

# Towards Provenance-Enabling ParaView

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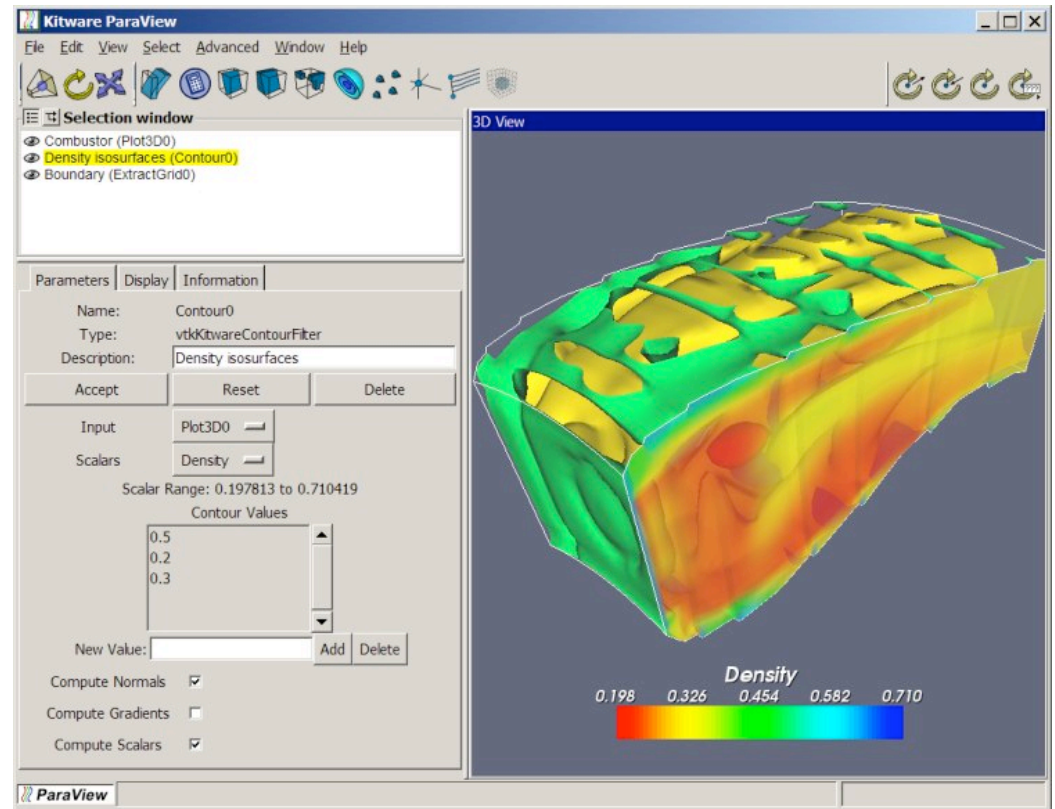
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# ParaView

- Open source tool for scientific visualization
- Event-driven with a graphical user interface
- Currently supports some history Undo/Redo as well as Lookmarks

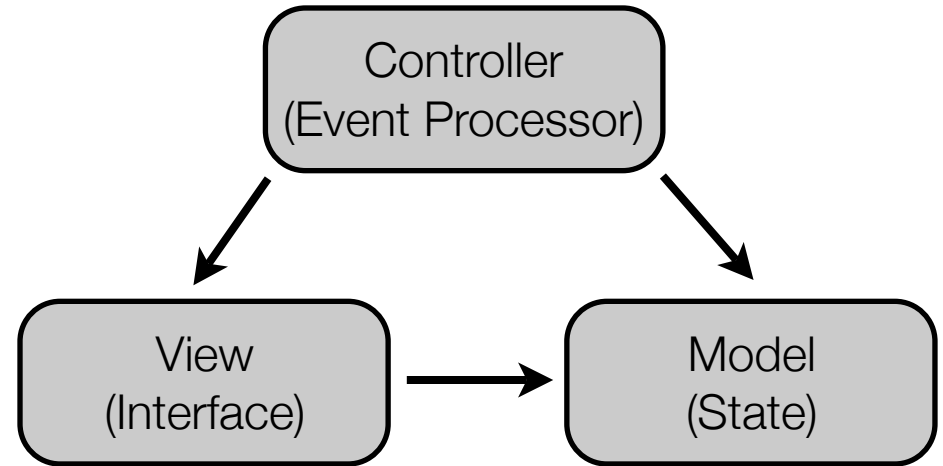


[www.paraview.org](http://www.paraview.org)

