Multiblock Data Structure Added to VTK-m

SAND2017-13355PE

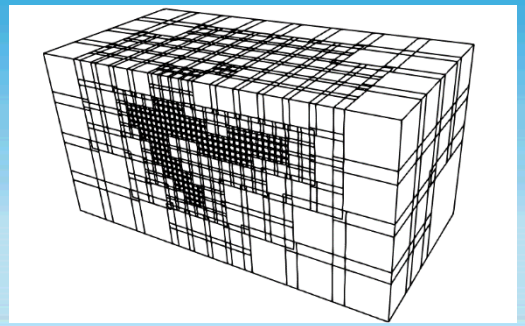
ECP WBS 2.3.4.13 ECP/VTK-m
PI Kenneth Moreland, SNL
Members ORNL, LANL, UO, Kitware

Scope and objectives

- ECP/VTK-m enables scientific visualization on the emerging processors required extreme scale computers
- Major focus on core functionality of HPC sci-vis software
- FY18 focus on field computation, computational geometry, and framework development/maintenance

Cool image

Multiblock data can represent hierarchical data like AMR (represented here), which is common in simulations using h-adaptive techniques.



Impact

- Multiblock allows VTK-m to better represent data from simulations (both within ECP and external)
- The multiblock structure will be integrated into future work (in conjunction with ALPINE) to support scheduling and management in MPI and AMT environments

Project accomplishment

- Multiblock structures common in modern simulations
- VTK-m can now hold multiblock structures efficiently
  - Filtering and other operations automatically iterate over blocks in data set.

Deliverables FY18Q1 [MS-18/01-03] Multiblock / Gradients / Release, WBS 2.3.4.13, Milestone STDA05-5
VTK-m source code repository available at: https://gitlab.kitware.com/vtk/vtk-m

Gradient Filtering in VTK-m

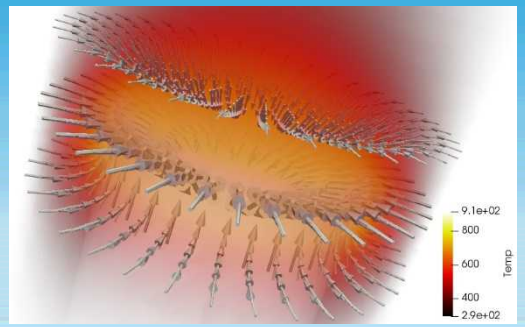
ECP WBS	2.3.4.13 ECP/VTK-m
PI	Kenneth Moreland, SNL
Members	ORNL, LANL, UO, Kitware

Scope and objectives

- ECP/VTK-m enables scientific visualization on the emerging processors required extreme scale computers
- Major focus on core functionality of HPC sci-vis software
- FY18 focus on field computation, computational geometry, and framework development/maintenance

Cool image

Gradients of a temperature field represented as arrows. The steepest decent of the gradient points toward the heat source.



Impact

- Gradients are an important way to characterize scalar and vector fields on 3D geometry using derivatives
- There are multiple valid mechanisms to estimate derivatives and related metrics
- VTK-m must support estimating gradients on all mesh types and all cell types.

Project accomplishment

- VTK-m gradient uses multiple implementations including finite differences of nearest neighbors and derivatives of first order interpolation equations
- Implementation added nearest neighbor topology search, which is also useful for many imaging algorithms

Deliverables FY18Q1 [MS-18/01-03] Multiblock / Gradients / Release, WBS 2.3.4.13, Milestone STDA05-5
VTK-m source code repository available at: https://gitlab.kitware.com/vtk/vtk-m

VTK-m Version 1.1 Released

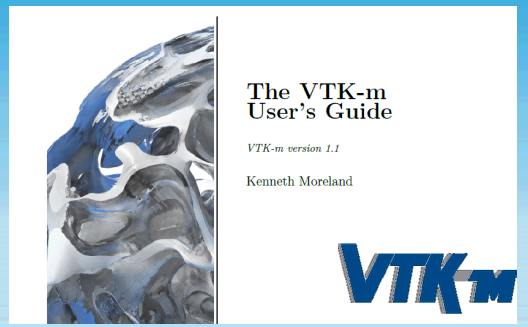
ECP WBS	2.3.4.13 ECP/VTK-m
PI	Kenneth Moreland, SNL
Members	ORNL, LANL, UO, Kitware

Scope and objectives

- ECP/VTK-m enables scientific visualization on the emerging processors required extreme scale computers
- Major focus on core functionality of HPC sci-vis software
- FY18 focus on field computation, computational geometry, and framework development/maintenance

Cool image

The release of VTK-m 1.1 includes a comprehensive user's guide made freely available to all users.



Impact

- VTK-m releases are critical for production software like ParaView, VisIt, and ASCENT

Project accomplishment

- The ECP/VTK-m is proud to announce the release of VTK-m version 1.1
- VTK-m 1.1 provides several new features to the core framework including key-based reduction and better filter interfaces
- VTK-m 1.1 also provides many new filter implementations

Deliverables FY18Q1 [MS-18/01-03] Multiblock / Gradients / Release, WBS 2.3.4.13, Milestone STDA05-5
Downloads of VTK-m 1.1 are available at: http://m.vtk.org/index.php/VTK-m_Releases
VTK-m source code repository available at: https://gitlab.kitware.com/vtk/vtk-m