Expressive feature characterization for ultrascale data visualization

Wesley Kendall[1], Jian Huang[1], Tom Peterka[2], and Robert Ross[2] Department of Electrical Engineering and Computer Science, The University of Tennessee at Knoxville, Knoxville, TN 37996, USA 2 Mathematics and Computer Science Division, Argonne National Laboratory, Argonne, IL 60439, USA 1

The grand challenge for visualization is to cast information into insightful content so scientists can test hypotheses and find phenomena not possible otherwise. This challenge is faced with a critical gap in the scientists' abilities to succinctly characterize phenomena of interest in their datasets. Furthermore, as applications generate larger and more complex datasets, efficiently retrieving the features of interest becomes a significant problem. In this paper we discuss recent achievements and new capabilities in the characterization and extraction of qualitative features. We also outline the necessary components needed by a backend system to use this new capability and operate in the same environment as the scientific applications. Our methods have allowed us to scale to high process counts on leadership computing resources and have also allowed us to keep pace with the growing size of scientific datasets. We discuss our efforts of examining qualitative events in cutting-edge climate data.