The NA-MIC Kit

3D Slicer  VTK  ITK  Nrrd  KWidgets

CMake  CTest  Dart  Batch Make XNAT

Sonia Pujol, Ph.D.
National Alliance for Medical Image Computing – Neuroimage Analysis Center
3D Slicer

- Open-source application available for Windows, Linux and Mac
- More than 2.8 million lines of code
- Neuroscience and Image-Guided Therapy
3D Slicer History

- Started in 1997 between the Surgical Planning Lab (Harvard) and the CSAIL (MIT)

Image Courtesy of the CSAIL, MIT
3D Slicer History

- Started in 1997 between the Surgical Planning Lab (Harvard) and the (CSAIL) MIT
- 2009: Multi-institution effort to share the latest advances in image analysis with clinicians and scientists
3D Slicer Geography

- **Open-source** platform developed on a national scale
- Supported by the **National Institutes of Health** consortia which include
  - National Alliance for Medical Image Computing
  - Neuroimage Analysis Center

P.I. Prof. Ron Kikinis, MD, Director of the Surgical Planning Lab
Three ways to use Slicer and the NA-MIC kit
The NA-MIC kit from three user perspectives

- Clinical researchers
- Biomedical engineers
- Algorithm developers
Clinical researchers

Interact in 3D to enhance data interpretation
Visualize

• User-driven views of anatomical structures

• Overlay between 2D grey-levels images and 3D anatomical structures

• Intuitive interaction with the 3D models
Biomedical Engineers

Extract relevant information from complex data
Analyze

• Advanced analysis of complex data

• Multimodal data fusion

• Clinical parameters extraction
Statistical Analysis of Anatomy from Medical Images

Tissue Segmentation

Eddy Current + Head Motion Distortion Correction

EPI Distortion Correction

Seeds

Volumetric Pathways

Tensor Linear Estimation

Courtesy of Tom Fletcher, University of Utah.

Sonia Pujol, Ph.D.
National Alliance for Medical Image Computing – Neuroimage Analysis Center
\[ \ln p(X | \pi, \mu, \Sigma) = \sum_{n=1}^{N} \ln \left( \sum_{k=1}^{K} \pi_k N(x_n | \mu_k, \Sigma_k) \right) \]

Develop plug-ins to extend image analysis capabilities
Create

- Integrate external executables with the Slicer3 platform
- Develop plug-ins in C++, Tcl or Python
- Build upon the NA-MIC kit to meet your scientific goals
Clinical researchers
Biomedical engineers
Algorithm developers

Translate techniques into skills
Learn

Slicer 3.4 Tutorials
- The following table contains “How to” tutorials with matched sample data sets. They demonstrate how to use the 3D Slicer.

<table>
<thead>
<tr>
<th>Category</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NA-MIC Training Compendium & Workshops
- NA-MIC Training Compendium & Workshops
  - 3D Visualization
    - Deformable transform
    - EM Pipeline: Patient-Specific Atlas Generation
    - Segmentation Results

Slicer Tutorial Contest (Winter 2009):
- The following tutorials were part of the Winter 2009 Slicer tutorial contest:

<table>
<thead>
<tr>
<th>Content</th>
<th>Tutorial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer 2009</td>
<td>Confocal Microscopy B (First Prize)</td>
</tr>
<tr>
<td>Summer 2009</td>
<td>ARCTIC: Automatic Regional Cortical Thickness V2.1B</td>
</tr>
<tr>
<td>Summer 2009</td>
<td>Trans-rectal MR guided prostate biopsy</td>
</tr>
<tr>
<td>Summer 2009</td>
<td>Python Stochastic Tractography Module</td>
</tr>
<tr>
<td>Summer 2009</td>
<td>White Matter Lesions Segmentation V2.2B</td>
</tr>
</tbody>
</table>

National Alliance for Medical Image Computing – Neuroimage Analysis Center
Conclusion

- An end-user application for image analysis
- An open-source environment for software development
- A technology delivery platform for community breakthroughs