The 3DSlicer open-source platform for segmentation, registration, quantitative imaging and 3D visualization of biomedical image data

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The community of Slicer developers is proud to announce the release of Slicer 4.1. Find out more...
3DSlicer

- Slicer is a *freely available open-source* application for viewing, analyzing and interacting with biomedical imaging data.
3DSlicer

- **Slicer** is a freely available open-source application for viewing, analyzing and interacting with biomedical imaging data.

- **Slicer** is a multi-platform software on Windows, Linux, and Mac.

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**Get Slicer 4.**

Slicer 4 is the latest stable version of 3D Slicer, a free, comprehensive software platform for medical image analysis and visualization developed with NIH support. 3D Slicer is distributed under a permissive BSD-style open source license. It has a thriving user and developer community.

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**Pre-compiled binaries**

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**System requirements**

Slicer requires 1GB of RAM absolute minimum, with more highly recommended. Common data sets may require 4GB or more RAM for processing. A fast graphics card or GPU that supports OpenGL is also recommended.

Slicer is built and tested on many hardware and software platforms. 3D Slicer runs on Microsoft Windows XP, Vista, and Windows 7; Mac OS X versions 10.5 Leopard, 10.6 Snow Leopard, and 10.7 Lion; and a variety of Linux distributions.
3DSlicer

- Slicer is a freely available open-source application for viewing, analyzing and interacting with biomedical imaging data.

- Slicer is a multi-platform software on Windows, Linux, and Mac.

- Slicer is a multi-institutional effort mainly supported by the National Institute of Health.
Slicer 16th year Anniversary

• 1997: Slicer started as a Master’s thesis between the Surgical Planning Lab (Harvard) and the Computer Science and Artificial Intelligence Laboratory (CSAIL) at MIT

• 2013: International open-source platform developed through a multi-institution effort

P.I. Prof. Ron Kikinis, BWH, Harvard
Slicer License

- Slicer is distributed under a BSD-style license agreement with no restriction on use
- Slicer is not FDA-approved nor CE-marked
- 3D Slicer bridges the “valley of death” for subject specific analysis
An interdisciplinary platform

An open-source environment for software developers

An end-user application for clinical investigators and scientists

A software platform that is both easy to use for clinical researchers and easy to extend for programmers
Slicer Is Open

- Open Science = Open Source + Open Data + Open Community
Slicer Open Community

- 80 authorized developers contributing to the source code
- >700 subscribers on user and developer mailing list
- > 55,000 downloads of Slicer4 since November 2011
Slicer 4 download statistics

- Total matching downloads: 55302
- Date range: forever
- Release type: any
- Browser type: desktop

Map view of download statistics by country, filename, and month.
Slicer4 downloads in Europe

Map data ©2012 Basarsoft, Google, ORION-ME, Tele Atlas - Terms of Use

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Bridging the gap to accelerate translational research

Bridging the communication gap requires a collaborative environment that fosters exchange of specialized knowledge and expertise between clinical researchers and scientists.
Slicer is 16 year old

- Every 4-5 year: Slicer versions: Major architectural, functional and GUI redesign
- Every 6 month: Within each version, updated release
- Every day!: Binary installation packages to access bleeding-edge functionality
Slicer is built every night

Slicer is under active development: built every night on every platform
### Slicer Bug Tracker

**Unassigned**

- **300195** Resample Scalar/Vector/DWI module does not accept DWI input
  - Command Line Modules (Moduler/CLI) - 2012-04-26 15:00
- **300190** Volume rendering volume received from OpenGTLink Base Code - 2012-04-24 16:53
- **300130** Scrolling volume slices past the last slice
  - Baseline Code - 2012-04-23 19:23
- **300120** Texts in 3D are hard to see
  - Baseline Code - 2012-04-23 15:36
- **300110** Color scale
  - Baseline Code - 2012-04-18 11:58
- **300100** Effect of matrix bottom view in Transforms module
  - Baseline Code - 2012-04-18 10:12
- **300105** Problem with fiducial registration
  - Command Line Modules (Moduler/CLI) - 2012-04-17 03:11
- **300100** Saving and reopening mrml problem
  - Baseline Code - 2012-04-12 12:43
- **300107** sceneview rounds up problem with LUT and with VR MRML - 2012-04-11 22:25
- **300188** Ensure Capitalization rule is respected all over Slicer GUI - 2012-04-10 10:55

**Resolved**

- **300104** Centralize revision/versi0nname in Slicer Packaging - 2012-04-26 18:03
- **300107** Fix warning related to SliceFunctionGenerator/ExtensionDescription Building (CMake, Superbuild) - 2012-04-16 17:04
- **300127** SVN download of loadable extensions modules does not work
  - Baseline Code - 2012-04-26 10:51
- **300127** window build run issues as of sun 19363
  - Building (CMake, Superbuild) - 2012-04-26 16:06
- **300136** To avoid RegisterApplication / _CGDefaultConnection error, create a template of launch file for dashboard Building (CMake, Superbuild) - 2012-04-26 12:38
- **300140** No version in mac bundle Packaging - 2012-04-26 10:31
- **300145** Update of the mouse mode toolbar GUI - 2012-04-25 16:00
- **300153** Untoggle "Play a fiducial" on click Annotations - 2012-04-25 16:22
- **300193** make RAS box axis labels visibility camera dependent
  - Baseline Code - 2012-04-26 11:35
- **300193** (documentation/(documentation/version)/module-category)) doesn't support extra newline spacing in XML Documentation - 2012-04-23 13:47