# Overview

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- Target applications
  - Event-driven (usually GUI-based)
  - Complex computational processes
  - Model-view-controller paradigm



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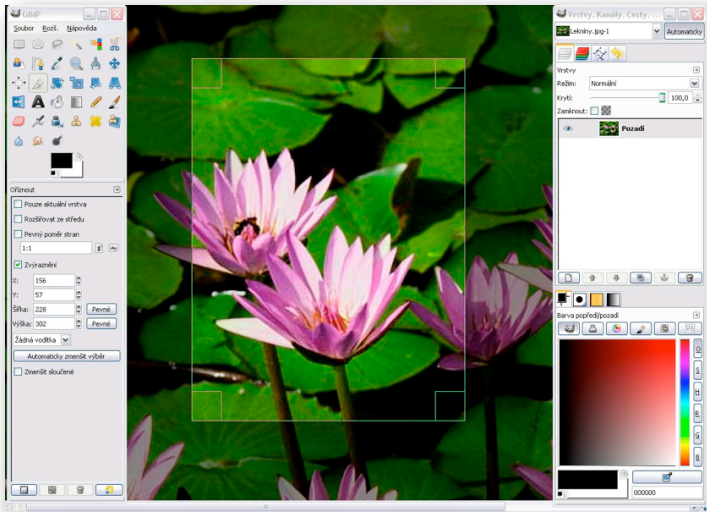
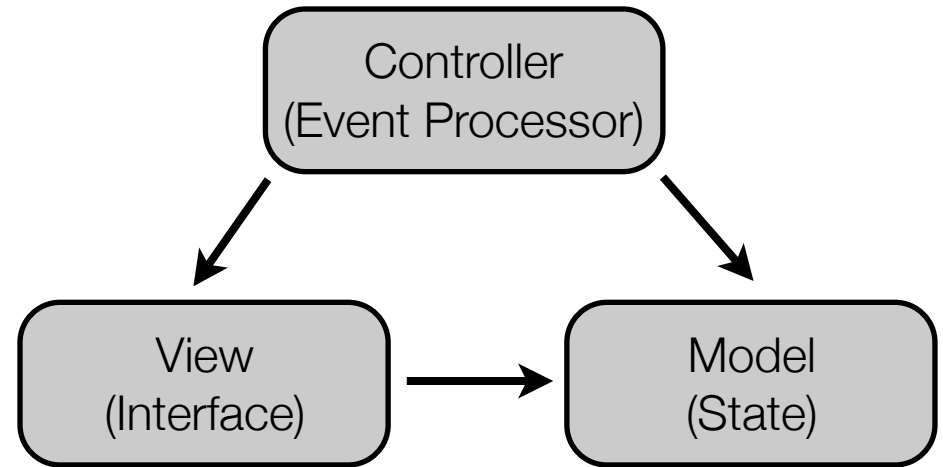


