Hokkaido University, Sapporo 2006 feb-Aug

Project

The goal was to use a FPGA to make a robot car able to learn to navigate through a simple maze-like environment. This project counts as an internship in Holland.

強化学習

Language course

I did a Japanese Language course to learn basic Japanese grammar, kanji, writing, reading and oral communication.

Culture

During my stay a had the opportunity to participate in Laboratory festivities, visit many Japanese festivals, travel and meet exchange students from all over the world. A stimulating experience I will never forget and I wish everybody to have.
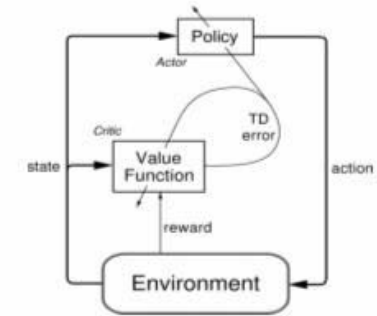
Summary

北海道大学 HOKKAIDO UNIVERSITY · LABORATORY OF HYBRID SYSTEMS · DCSC · TUDelft

Reinforcement Learning for a FPGA based mobile car

What is reinforcement Learning?

Reinforcement learning an Artificial Intelligence Algorithm capable of learning what to so as to maximize a numerical reward signal.

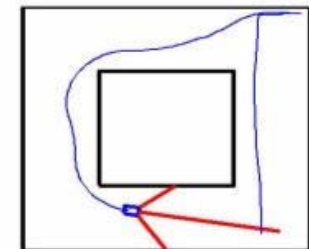$$TD_{error} = r_{t+1} + \gamma V(s_{t+1}) - V(s_t)$$

What is a FPGA?

a FPGA is short for Field Programmable Gate Array. This is a reprogrammable chip in which the Reinforcement Learning Algorithm is to be implemented as Hardware

Where did you start?

The first step was creating a simulated and controlled environment using Matlab to test and optimize the theory for the specific application
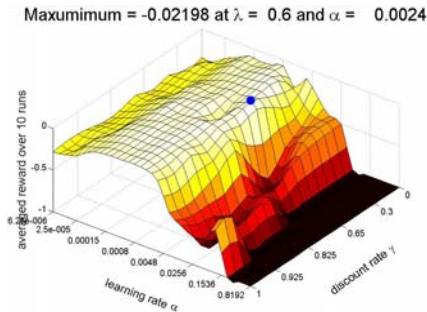

Research

Reinforcement Learning for a FPGA based mobile car

What were the simulation results?

Maxumimum = -0.02198 at λ = 0.6 and α = 0.0024

Once the theory was also working in simulation there were some parameters to be optimized. This was done by doing a gridsearch and a genetic algorithm. The optimization showed that the Actor Critic algorithm worked best. It also showed the given problem was too simple to make a reinforcement Learning Algorithm a necessity
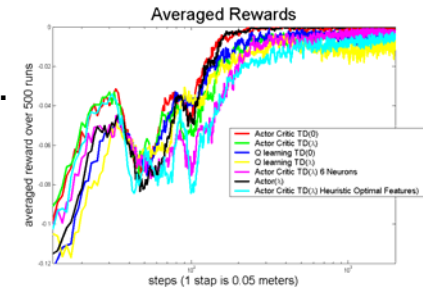
What were the implementation results?

The Implementation in the FPGA proved harder then expected. The algorithm work to some extend but never as good as the simulation. The main problem is that Hardware programming is very different then software programming and debugging was almost an impossible task.

Research

Student Life