

Can we Computerize an Elephant?

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Abstract

The talk shows how techniques from computer science and software engineering can be applied beneficially to research in the life sciences. We discuss the idea of comprehensive and realistic modeling of biological systems, where we try to understand and analyze an entire system in detail, utilizing in the modeling effort all that is known about it. I will address the motivation for such modeling and the philosophy underlying the techniques for carrying it out, as well as the crucial question of when such models are to be deemed valid, or complete. The examples will be from among the biological modeling efforts my group has been involved in: T cell development, lymph node behavior, organogenesis of the pancreas, and fate determination in the reproductive system of the *Caenorhabditis elegans* nematode worm. The ultimate long-term “grand challenge” is to produce an interactive, dynamic, computerized model of an entire multi-cellular organism, such as the *C. elegans*, which is complex, but well-defined in terms of anatomy and genetics.