

LabActivity4 - Report

Problem Analysis

The exercise requires implementing a robot capable of detecting a light source, reaching it as quickly as possible, and avoiding obstacles. Once the robot gets close to the light source, it must stop.

The arena is composed of the usual perimeter walls, a light source, and a corresponding black spot that identifies the area where the robot should stop. A variable number of obstacles and robots are randomly generated.

The problem must be solved using a motor schemas architecture.

My Solution

In the motor schemas architecture, different behaviors are represented as vector fields. The wheel speed and direction are determined by the weighted sum of the resulting vectors.

I implemented two schemas, with slightly different priorities (the obstacle avoidance schema has a higher weight):

- Light-following schema \Rightarrow the direction with the highest light value is identified, and the length of the vector determines the robot's forward speed.
- Obstacle avoidance schema \Rightarrow only the front sensors corresponding to angles between -1.2 and 1.2 are used (i.e., sensors 1–5 and 20–24), so that the repulsive force from walls is not too strong (*). The resulting vector has the opposite direction of the obstacle, creating a repulsive force.

Finally, the two vectors are summed, and the wheel velocities are computed accordingly.

(*) In fact, when using all proximity sensors near the walls, the robot would accelerate excessively in the opposite or parallel direction, due to the accumulation of sensor values. By considering only the front-facing sensors, the repulsive force is weaker but still effective.

