The robot aims to find the light source, which is placed in a rectangular area outside its closed neighborhood. The robot has two light sensors and can only sense the light if it is close enough to it. The robot acts based on the output of the controller.

The controllers are evolved with a genetic algorithm.

**Evolutionary algorithm:**
- Elitist strategy (15% of best kept)
- Keep some random individuals for higher diversity (5%)
- Mutate 50%
- New offspring with crossover (1-point, uniform) (40%)
- Add new individuals (10%)

**Fitness functions:**
- (F1) time and distance
- (F2) time, distance and grid cells visited
- (F3) time, distance and weighted grid cells (favor moves in spiral)

**Mutations for Mealy machine:**
- Modify transition (output, next state)
- Change init state
- Replace transition
- Modify threshold for input

**Mutations for NN:**
- Modify bias
- Modify weight

**Comparing Mealy machines:**
- Hamming distance
- Using max equal prefix

**Comparing NN:**
- Difference of sums of weights and biases

**Generation of Mealy machines:**
- Random
- “Simao” based on [4] – making sure all states are reachable

**Best evolved Mealy machine**
Evolved with F1, Simao generation, using uniform crossover (thresholds: 1, 60)

**Experiments and Results**

In the representation we also encode the initial state and the thresholds used for input mapping.

**References**