VISUALIZATION OF VERY LARGE MULTIRESOLUTION TIME SERIES DATA

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I. Problem: Large Data Sets
Data Driven Research
• Raw data produced by numerical simulation
• Multi-GTAV
• Too large to visualize, store, access

Time Series Data
• Fluctuating, difficult for interactive visualization
• Naturally multiresolution and dynamic data

Interactive Data Visualization
• Cart exploration: understand the data
• Dynamic Context: Focus (Zoom)
• Each frame needs new time step

Multiresolution data
• Low spatial resolution for coarse view
• Higher spatial resolution for focus
• Helps keep memory usage constant

II. STAR Data Model
STAR Data Model
• Supports both spatial and temporal multiresolution data with error
• Supports adaptive resolution data

STAR Hierarchy
• Spatially structured hierarchy – easy to navigate
• Supports adaptive resolution hierarchy
• Monitoring: All directly requires precalculated algorithms
• All data may be enumerated to uniform resolution at run time
• Uniform resolution data compatible with existing rendering algorithms

STAR Hierarchy Generation
• Supports multiresolution hierarchy with error
• STAR data hierarchy + error

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III. Domain: Solar Wind / Magnetospheres Interaction
Solar Wind / Magnetospheres Interaction
• Models interaction between solar wind and Earth's magnetosphere
• Models of Magnetohydrodynamics (MHD) equations
• Radiation Belts
• Bulk plasma velocity
• Current density
• Pressure
• Density
• GGCM data sampled on non-linear grid
• GGCM data in 65 GB

Interactive Visualization Model
• Interactive visualization of dense views: easier to navigate and visualize low error data
• Interactive visualization of low error views: easier to navigate and visualize low error data

IV. STAR Visualization Framework
STAR Visualization Framework
• Provide navigation assistance to the user
• Focuses on spatial resolution of interest to the user
• Entire low resolution dataset to get an overview visualization
• Supports visualization of MR/AR-data in both spatial and temporal domains

Context and Focusing
• Use low resolution data to get an overview visualization
• Zoom into regions of interest with simultaneous spatial focusing
• Memory management: trading off view range against memory

Uncertainty Visualization
• Context: Black out low error datasets
• Error: Block out low error datasets
• Memory: Trade-off between view accuracy and memory

V. STAR Data Integration
STAR Data Integration
• VISIT Toolkit
• Reduce data footprint
• Generate STAR data model with current VISIT visualization libraries

VI. Iteration Aware Memory Management
Iteration Aware Memory Management
• STARview Goals
• Provide transparent uniform resolution interface to MRR data
• Support visualization of spatial and temporal data

Visionary Memory Management
• Monitor and control memory usage
• Allow scientist to explore interesting data
• Allow scientist to explore interesting data

VII. Conclusions And Future Work
Conclusions And Future Work
• Future Work
• Open source implementation of memory management algorithms that keep interactive data in memory
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VIII. Acknowledgements
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