The Video Inspector – A Graphical Representation of Temporal Data from Simulations

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Sapphire Project: http://www.llnl.gov/casc/sapphire

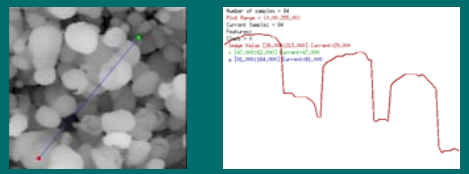
Motivation

We are analyzing 3-dimensional time varying data of the Rayleigh-Taylor instability in a fluid mix problem. When an initially perturbed interface between a heavier and lighter fluid is accelerated by gravity, it gives rise to bubbles and spikes. We are interested in understanding the bubble dynamics over time.

Since the data sets are very large (25 terabytes), it is extremely tedious to analyze manually. Our goal is to develop a tool to aid in the automated analysis of this data.

The Image Inspector

The image inspector is a tool to analyze single images. It gives the ability to examine the variation in intensity between two points in an arbitrary orientation (instead of only vertical or horizontal orientation). However, it is not possible to examine change in data over time.



Original Image Inspector

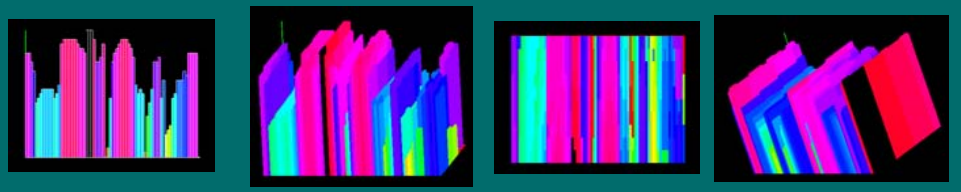
The Video Inspector

The video inspector extends the concept of the image inspector to include time varying data. In this project we are using OpenGL and C++ to analyze a series of images from simulation data, such as the fluid mix problem.

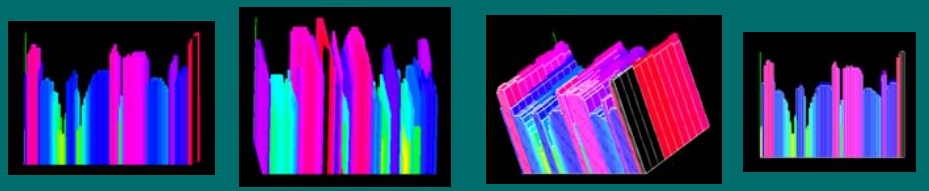
The video inspector creates a dynamic 3D plot of a series of samples in an arbitrary orientation over time. It includes the ability to rotate, zoom, and translate, as well as the ability to manipulate coloring options to aid in data analysis.

Video Inspector Results

Time progression reveals bubble movement



Optional line boundaries and color coding gives users the ability to examine data from multiple perspectives



Different viewing angles, using rotation and zoom features, help users in data analysis

Future Work

The next step in this project is to make further developments and improvements on the video inspector, as well as make enhancement on the original image inspector. Key ideas for video inspector development include usability, an improved interface, and consideration of density and velocity of the bubble movement. Image inspector improvements will include implementation of an individual pixel tracker, as well as interface and usability improvements.

This work was performed under the auspices of the U.S. Department of Energy by University of California Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.