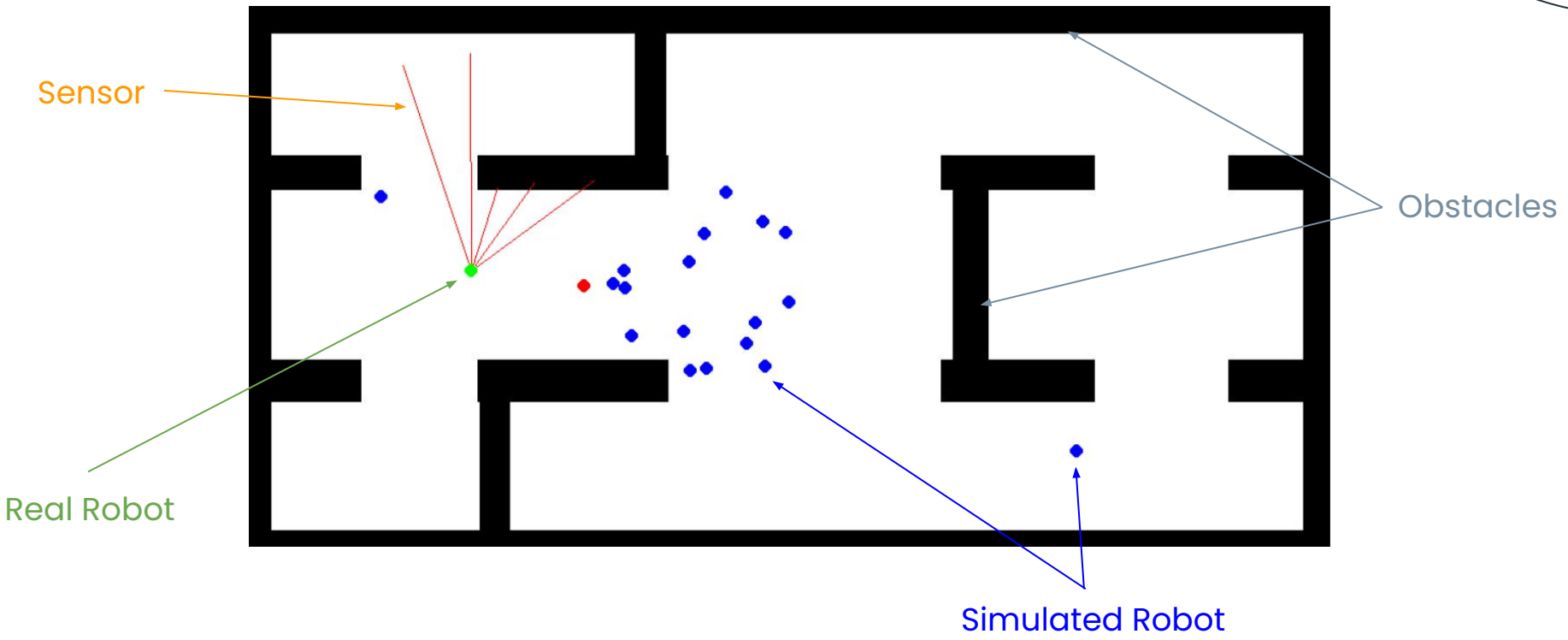
Simulation Environment



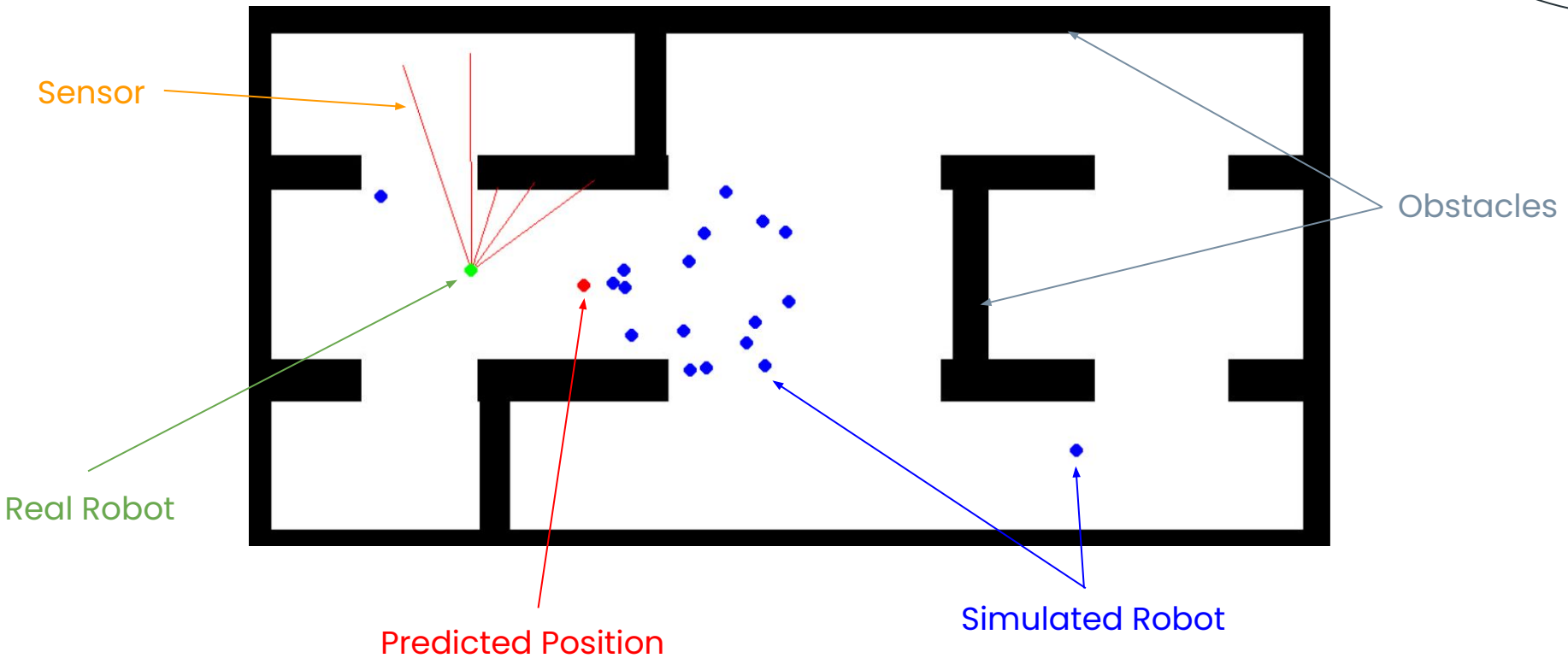
Simulation Environment



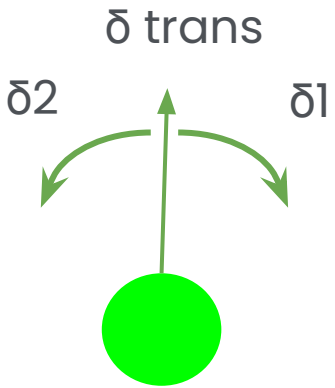
