University of Central Florida

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Accurate & Complete Computer Modeling with High-Quantity Parameter Synthesis

Demand for models that more accurately and completely represent real-life systems spans the fields of mechanics, aerospace, physics, economics, biotechnology, and medicine. Computer modeling offers a way to better predict the behavior of systems being studied and a way to gain confidence in newly developed systems. The knowledge gained from modeling can be used for applications from qualitative hedge funds to drug design.

To accurately reflect the observed or expected behavior of the system being modeled, complex computational model development often requires estimating a large number of parameters. While models mirror a given system more closely as the number of included parameters rises, the problem of parameter space explosion pushes the exponentially large space of parameter values past the limits of what can be modeled using conventional methods.

Advantages

Currently, the state-of-the-art approach in parameter synthesis for computational models is a search of the exponential parameter space using incomplete heuristics like sensitivity analysis. This new approach can automatically synthesize parameters of computational models from behavioral specifications about the system being modeled. The computational model parameter synthesis system generates approximately correct parameter values by exhaustively exploring only a polynomial number of parameter values, trading off an exponential number of computations in favor of guaranteed approximate optimal parameter values.

Technical Details

This stochastic computer model parameter synthesis system can form the basis of software, enabling processing and consideration of a high number of variable parameters, orders of magnitude greater than the current standard. To begin, parameter objectives are defined. Then, when known parameters and behaviors are input into the system, the system generates parameter values that allow the model to replicate the behavior of the system being modeled. It can also prove, with any given probability, when a parameter value does not exist, indicating that the model must be corrected before it can replicate the behavior of the system.

Benefits

- Generates parameters orders of magnitude greater than currently available methods

Applications

- Engineering
- Physics
- Finance
- Medicine
- Ecology

Tech Fields

Software

Keywords

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