

GCA Multi-Softcore Architecture for Agent Systems Simulation

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The GCA (Global Cellular Automata) model consists of a collection of cells which change their states synchronously depending on the states of their neighbors like in the classical CA (Cellular Automata) model. In differentiation to the CA model the neighbors are not fixed and local, they are variable and global. The GCA model is applicable to a wide range of parallel algorithms. The application in this paper is multi-agent behavior simulation. By using the GCA model many multi-agent behaviors can easily be described and efficiently simulated. A general purpose multiprocessor architecture to accelerate the simulation of multi-agent behaviors based on the massively parallel GCA model is presented. In contrast to a special purpose implementation of a GCA algorithm the multiprocessor system allows the implementation in a flexible way through programming, thus simulating different behaviors on the same architecture. The implemented architecture mainly consists of a set of processors (Nios II) and a network. The Nios II features a general-purpose RISC CPU architecture designed to address a wide range of applications. Three different networks have been implemented and evaluated with regard to the multi-agent simulation application. A system with up to 16 processors was implemented as a prototype on an FPGA.