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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.