Modelling the Climate System: Is Model-Based Science Like Model-Based Engineering? (Keynote)

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I. ABSTRACT

Modern computational science is largely a model-building activity. At first sight, the models that scientists construct seem to differ radically from those used in model-based engineering. Scientists tend to build indicative ('how things are') models of the world using sets of continuous equations, while engineers tend to build optative ('how things should be') models of the world using structural and procedural abstractions. But a closer look reveals many fascinating similarities. In this talk, I will explore the relationship between the two types of modelling, drawing on my field studies of how climate modellers work. I'll begin with an overview of what a climate model is and how it is used. I'll then dive deeper into the engineering challenges of constructing a climate model, including the challenges of coupling disparate model components, dealing with model versioning and model management issues, and the role that climate models play in enabling collaborative work. In the process, I hope to inspire people to explore how ideas from model-based software engineering might contribute to scientific modelling in general, and, more specifically, to the societal grand challenge of climate change.

II. BIOGRAPHY

Steve Easterbrook is a professor of computer science at the University of Toronto. He received his Ph.D. (1991) in Computing from Imperial College in London (UK), and was a lecturer at the School of Cognitive and Computing Science, University of Sussex from 1990 to 1995. In 1995 he moved to the US to lead the research team at NASA's Independent Verification and Validation (IV&V) Facility in West Virginia, where he investigated software verification on the Space Shuttle Flight Software, the International Space Station, the Earth Observation System, and several planetary probes. He moved to the University of Toronto in 1999. His research interests range from modelling and analysis of complex adaptive systems to the socio-cognitive aspects of team interaction. His current research is in climate informatics, where he studies how climate scientists develop computational models to improve their understanding of earth systems and climate change, and the broader question of how that knowledge is shared with other communities.