Simulation Environment



Simulation Environment



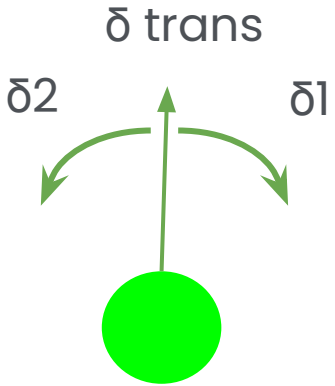
Sample Motion Model



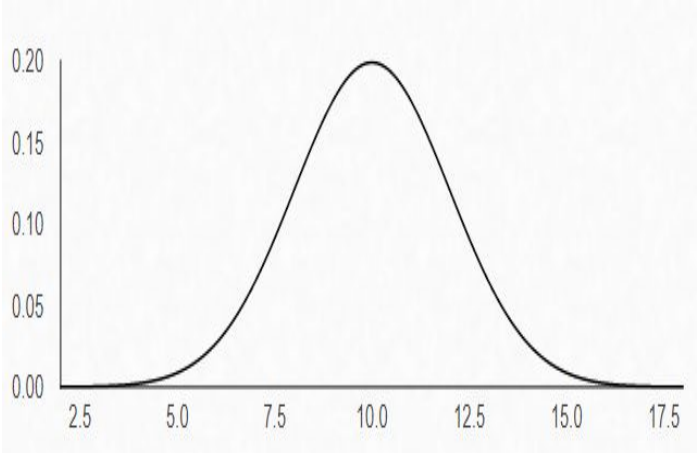
U = (δ trans, δ1, δ2)