Image Manipulation

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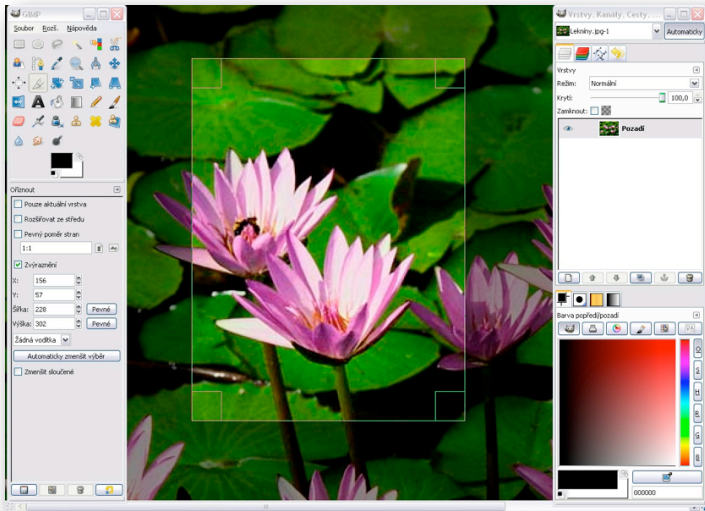
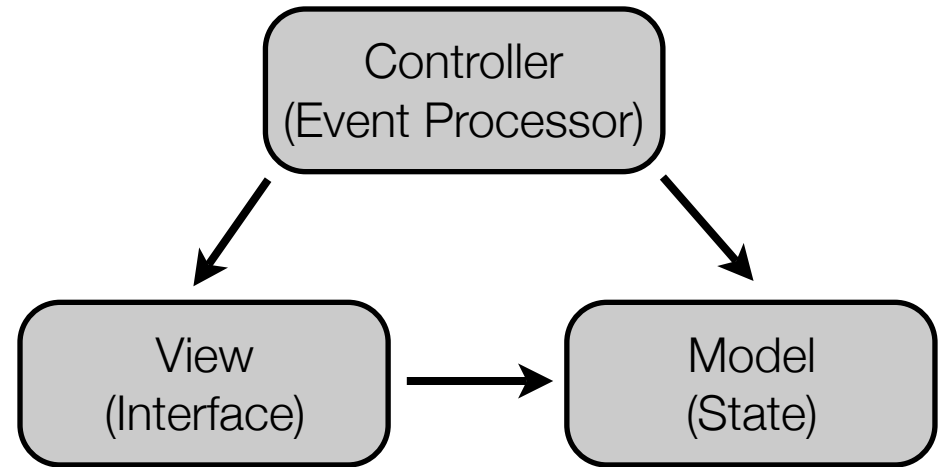
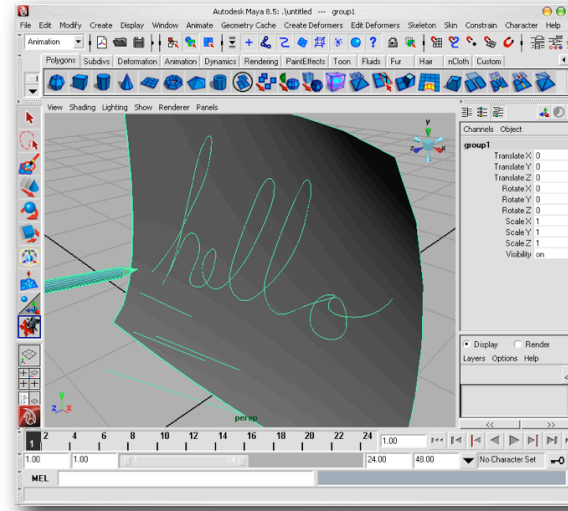


