SEPARATION AND EQUIVALENCE RESULTS FOR THE CRASH-STOP AND CRASH-RECOVERY SHARED MEMORY MODELS

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Non-Volatile RAM technology motivates the design of recoverable objects in the crash-recovery model.

What is a "correct" recoverable object?!

Strict-Linearizability

A crash of a process is a response, either successful or unsuccessful, to the interrupted operation

[Aguilera and Frøland. 2003]

Conjecture

Helping contradict strict-linearizability

What is Helping?!

Linearization-Helping

Considers a specific event e, in which it is decided that operation OP_1 is linearized before OP_2.
In an implementation that *does not* have linearization-helping, e is an event by the process whose operation is decided to be the one that comes first

[Censor-Hillel, Petrank and Timnat. 2015]

Universal-Helping

The progress of some process eventually ensures that all pending invocations are linearized

[Attiya, Castañeda and Hendler. 2018]

Our contribution

- Definition of the crash-recovery model and its characteristics
- Linearization-helping and universal-helping are incomparable

Strict-Linearizability vs Linearization-Helping

- Linearization-helping and strict-linearizability are incomparable
- Restricting the definition of linearization-helping to be prefix– respecting[1] , linearization-help free implies strict-linearizability

Strict-Linearizability vs Universal-Helping

- Universal-helping and strict-linearizability are incomparable
- Any non-blocking implementation of an order–dependent[2] type that is strict-linearizable has no universal-helping

[1] a linearization function is prefix-respecting if once OP1 is linearized before OP2 then OP1 is always linearized before OP2 in any extension of the execution

[2] an order-dependent object have two operations such that adding exactly one of them or both changes the response of some other operation. In addition, the order in which both operations are performed effects the response of some other operation.
The class includes: queue, stack, and more