U = (10, 10°, 10°)

Sample Motion Model



Imperfect Movement



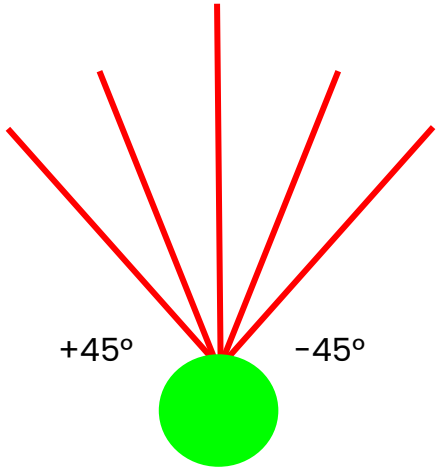
$U = (\delta \text{ trans}, \delta 1, \delta 2)$

$U = (10, 10^{o}, 10^{o})$

$\mu = 10$

$\sigma = 2$

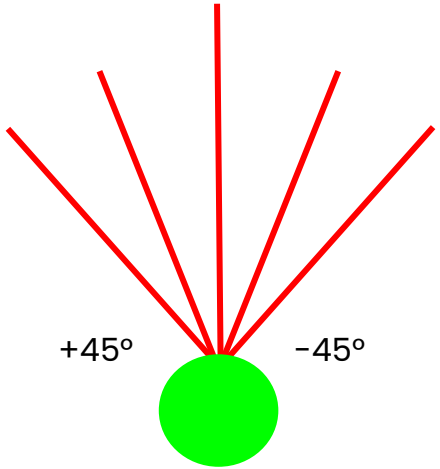
