

MERSIV – Monitor, Explore, Review Simulations with Immersive Visualization

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MERSIVE is a collection of commands/tools that allows a user within the ACMD High End Visualization (HEV) environment to Monitor, Explore, Review Simulations with Immersive Visualization.

The ACMD High Performance Computing and Visualization Group (HPCVG) collaborates with NIST EL to create computational models of various matter flows to simulate different rheology concepts. Some of these computations can take weeks, even months to complete. In the past, visualizations of these simulations were done at the end of computation. We are moving toward monitoring the simulation *in situ*, i.e. while it runs, which will enable deeper understanding of simulation parameters, and facilitate catching bugs and fixing them sooner. MERSIV is a toolkit that will allow scientists to run different visualizations on data that is periodically dumped from computations. This capability allows for a much more accessible way of monitoring the run.

Summer Project. MERSIV was started as a 2017 summer project with a team of SURF (Summer Undergraduate Research Fellowship), SHIP (Summer High School Intern Program) and volunteer students. The team built a prototype system and a skeleton set of commands sufficient for a proof-of-concept implementation. The prototype was successfully tested with a flow application. The team defined a software workflow for MERSIV; see Figure 57. Implementation Time is the work done by the visualization developer in to create the scripts/software necessary to visualize the data. Once the application specific software in place, each new data set must be transformed into displayable data structures (files). Depending on the size of the data, this step can be quick or lengthy. After the application scripts have been developed and tested, the Build Time is typically performed by the domain scientist. Run Time is the time spent by the domain scientist viewing and interacting with the data.

Future Work. Due to the limited time available during a typical summer session, MERSIVE was not developed beyond a prototype. However, the project was a successful experience for the students. The resulting SURF student presentation and SHIP student poster were very well received. The project provided an appropriate level of complexity and technical learning experience for the students.



Figure 55. The team views molecular data in the cave.

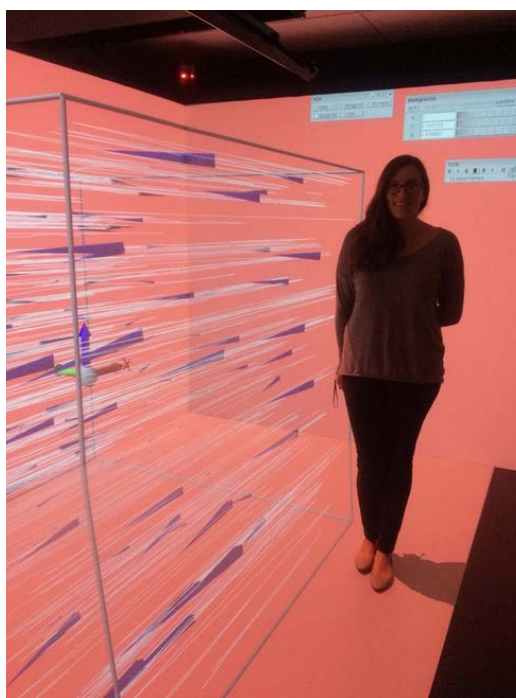


Figure 56. MERSIV used for directional flow field.

Software Workflow for MERSIV

Implementation Time (Developer)	Build Time (Scientist)	Run Time (Scientist)
➤ Create build scripts and programs	➤ Create testing environment	➤ Begin the the run executable
➤ Share data	➤ Run build script	➤ Initialize visualization
➤ Create manual pages	➤ Clean up directory	

Figure 57. Software workflow for MERSIV.

We are planning to continue the project with similar summer student teams. Each year will build upon the previous work and produce a usable and functional software toolkit.