

Universität Augsburg University 

and strategy.

# **STARCRAFT** An Organic Computing Testbed

## Summary

Organic Computing (OC) research focuses mainly on real-world applications, for instance, urban traffic control, smart camera networks or smart factories. The approach of introducing these new methods into real-world applications is unquestionably expedient and should not be omitted in the future. But, sometimes one faces handicaps of real-world applications that are quite hard to overcome. These can be problems of limited resources, e.g., constructing a large-scale smart camera network is very expensive, or, problems of safety concerns by the infrastructure holder, e.g., regulators do not agree with a learning (and thus non-deterministic) traffic control system. Therefore, we propose Starcraft as an Organic Computing testbed since it is not affected by problems as mentioned before, but, perfectly fits our notion of an OC system.

use C++ library that provides an **interface** to the game and therefore allows the development of artificial players as well as automated test runs of it. Several bots, i.e., automated players, for BW have been released. Most of them have been designed by researchers from around the globe. Their bots compete in several tournaments that are staged at scientific conferences. Even though these bots are promising approaches, a bot that can compete with the top-level human players is still missing. This again underpins that mastering RTS games is a far from trivial problem for computer science.

#### **Observer/Controller Architecture**

This poster demonstrates a first step towards BW as OC testbed: We designed an **Observer/Controller architecture** for a BW bot using OC principles (see Figure below). We took a flat architecture for the different entities (units/buildings) that is enhanced with a hierarchical structure for different purposes, i.e., combat, economy

#### Starcraft as...

Maybe the most famous instance of a real-time strategy (RTS) game is Starcraft: Broodwar (BW, sometimes also referred to as only *Starcraft* or *Broodwar*). It has been released in 1998 for PCs and since then nearly 10 million Copies have been sold. Founded on this number and on a huge amount of players attracted to the game until today, it is Events seen as the most successful RTS game ever. RTS games can be characterized by three main tasks the player has to fulfill:

> $\succ$  collecting resources creating buildings/units  $\succ$  controlling the units.

### ...OC Testbed

There are several reasons that qualify BW as an

**OC testbed**. The most important is that it shows the characteristics of an OC application, i.e., we face a **set of entities** (units and buildings) that **interact** with an environment (map and units of other players) and those entities interact in non-trivial ways. Furthermore, the environment is only partial observable and brings different types of uncertainty with it. Compared to other games that have been used as scientific testbeds, such as chess, go or poker, it creates a much bigger challenge. Another

Data

OC techniques is the availability of an easy to



Controller





Stefan Rudolph stefan.rudolph@informatik.uni-augsburg.de Sven Tomforde sven.tomforde@informatik.uni-augsburg.de

daniel.mayrock@student.uni-augsburg.de Daniel Mayrock Jörg Hähner joerg.haehner@informatik.uni-augsburg.de

ORGANIC COMPUTING GROUP FACULTY OF APPLIED COMPUTER SCIENCE UNIVERSITY OF AUGSBURG

