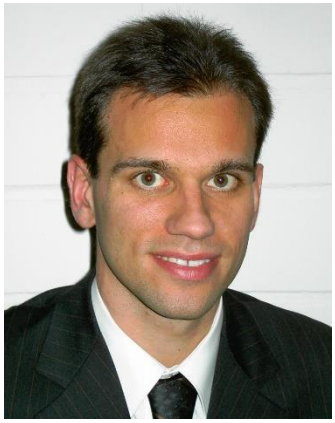
Visual Computing Forum

Visual Analysis of Ensemble Simulations



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Abstract

Mathematical models are used for the description and the understanding of phenomena in all sciences. Numerical simulations support the validation of the models and data assimilation purposes. Such simulations often depend on a number of simulation parameters and initial configurations. The selection of these parameters and configurations is often not exactly known or their impact is part of the underlying research tasks. Therefore, multiple simulation runs with varying parameter settings or ensembles of simulations with varying configurations are executed. The analysis of such simulation ensembles is complex, especially when each simulation run represents a four-dimensional spatio-temporal phenomenon. The amount of data of a simulation ensemble often adds up to hundreds of Gigabytes or even Terabytes. The analysis of such complex data is no longer possible without the use of computers. On the other hand, such an analysis typically requires the expertise of a human. As visual representations are intuitive and can be processed efficiently by humans, it is a suitable approach to combine visual representations and interaction mechanisms with automatic analysis steps. In this talk, I will present novel visualization methods that allow for an interactive comparative analysis of such large and complex data stemming from simulation ensembles. The methods are applied for the analysis of data stemming from biology, climate research, astrophysics, and medicine.