CELLULAR NEURAL NETWORK VIRTUAL MACHINE
FOR GRAPHICS HARDWARE WITH APPLICATIONS IN IMAGE PROCESSING

Ryanne Dolan

Dr. Guilherme DeSouza, Thesis Supervisor

ABSTRACT

The inherent massive parallelism of cellular neural networks makes them an ideal computational platform for kernel-based algorithms and image processing. General-purpose GPUs provide similar massive parallelism, but it can be difficult to design algorithms to make optimal use of the hardware. The presented research includes a GPU abstraction based on cellular computation using cellular neural networks. The abstraction offers a simplified view of massively parallel computation which remains universal and reasonably efficient. An image processing library with visualization software has been developed using the abstraction to showcase the flexibility and power of cellular computation on GPUs. A simple virtual machine and language is presented to manipulate images using the library for single-core, multi-core, and GPU backends.