

Department of Computer Sciences
University of Salzburg

PS Natural Computation
SS 13/14

Design and implementation of a robot task

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Abstract

The main goal of this project is designing a task that demonstrates that the usage of neuromodulators can influence the evolution of a neural network in a positive way. For implementation and simulation of the task we use SIMMA "a simulation framework mainly developed for the simulation of mobile autonomous robots and their behaviour".

1 Introduction

In this class our team of four people design a task for neural networks. The main goal is to demonstrate that the usage of neuromodulators can influence the evolution of a neural network in a positive way. After careful considerations we decided to implement a robot whose task it is to take several pegs to a certain place. By delivering the pegs to the certain place the robot has to avoid an enemy. If the robot is captured by the enemy, he will get damage, which effects its speed. The robot will learn this task by means of neural networks. We hope that neuromodulators will influence the evolution of our neural network in a positive way. So the neuromodulators assist our robot by learning this task. For implementation and simulation of the task we use SIMMA "a simulation framework mainly developed for the simulation of mobile autonomous robots and their behaviour".

1.1 Neuromodulation

Neuromodulation basically describes a mechanism, which allows a neuron to switch between different states. There are different approaches how this may work in nature and also how neuromodulators are implemented in different variants of ANNs. In our case the mentioned states of the neuron are associated with a change of bias, the neurons output. In general, it is a complex problem, to find out in which cases bias changes would have a positive effect. So we simply left this to evolution.

For our project, we have defined one neuromodulator using the SIMMA class `simma.ann.modulator.BiasChange`. As Brain we selected the also already existing class `simma.ann.NeuroFeedForwardController`. See appendix for a complete listing (xml) of our setup.

2 SIMMA

SIMMA (Simulator for EMMA) is ...

3 The task

3.1 The Robot

3.2 The Enemy

3.3 The Fitness Function

4 Results

5 Conclusion

6 Links

- Project Page: <http://student.cosy.sbg.ac.at/~cmueller/natcomp/>
- PS Page: <http://www.cosy.sbg.ac.at/~helmut/Teaching/NaturalComputation/proseminar.html>

7 Appendix

7.1 XML-Listing

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```

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