Exercise 1

1 (Theory) [40 points]

In chapter 1.2.1 of the book "Behavior Based Robotics" by Ronald Arkin, Grey Walter's Turtle is presented as a simple behavior-based system.

  a) Briefly describe the main hardware elements necessary for its behavior. [20 points]

  b) Draw a state diagram of the system's behavior (in analogy to finite state machine) [20 points]

2 (Programming) [40 points]

Use the provided simulator to implement Braitenberg vehicles with two sensors and two motors that show the following behaviors towards a light source:

  a) Love: The robot moves toward the light, getting slower as it approaches, stopping in front of the light. [10 points]

  b) Aggression: The robot accelerates towards the light and drives through it. [10 points]

  c) Fear: The robot turns away from the light as fast as possible. [10 points]

  d) Curiosity: The robot gets slower when approaching the light, but then turns and continues to explore the environment. [10 points]

In the simulation, a Khepera robot is simulated, with eight instead of two light sensors. For the implementation, these need to be fused to get two sensors first, afterwards the wiring of the Braitenberg vehicles needs to be reproduced in software.

3 (Programming) [20 points]

Implement the behavior of Grey Walter's Turtle based on the behavior of a Braitenberg vehicle. The implemented behavior must have the following properties:

  • Search for light source.

  • Move to adequate light source.

  • Fear from a light source that is too strong.