Analysis and Optimization of a Demographic Simulator for Parallel Environments

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Motivations

Multicore/multithreaded computing systems have become the de-facto standard for high-end applications.

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Abandoning the single-threaded approach in favor of a multi-threaded programming paradigm could increase the performance achieved by running PDES, due to the possibility to rely on access-optimized shared memory. This reduces communication latency and enables for more advanced policies of load sharing.
Yet Another Demographic Simulator (Yades)


There are two different versions using two different runtime PDES engines:

- \( \mu \text{sik} \) [5]: offers a lookahead-based conservative and a state rollback-based optimistic execution targeting the multi-process paradigm
- ROOT-Sim [1, 4]: offers a rollback-based optimistic execution targeting multi-thread paradigm.
The ROme Optimistic Simulator (ROOT-Sim)

- Multi-threaded opensource optimistic simulation platform based on the Time Warp protocol [2].
- General-purpose solution.
- Tailored for UNIX-like systems.
- Support differentiated simulation models adhering to a very simple and intuitive programming model with a transparently platform.
Main Contributions

- Preliminary assessment of a multi-threaded runtime environment applied to large-scale agent-based demographic systems.
- Integrate Yades with ROOT-Sim.
- Add shared-memory capabilities to Yades.
- Reduction of the internal communications of Yades, decreasing its execution time.
Main Contributions

- Results in sequential:

![Graph showing comparison between Original implementation and New implementation](image)

- X-axis: Family Units
- Y-axis: Time [SEC]
- The graph compares the performance of the Original implementation with the New implementation.
Main Contributions

- Results in parallel:
References I

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