**Recently Modified**

- **300155** Link errors during CTK build Building (CMake, Superbuild) - 2012-04-27 17:03
- **300140** Crash on exit and other issues Scripting (Wingdings, Python) - 2012-04-27 17:04
- **300152** Found PythonLibs: ... get_filenames component unknown component optimized Building (CMake, Superbuild) - 2012-04-27 16:09
- **300153** Export module and show up on the Modules Setting but works fine
  - Baseline Code - 2012-04-27 16:44
- **300156** drag & drop: option to keep look settings GUI - 2012-04-27 16:54
- **300152** Model to Label Map not working
  - Diffusion - 2012-04-27 07:41
- **300152** Extensions download from SVN repository fails
  - Extensions - 2012-04-26 21:22
- **300152** Camera position after loading scene GUI - 2012-04-26 20:13
- **300152** VTK QD designer plugins are missing
  - Packaging - 2012-04-26 19:26
- **300152** Add Test to make slicer starts
  - Baseline Code - 2012-04-26 19:04
Interoperability with software package and libraries

- Open-science and open-community philosophy
- File Format compatibility
- Complementary aspects of different open-source software on specialized functionalities
Slicer Extension Manager

Slicer is Extensible through plugins

Slicer Extension Catalog offers the possibility to the user to download additional Slicer modules
Slicer4 core functionalities include 108 modules, and represent 700,000 lines of code
Core Functionalities

- Visualization
- Segmentation
- Registration
- Reconstruction
- Diffusion
- Image Guided Therapy
- Quantification
- Reporting
DICOM module

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DICOM module

- Interface Between DICOM and Slicer
  - Core DICOM Parsing in DCMTK/CTK
  - Data Pre-Cached in Database
  - MRML Manipulation in Slicer Module Logic

- Patient/Study/Series Browser
  - Offers Slicer Interpretation of Selected Data
  - Multiple Interpretations where DICOM Data is Ambiguous
Slicer applications

- Driving Biological Projects leading to the development of new tools
- Applied science oriented toward subject specific analysis in the presence of pathology
- Example: Image-guided therapy
Slicer use in clinical research environment

• AMIGO, BWH, Boston, USA (DTI)
• Slicer RT – Canada (ECR 2013 IMAGINE Session, ‘SlicerRT – 3D Slicer based open-source toolkit for radiation therapy research’. Pinter et al)
• Quantitative Image Network collaboration with German Cancer Research Institute (PET/CT)
Improving Patient Care with AMIGO
Advanced Multimodality Image Guided Operating Suite
Image-guided therapy for prostate interventions:

- Brachytherapy Planning
- Navigation for Biopsy


Image Courtesy of Steven Haker, PhD and Clare Tempany, MD
Neurosurgical planning

Slicer modules used for
- DWI denoising
- T1/T2/DTI Registration
- Tumor Segmentation
- Tractography with Labelmap Seeding
- Tractography with Fiducial Seeding

Image courtesy R.Kikinis
Fiducial Seeding

Example of on-the-fly exploration of white matter structures in the contralateral side of the tumor.
Bridging the gap to accelerate translational research

Algorithm Development

GAP

Problem solving

Image courtesy of Arya Nabavi, MD
Slicer Training History: 2005-2013

- Training Core Component of two major NIH-funded consortia: the National Alliance for Medical Image Computing (NA-MIC) and the Neuroimage Analysis Center (NAC) (P.I. Ron Kikinis)

- Accelerating the translation of new technology into new skills of scientists and clinical investigators
Slicer Training Workshops

- 1-2 day hands-on events
- Thematic
  - DTI
  - Image-guided therapy
  - 3D Visualization for radiological applications
  - PETCT SUV Computation
- 15-25 all-level participants
Slicer Training Events

Hands-on courses at major international conferences

- **SfN** 2009, 2011
- **SPIE** 2012, 2013
- **CAOS** 2010
- **CARS** 2010, 2012, 2013
- etc…
Invited workshops at international venues:

- PLA General Hospital, Beijing, China,
- Tokyo Women’s Medical University, Japan
- IHK Akademie Westerham, Munich, Germany
- Rey Juan Carlos Universidad, Spain
Project Weeks

- Bi-annual week of hands-on programming
- Practical exchange of idea and experience
- 2010: 126 international attendees, 71 projects, 8 countries (Austria, England, France, Germany, Italy, Japan)
- 17 project weeks in the US since 2005
Conclusion

• Slicer is an open-source research platform for the rapid development of biomedical image analysis tools.
• Slicer community is open community with contributors from all over the world
• Slicer is a versatile platform for translational research and subject specific analysis of biomedical image data
Acknowledgments

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Neuroimage Analysis Center
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