

Exploration of Ensemble Data Via Interactive User Inputs

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The FLAG hydrodynamics code simulates shock physics experiments that are used to understand the evolution of material properties in extreme conditions. One challenge for the hydrodynamics code modelers is identifying an ensemble of input parameters that produce a feature with similar characteristics in the simulation output data. For example, the position, width, height, and shape of a plateau in velocimetry data or a peak in x-ray diffraction data. We have developed a generalized visualization toolkit that modelers can use to visualize input parameters that generate output data with similar features, and to visualize output data generated from similar input parameters. We use principal component analysis to display simulations with similar input parameters or output data. The user can interactively select a subset of simulations in the input or output space from displays of the principal components, the output data, and a parallel-coordinates plot of the input parameters. Complex features in the output data can be drawn by the user and the k -nearest neighbors algorithm is used to find simulations with similar output data. Here, we present the application of this toolkit to data from the FLAG hydrodynamics code and x-ray diffraction data.