Challenge 1 Results

AlgoDEEP Meeting
Rome, July 14-15, 2011
Adaptivity: ability of reacting to changing conditions

Adaptivity is needed, for instance,

- to **ensure correctness**
  Example: resiliency to hardware faults
- to **attain efficiency**
  Example: heterogeneous platforms in grid/global/cloud computing
C1: Tasks

- **C1.1: Faulty Memories**
  - Design of adaptive algorithms and data structures that are resilient to memory faults
  - Is "fault-obliveness" (i.e., resiliency without knowing a statistics of faults) possible?

- **C1.2: Oblivious Multicore Computations**
  - How far optimal performance can be attained in an oblivious fashion w.r.t. parallelism, memory hierarchy, and communication?
  - Ultimate goal: a notion of "machine obliviousness"
C1: Expected Results

▪ C1.1: Faulty Memories
  ▪ M12: new computational models for faulty memories, including fault-obliviousness. New resilient (possibly fault-oblivious) algorithms and data structures
  ▪ M24: experimental validation of the resilient algorithms and data structures developed during the first year

▪ C1.2: Oblivious Multicore Computations
  ▪ M12: unified computational model that accounts for network locality, locality of reference, and parallelism, as shaped in multicores
  ▪ M24: framework for the specification of machine-oblivious algorithms. Machine-oblivious algorithms for basic primitives
## Units Involved

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- The symbol * denotes direct involvement
- The symbol + denotes a mere interest
Task C1.1: Contributions #1

- **RM1 Unit: contributions to M12 & M24**
  - Resilient framework for faulty memories that can be applied to all local dependency dynamic programming problems
  - Framework extension to non-local problems such as all-pairs shortest paths and matrix multiplication
  - Cache-oblivious implementation of resilient algorithms, that incur an (almost) optimal number of cache misses
Task C1.1: References #1

- **RM1 Unit: references for M12 & M24**
Task C1.1: Contributions #2

- RM2 Unit: contributions to M12 & M24
  - Design and theoretical analysis of resilient algorithms and data structures for fundamental algorithmic problems, such as dictionary problems
  - Implementation and experimental evaluation of the new resilient algorithm
  - Comparison of the new algorithms against other implementations available in the literature
Task C1.1: References #2

- RM2 Unit: references for M12 & M24

  
  
Task C1.2: Contributions

- PD Unit: contributions to M12 & M24s
  - New multicore model, named HM, consisting of a parallel shared-memory machine with hierarchical multi-level caching
  - Multicore-oblivious framework for designing efficient HM algorithms; multicore-oblivious algorithms for notable problems
  - Strong lower bounds on information exchange, which affects key measures of complexity in oblivious frameworks
Task C1.2: References

- **PD Unit: references for M12 & M24s**
Task C1.2: Extras

- PD Unit: further contributions
  - An algorithm, called Min-Tree, to compute the stack distance for a class of inclusion replacement policies for the memory hierarchy, which encompasses several of the policies considered in the literature

- PD Unit: further references
C1: Progress Report

- **C1.1: Faulty Memories**
  - M12: new computational models for faulty memories, including fault-obliviousness. New resilient (possibly fault-oblivious) algorithms and data structures
  - M24: experimental validation of the resilient algorithms and data structures developed during the first year

- **C1.2: Oblivious Multicore Computations**
  - M12: unified computational model that accounts for network locality, locality of reference, and parallelism, as shaped in multicores
Task C1.1: Contributions #3

- PI Unit
  - None (but the unit did not promise involvement: it expressed a mere interest)
Task C1.2: Contributions #2

- **RM1 Unit**
  - None (but the unit did not promise involvement: it expressed a mere interest)

- **RM2 Unit**
  - None (but the unit did not promise involvement: it expressed a mere interest)