Measurement Model



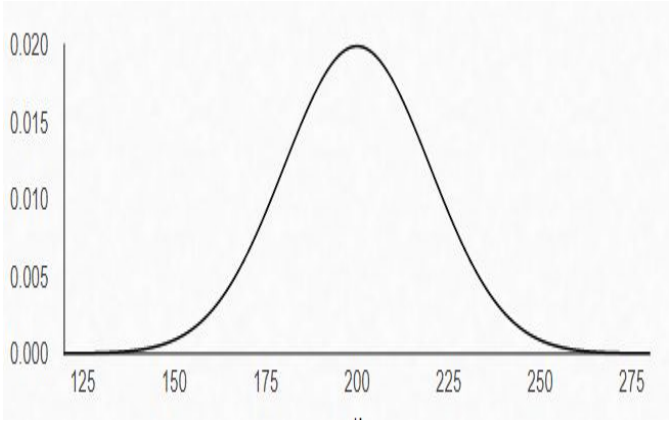
5 Rays

Range : 200

Measurement Model



Imperfect Movement



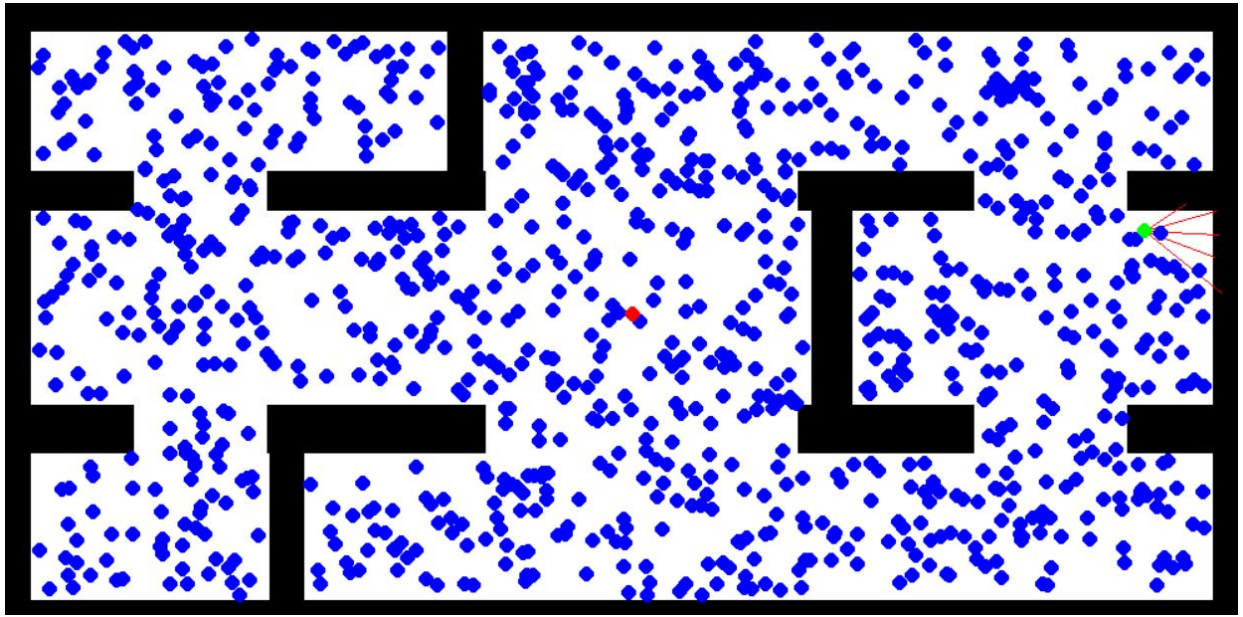
5 Rays

Range : 200

μ =200

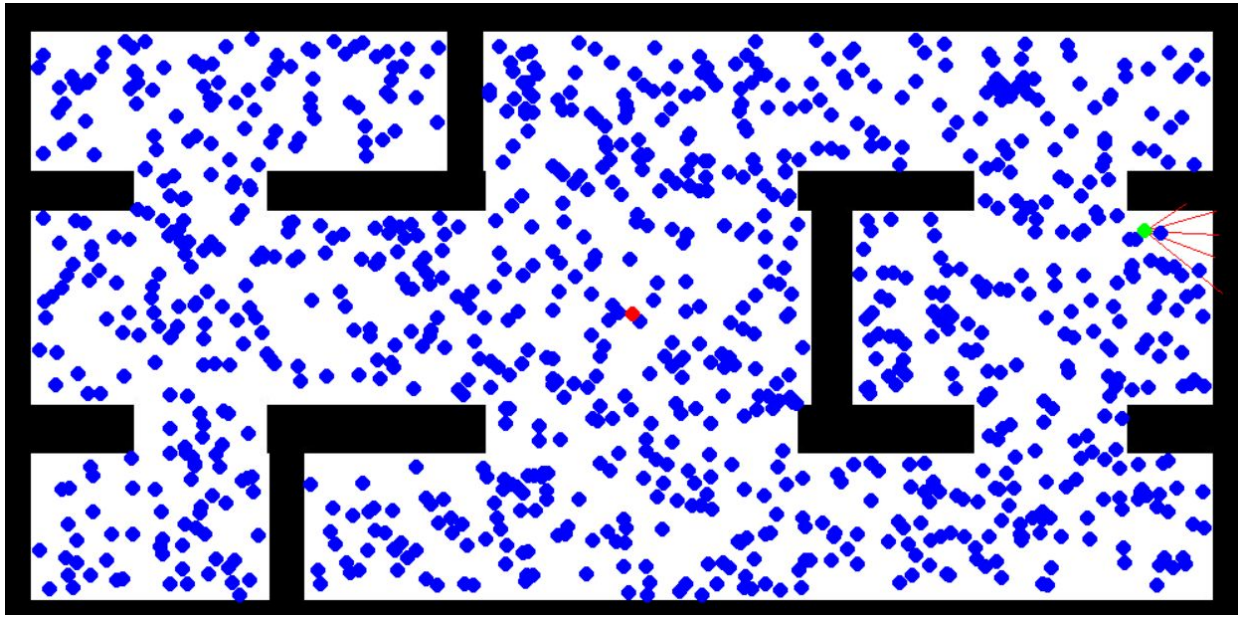
