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Propositions belonging to the Ph.D. dissertation

Software Development by Abstract Behavioural Specification

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1. The concurrency model of Java is an extension of the sequential model. The basic sequential model is that of synchronous calls, making it very difficult to express asynchronous calls as they are defined as a primitive concept in the actor-based model of concurrency. (Chapter 2)
2. Recent versions of Java include more functional features like lambda expressions which are a powerful means for emulating asynchronous calls. (Chapter 4)
3. There is a trade-off between using ABS directly by means Java library and through a compiler which translates ABS into Java. The first approach allows for integration with existing Java-based libraries and data structures, but requires reverse-engineering to extract the software model. Using ABS through a compiler allows for usage of formal analysis tools on the model directly.(Chapter 5)
4. The powerful abstraction of cooperative scheduling can be, in theory, modeled by a run to completion model of active objects, but it is difficult to put in practice due to the overhead added to maintain correct actor semantics. (Chapter 7)
5. An important challenge for formal models is to have an efficient code generation process from the modeling language to maximize the benefits of the model.
6. In a functional programming approach a process can be stored as data, and data can be executed like a process. This allows more efficient use of the stack and heap memory in multi-threaded models.
7. Coroutines are a very important programming concept in object-oriented programming for organizing control flow of a large number of small tasks. Support in JVM requires explicit resumption that can be prone to errors as a coroutine may be resumed more than once, in contrast to modeling where resumption can be made implicit and handled by an underlying scheduler to avoid these errors.
8. Reasoning about the full correctness of a compiler is a very difficult process and it is a step-by-step process that requires formal investigation into separate parts of the translation.
9. While software development is always striving to keep up with the rapidly evolving hardware, in the special current circumstances it is the hardware that requires the necessary infrastructure to support an online virtual world.
10. Although some of the aspects of human interaction can equally be covered by online meetings, research and development is highly dependent on physical interaction and expertise exchange.