FlowPools: Lock-Free Deterministic Concurrent Data-Flow Queues

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Abstract. Implementing correct and deterministic parallel programs is hard (additional motivation sentence after this). We present the design and implementation of a fundamental data structure for deterministic parallel data-flow computation. Aditionally, we provide a proof of correctness, showing that the implementation is linearizable, lock-free, and deterministic. Finally, we provide microbenchmarks which compare our *flow pools* against corresponding operations on other popular concurrent data structures, in addition to performance benchmarks on a real XYZ application using real data. (Keep abstract between 70 and 150 words).

Keywords: data-flow, concurrent data-structure, determinism

1 Introduction

Obligatory multicore motivation paragraph.

Lock-free is better, and why.

Introduction and motivation for data-flow programming model.

2 Model of Computation

Producer-consumer parallelism. Description and image of queue/stream of values, producer, and multiple consumers.

3 Programming Interface

`<<` (insert) and `seal`.

Examples.

4 Implementation

5 Proofs

5.1 Abstract Pool Semantics

5.2 Linearizability

5.3 Lock-Freedom

5.4 Determinism

6 Experimental Results

7 Related Work

Things to probably cite: Oz, gpars, Java CLQ.

Things we should probably have a look at: Microsoft TPL, Dataflow Java... Forcing a bib, [1], [2], [3], [4], [5], [6]

8 Conclusion

References

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