σ = 20

Initialization



500 Particles

Initialization

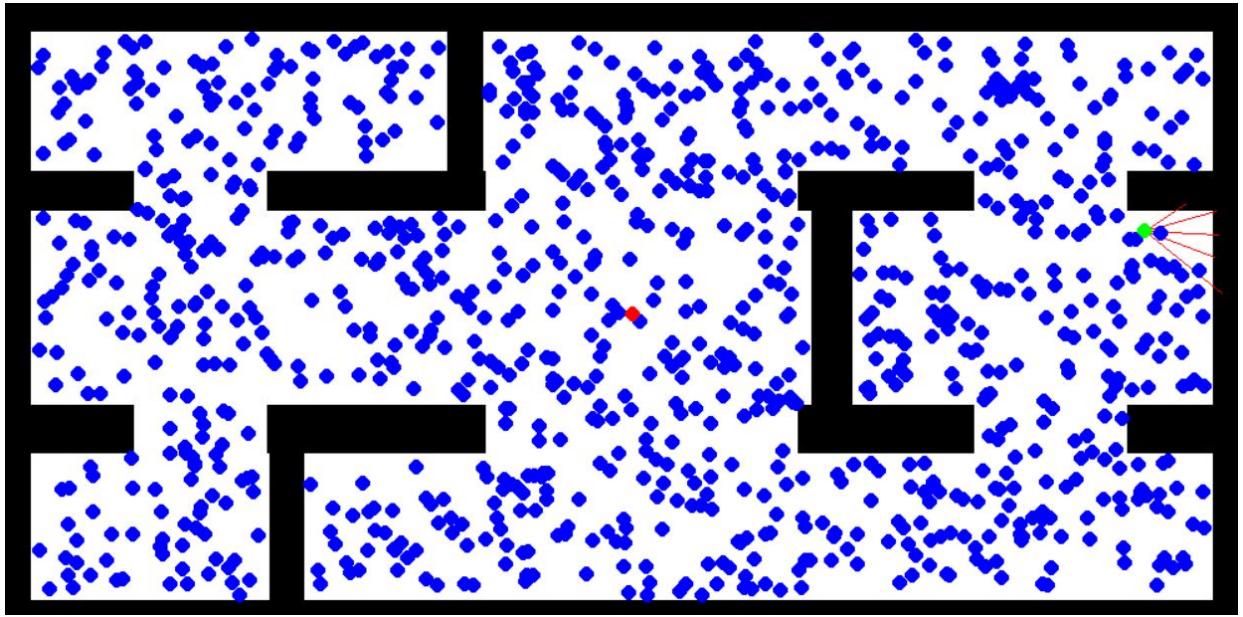


500 Particles

Weight :

$\omega i = 1/500$

Initialization



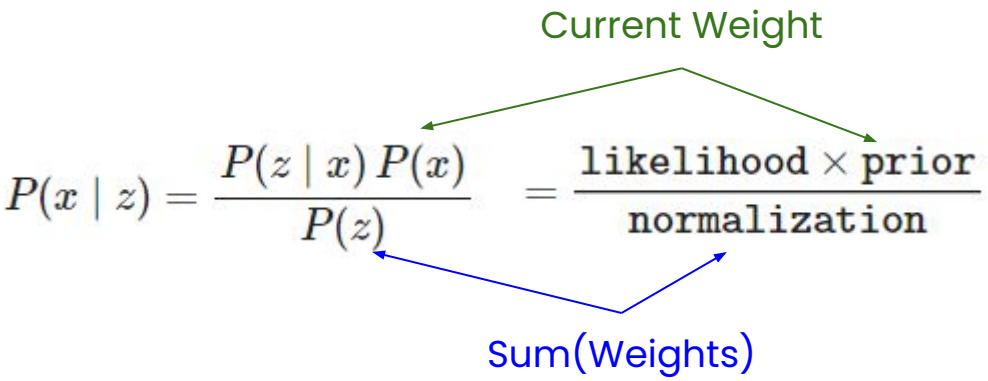
500 Particles

Weight :