Image Manipulation



Modeling/Animation

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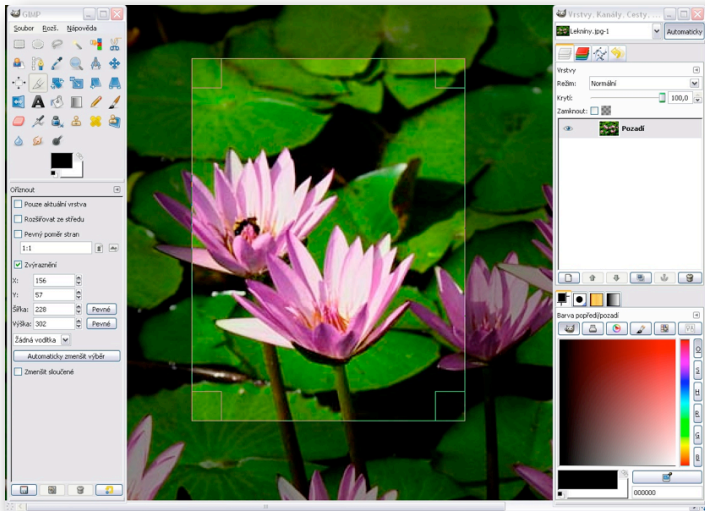
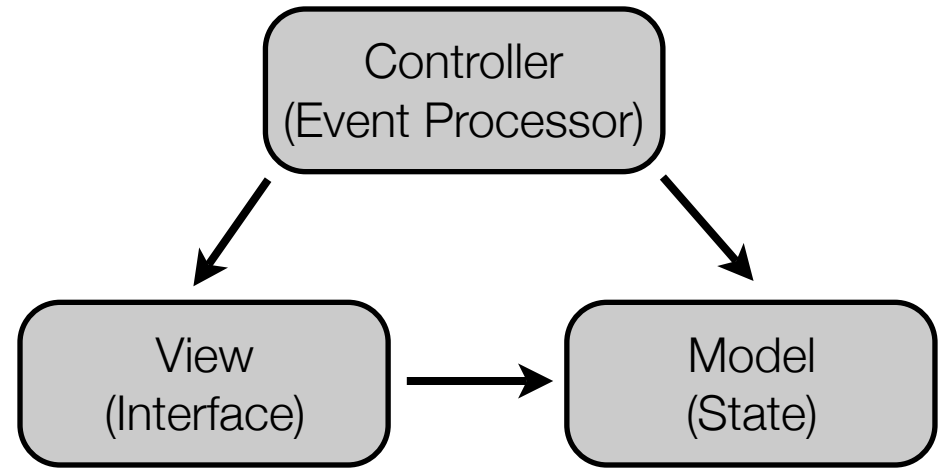
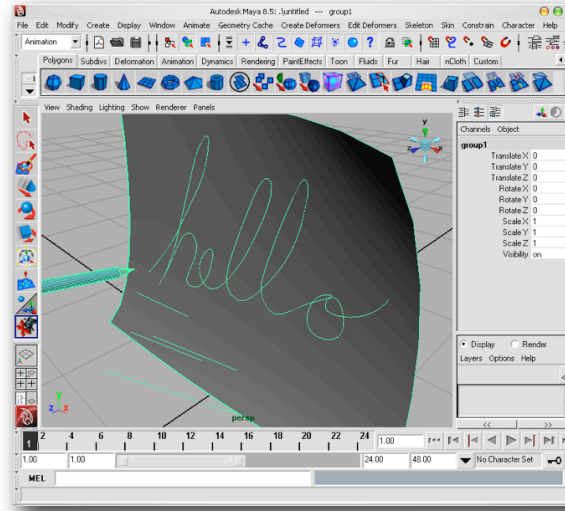
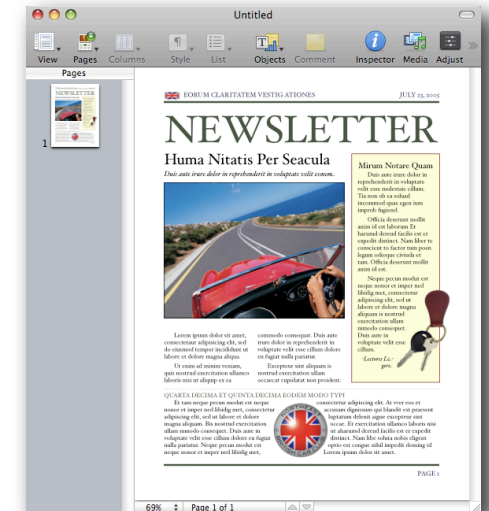


