

Structured parallel programming for Monte Carlo Tree Search Mirsoleimani, S.A.

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STRUCTURED PARALLEL PROGRAMMING FOR MONTE CARLO TREE SEARCH

Ali Mirsoleimani, June 17, 2020

- 1. The Monte Carlo Tree Search (MCTS) algorithm can be efficiently parallelized for both multi-core and manycore machines. For this task three key ingredients are necessary: task-level parallelization, lock-free data structures, and parallel patterns. (This dissertation)
- 2. Task-level parallelization is to be preferred over thread-level parallelization for parallelized MCTS. (Chapter 4)
- 3. A correct lock-free data structure removes the synchronization overhead without losing search information. (Chapter 5)
- 4. The pipeline pattern overcomes search overhead for parallelized MCTS since it avoids violating the iteration-level data dependencies. (Chapter 6)
- 5. For a balanced behaviour the exploitation-exploration trade-off needs to be chosen in relation to the size of the search trees for parallelized MCTS. (Chapters 7 and 8)
- 6. Performing small science in a big science project is equally rewarding when the results are recognised as outstanding.
- 7. Universities are inherently too small for big science. Therefore, the Academia should join forces as CLAIRE is doing.
- 8. Exploration is the father of Exploitation.
- 9. SCHOONSCHIP is of all times. "Schoonschip maken" is an emotional achievement of scientific format.
- 10. In 2026 the Iranian IGM Alireza Firouza will become the human World Chess Champion.