

Abstract

In this thesis, I designed and implemented three new web applications tailored for the Cellular Automata (CA) simulation models SCIDDICA-k1, SCIARA-fv3 and ABBAMPAU, making use of the Google Web Toolkit framework and WebGL.

Moreover, I have contributed to the optimizations of the numerical models mentioned above and I also developed part of a library, called OpenCAL, for developing CA simulation models in C/C++. In this case, my most significant contribution regarded the support given to the parallelization through the OpenCL standard, in order to facilitate with a few lines of codes, the parallelization for the execution on any device, especially on General Purpose Computation with Graphics Processing Units (GPGPU).

The development of the web applications involved the implementation of strategies so that optimizing the server load in the connections' management and enhancing the real time visualization of maps on devices of any kind, even mobile.

As regards the OpenCAL library, the tests performed on a test models has shown significant performance improvements in terms of speedup, thanks also to the use of some new optimization strategies. In this way, the validity of the use of graphics processing units as alternative to more expensive hardware solutions for the parallelization of CA models has been confirmed.