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Project Proposal (Functional and Parallel Processing)

Parallelized Futoshiki Puzzle Solver in Scala

Idea:
Create a programme that solves Futoshiki puzzles efficiently by leveraging parallel computing. The solver will implement constraint propagation and backtracking techniques, parallelized to significantly reduce the solving time.

Project Components:

- Use the Future library in Scala to implement the Futoshiki solver.
- **Sequential Solver Implementation**:
  Develop a baseline sequential solver for Futoshiki puzzles.
  Implement constraint propagation and backtracking.
  Measure the performance of the sequential solver on various puzzle sizes and difficulties.
- **Parallelization**:
  Analyse the sequential solver to identify parallelizable components.
  Focus on parallelizing the backtracking search space.
  Ensure proper synchronisation and load balancing.
- **Implementation of Parallel Solver**:
  Use multi-threading to parallelize tasks.
  Ensure the correctness and efficiency of the parallel solver.
- **Performance Measurement**:
  Measure the performance of the parallel solver compared to the sequential version.
  Identify bottlenecks and further optimise the parallel implementation.
  Test on puzzles of varying sizes and complexities.
- **Evaluation and Analysis**:
  Analyse the performance improvements and speedups achieved.
  Document the challenges and solutions during implementation.
  Document who did what in the code
  Suggest areas for future improvements.

Success Criteria:

Achieve a significant speedup (e.g., 5x or more) in solving Futoshiki puzzles using the parallel solver compared to the sequential version. Ensure the solver is correct, reliable, and efficiently handles synchronisation and load balancing.