$\omega i = 1/500$

Resample Step : 5

Update Weights



Update Weights

Current Weight

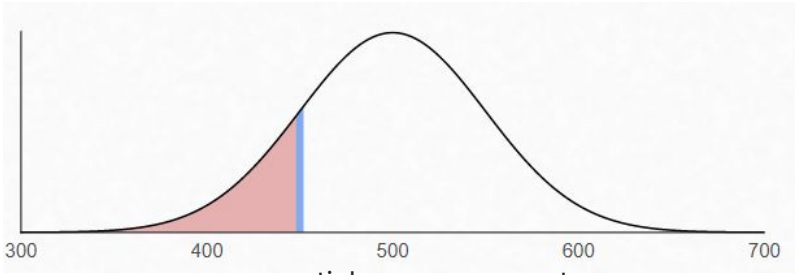
$$P(x \mid z) = \frac{P(z \mid x)\,P(x)}{P(z)} = \frac{\text{likelihood} \times \text{prior}}{\text{normalization}}$$

Sum(Weights)

For example : Likelihood

Particle Measurement : 500
Robot Measurement : 450

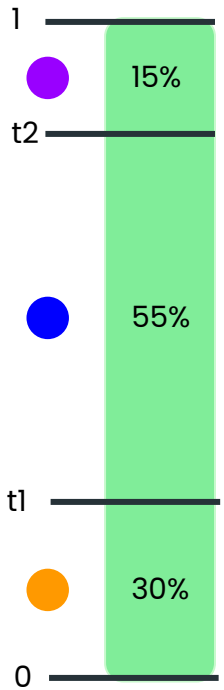
$P(x \mid z)$



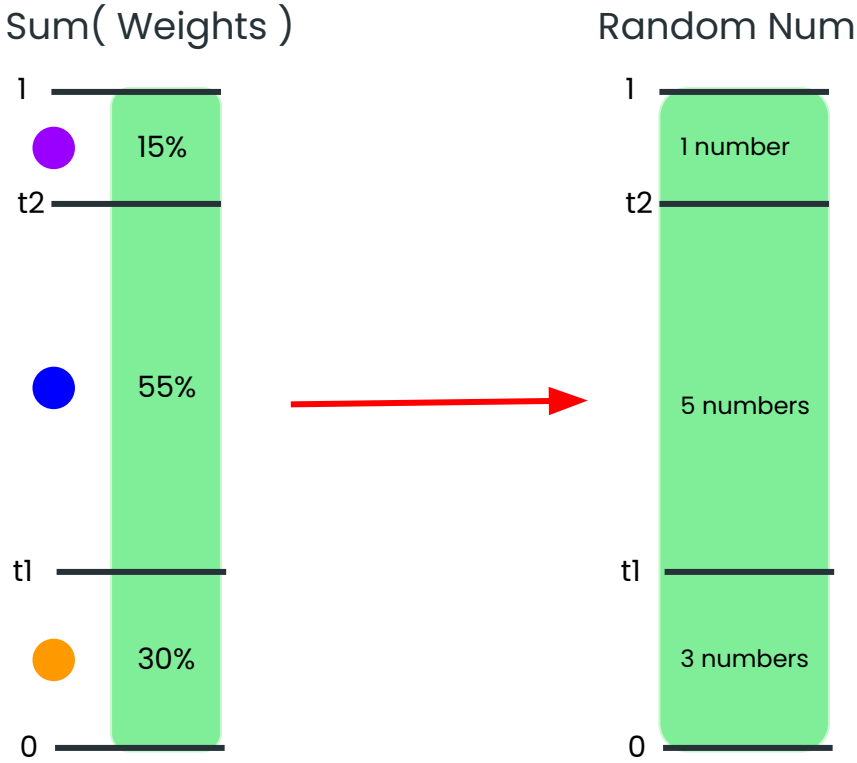
μ =particle measurement
σ = std deviation sensor

