bhi biomedical and health informatics

UNIVERSITY OF WASHINGTON

Biomedical and Health Informatics Lecture Series

Tuesday, January 5, 2010
12:00 - 12:50 p.m., Room T-663

Daniel L. Cook, MD, PhD

Research Professor, Departments of Physiology/Biophysics and
Biological Structure, School of Medicine, University of Washington

"Composite Annotations — Say what you mean with biomedical ontologies"

A growing collection standardized ontologies and terminologies provide detailed semantics for biomedical entities and have been designed to assure interoperability and communication across the semantic web. However the complexity of biological organisms and their processes far outstrip current resources and methods for uniquely encoding all entities of biomedical interest. Even the large and comprehensive Foundational Model of Anatomy does not encode even all acroscopic constituents of human bodies let alone its microscopic and molecular constituents. Furthermore, in our studies aimed at linking physics-based biosimulations to declarative knowledge resources, we must routinely annotate biological observables as specific as — *the concentration of Ca ions in the endoplasmic reticulum of a vascular smooth muscle cell in the wall of a systemic arteriole.* Although various "cross-product" schemes can post-coordinate some ontologies, such methods scale very poorly to our real-world tasks. Rather, we have introduced, and are developing, "composite annotations"—ordered lists of ontological entities and relations. We describe how composite annotations rigorously extend and integrate available declarative knowledge resources and how they flexibly encode biological entities at all biophysical and structural scales for sharing on the semantic web.

Dr. Cook has been developing tools for the representation and analysis of complex dynamic systems for 40 years. He earned a BSME in mechanical engineering from the University of Michigan and spent 4 years as a Boeing while earning his Masters degree in Mechanical Engineering from the UW. To follow-up his Master's thesis project on the simulation of glucose-induced insulin secretion, he entered the UW's Medical Scientist Training Program to earn his MD and a PhD in Physiology & Biophysics. After making seminal discoveries in the electrophysiology of insulin secretion, Dr. Cook returned to his interests in the computational representation and analysis of complex systems. He authored two graphics-based applications for diagramming and analyzing cell networks and based one program, Chalkboard, on a linguistic metaphor of entity interactions using noun/verb constructs. He then connected with Dr. Cornelius Rosse and the FMA project to learn state-of-the-art knowledge representation and query methods as part of the DARPA-sponsored Virtual Soldier Project. In subsequent collaborations with Drs. John Gennari, James Brinkley, and others, he is developing informatics methods for the declarative representation of physics-based biosimulation models as needed by, for example, the European Virtual Physiological Human and IUPS Physiome projects. The major contributions to this effort are an ontology of classical physics, the Ontology of Physics for Biology (OPB), and light-weight OWL representations (SemSim models) that map the biological and mathematical content of individual simulation models to the FMA and OPB.