

Lab-Activity-1

Exercise 1 - Phototaxis

Problem Analysis

The exercise requires implementing the behavior of a robot capable of detecting light and moving toward it.

The arena consists solely of boundary walls and a light source. I chose to randomly generate the position of the light source within the arena to observe the robot's behavior under different simulation conditions. The initial position of the robot is also randomized.

My Solution

The implemented behavior is based on the readings from the light sensors positioned around the circumference of the robot. Specifically, I considered four sensors for each direction: left, right, and front. At each simulation step, the robot evaluates which of the three directions has the highest light intensity, i.e., which group of four sensors produces the highest sum:

- If the light comes from the front, the robot moves straight forward and its LED turns yellow.
- If the light is stronger on the left, the robot rotates to the left and its LED turns blue.
- If the light is stronger on the right, the robot rotates to the right and its LED turns green.
- If no significant light is detected (below a threshold), the robot performs a random movement every 50 steps to explore the environment, and the LED remains off (black).

Exercise 2 - Collision Avoidance

Problem Analysis

The exercise requires implementing the behavior of a robot capable of detecting obstacles along its path and avoiding them.

The arena consists of boundary walls and a variable number of obstacles. The number of robots can also be changed, as each robot must be able to avoid collisions with others.

My Solution

The implemented behavior is based on readings from the proximity sensors placed around the circumference of the robot. Specifically, I take into account 8 of these sensors: four facing the front-left direction and four facing the front-right direction.

In the absence of obstacles, i.e., when none of the sensors detect a proximity value above a given threshold, the robot moves randomly.

At each simulation step, the sensor with the highest reading is identified (i.e., the one detecting the nearest obstacle). If the sensor is among the four on the left, the robot avoids the obstacle by turning to the right, and viceversa