



Jul 11th, 9:30 AM - 9:50 AM

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Byrd, Aaron R. and Tarboton, David G., "The Case for Standardizing Procedural Knowledge Models for Cross-Discipline Data and System Integration" (2016). *International Congress on Environmental Modelling and Software*. 20.

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# The Case for Standardizing Procedural Knowledge Models for Cross-Discipline Data and System Integration

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**Abstract:** Scientifically consistent and coherent systems for model and data discovery and integration rely on a shared body of concepts that describe the data and systems. The standardization of these bodies of concepts and their socialization and integration into an increasingly wider range of scientific disciplines is critical to the effectiveness of their ability to integrate data and systems across disciplines. There is, however, a significant shortcoming with most current approaches to creating these bodies of concepts. This is that they are designed to target only one type of knowledge – propositional knowledge – and neglect the other key type of knowledge – procedural knowledge.

Procedural knowledge is at the heart of the actual process of integrating data and systems across disciplines. Procedural knowledge, however, is dependent upon propositional knowledge. The bodies of concepts that are being created to facilitate data and system integration need to incorporate both propositional and procedural knowledge. The systems used to encode and operate on these bodies of knowledge, however, often choose to limit or eliminate the procedural knowledge capabilities because they create a situation where the language becomes non-decidable – there could be bugs or problems with the logic that don't make sense.

This talk will present work on an integrated propositional and procedural knowledge system that has been applied to integrate data and simulations across disciplines – climate, weather, hydrology, and agent-based ecological modelling – as an example of how the field of standardization of concepts for scientific interoperability needs to include integrated procedural and propositional knowledge. .

**Keywords:** Semantics, Ontologies, Procedural Knowledge, Cross-Discipline Integration