Resample

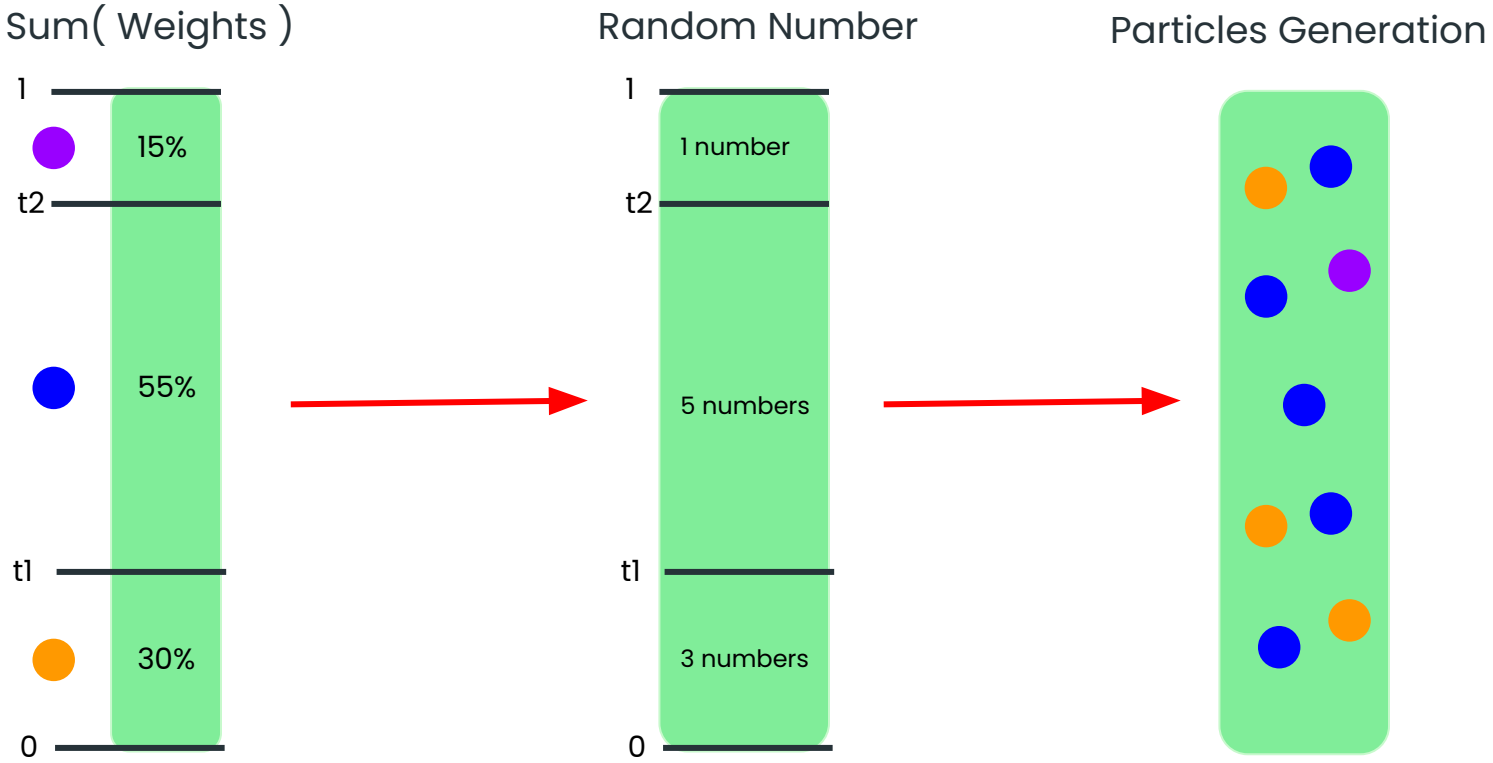
Sum(Weights)



Resample


Sum(Weights)
Random Number
1
15%
t2
55%
t1
30%
0
1
1 number
t2
5 numbers
t1
3 numbers
0

Resample


Sum(Weights)
Random Number
Particles Generation
1
15%
t2
55%
t1
30%
0
1
1 number
t2
5 numbers
t1
3 numbers
0

Video