Image Manipulation



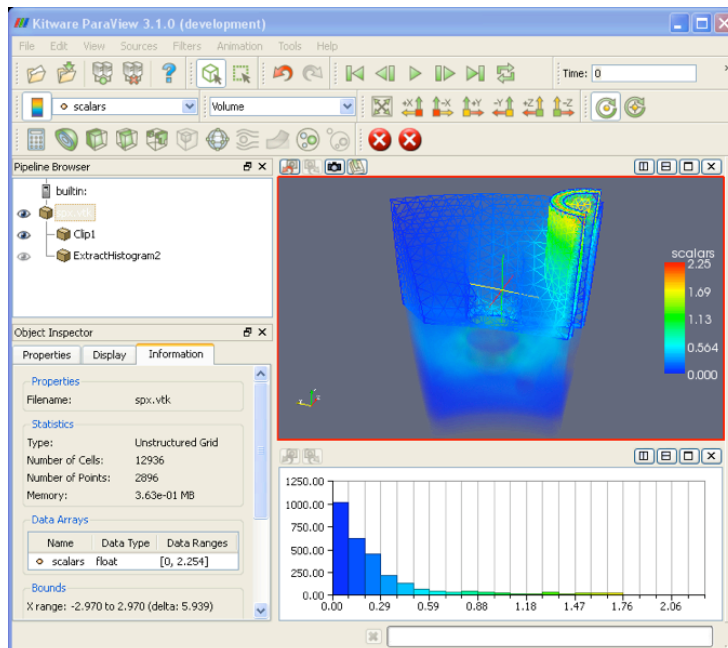
Modeling/Animation



Word Processing

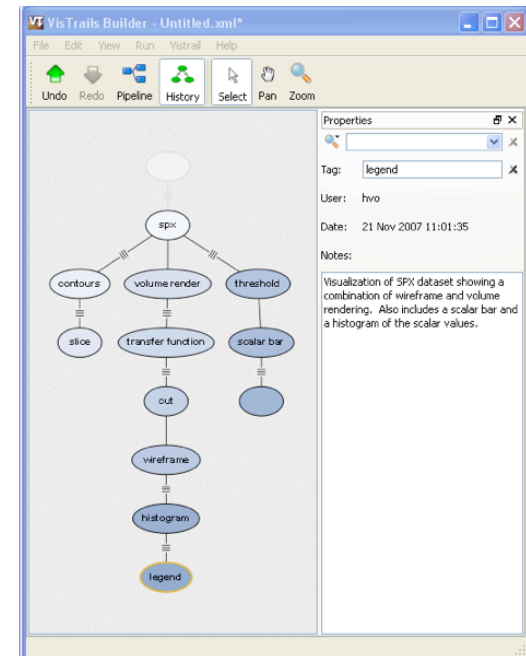
# Overview

- Plug-in or Add-on Strategy
  - Application (ParaView)
  - Provenance Explorer
  - Communication API



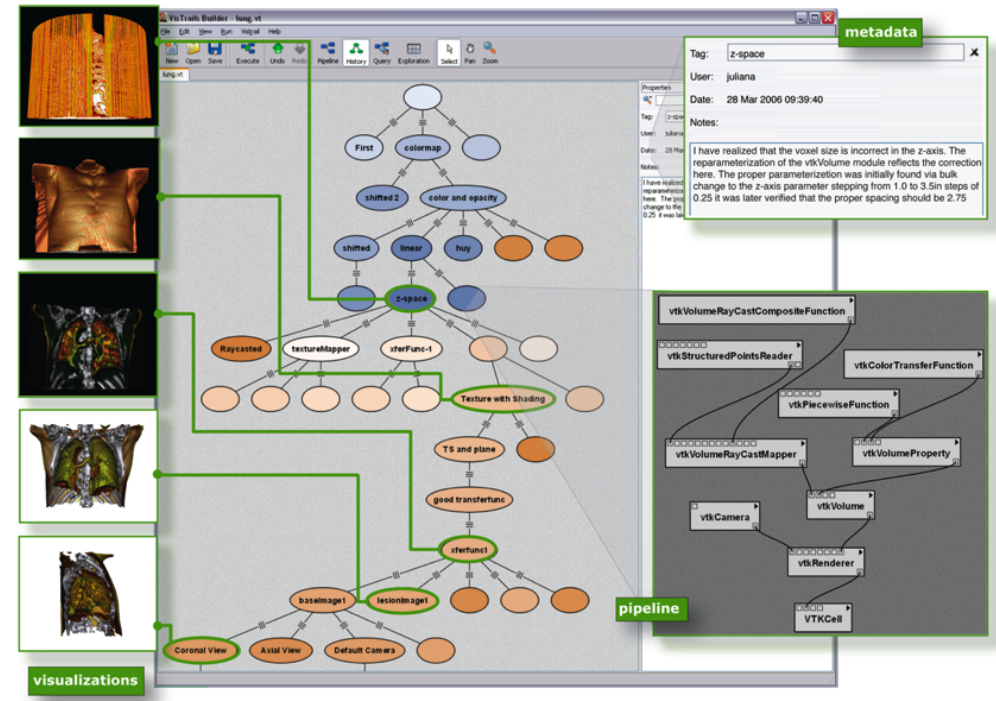
Capture

Replay



# Process Provenance

- An action  $a$  takes model state  $s_1$  to model state  $s_2$
- Traditional state-based mechanism:
  - Stores:  $s_1$  and  $s_2$
  - Replays:  $s_2$
- Our action-based mechanism:
  - Stores:  $a$
  - Replays:  $a$  is applied to  $s_1$



For more detail, see [Callahan et al., SciFlow 2006]



# Capturing Actions

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- Monitor through callbacks:
  - Undo/Redo mechanism
  - Event loop
  - Changes in state
- Granularity of actions is determined by the application
  - Undo/Redo mechanism

# Replaying Actions

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- Clear the state of application
- Compose a list of stored actions
- Send actions to the same routines where they were captured
  - Undo/Redo mechanism
  - Event loop
  - Changes in state

# Demonstration

The image displays two software windows side-by-side. The left window is ParaView 3.1.0 (development), showing a 3D visualization of a cup with a color map of scalar values. The right window is VisTrails Builder - Untitled.xml\*, showing a pipeline diagram for the visualization.

**ParaView 3.1.0 (development) Details:**

- Menu: File, Edit, View, Sources, Filters, Animation, Tools, Help
- Toolbar: Includes icons for file operations, navigation, and rendering.
- Pipeline Browser: Shows a pipeline with 'builtin', 'Clip1', and 'ExtractHistogram2'.
- Object Inspector: Shows properties for 'spx.vtk' (Unstructured Grid, 12936 cells, 2896 points, 3.63e-01 MB).
- Data Arrays: Shows 'scalars' as a float array with a range of [0, 2.254].
- Bounds: X range: -2.970 to 2.970 (delta: 5.939).
- 3D View: Shows a cup with a color map of scalar values ranging from 0.000 to 2.25.
- Histogram: Shows a histogram of scalar values with a peak around 0.000.

**VisTrails Builder - Untitled.xml\* Details:**

- Menu: File, Edit, View, Run, Vistrail, Help
- Toolbar: Includes icons for Undo, Redo, Pipeline, History, Select, Pan, Zoom.
- Pipeline Diagram: Shows a flow from 'spx' to 'contours', 'volume render', and 'threshold'. 'contours' leads to 'slice'. 'volume render' leads to 'transfer function' and 'out'. 'threshold' leads to 'scalar bar'. 'out' leads to 'vireframe', 'histogram', and 'legend'.
- Properties: Tag: legend, User: hwo, Date: 21 Nov 2007 11:01:35.
- Notes: Visualization of SPX dataset showing a combination of wireframe and volume rendering. Also includes a scalar bar and a histogram of the scalar values.

# Acknowledgments

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