

ITK and VTK- The Standard Libraries

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Who Should Use ITK ?



- Best suited for :
 - Larger research projects
 - Need customization/changes over time
 - Likely to implement new algorithm or approaches
- Not suited for:
 - Projects where compiled software exists already.



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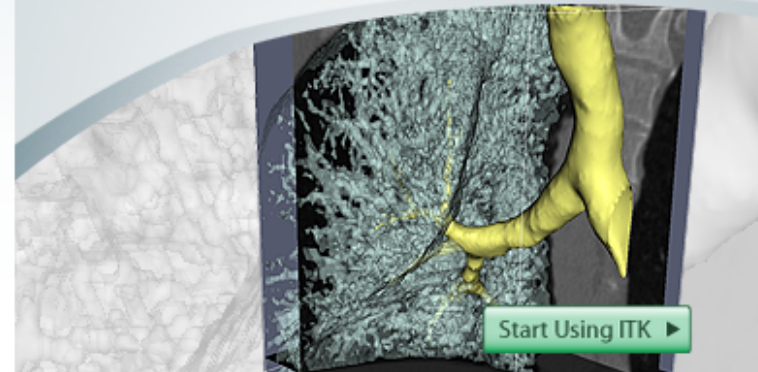
OPEN SOURCE

Welcome to the National Library of Medicine **Insight Segmentation and Registration Toolkit (ITK)**. ITK is an open-source, cross-platform system that provides developers with an extensive suite of software tools for image analysis. Developed through extreme programming methodologies, ITK employs leading-edge algorithms for registering and segmenting multidimensional data. The goals for ITK include:

- Supporting the Visible Human Project.
- Establishing a foundation for future research.
- **Creating a repository of fundamental algorithms.**
- Developing a platform for advanced product development.
- Support commercial application of the technology.
- Create conventions for future work.
- Grow a self-sustaining community of software users and developers.

ITK

ITK provides leading-edge segmentation and registration algorithms in two, three, and more dimensions; it is distributed as an open-source software package.



My Toolbox

The logo for MeVisLab, featuring the text "MeVisLab" in white on a black rectangular background.

MeVisLab

Rapid prototyping



Repository of image processing algorithms



Visualize images



Repository of visualization algorithms



Visualize meshes



Multi-platform build system



EMORY

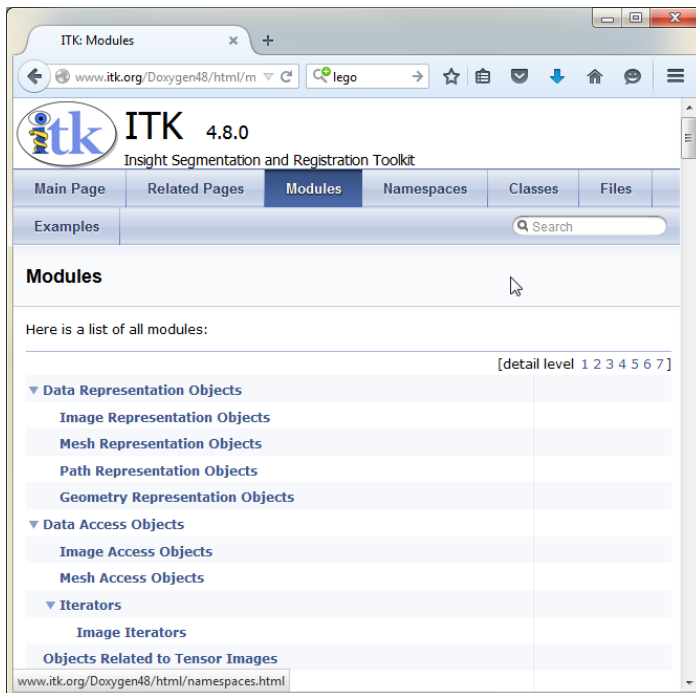
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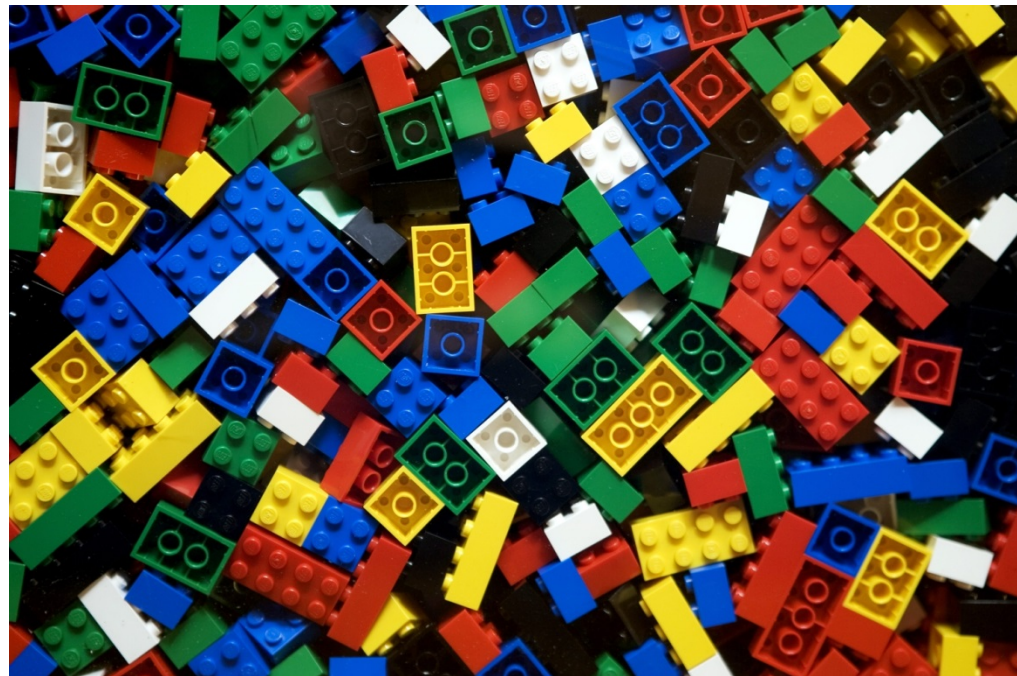
Why I Like It ?

- ITK and VTK are like Legos
 - ITK designed as building blocks from which customized applications are created.

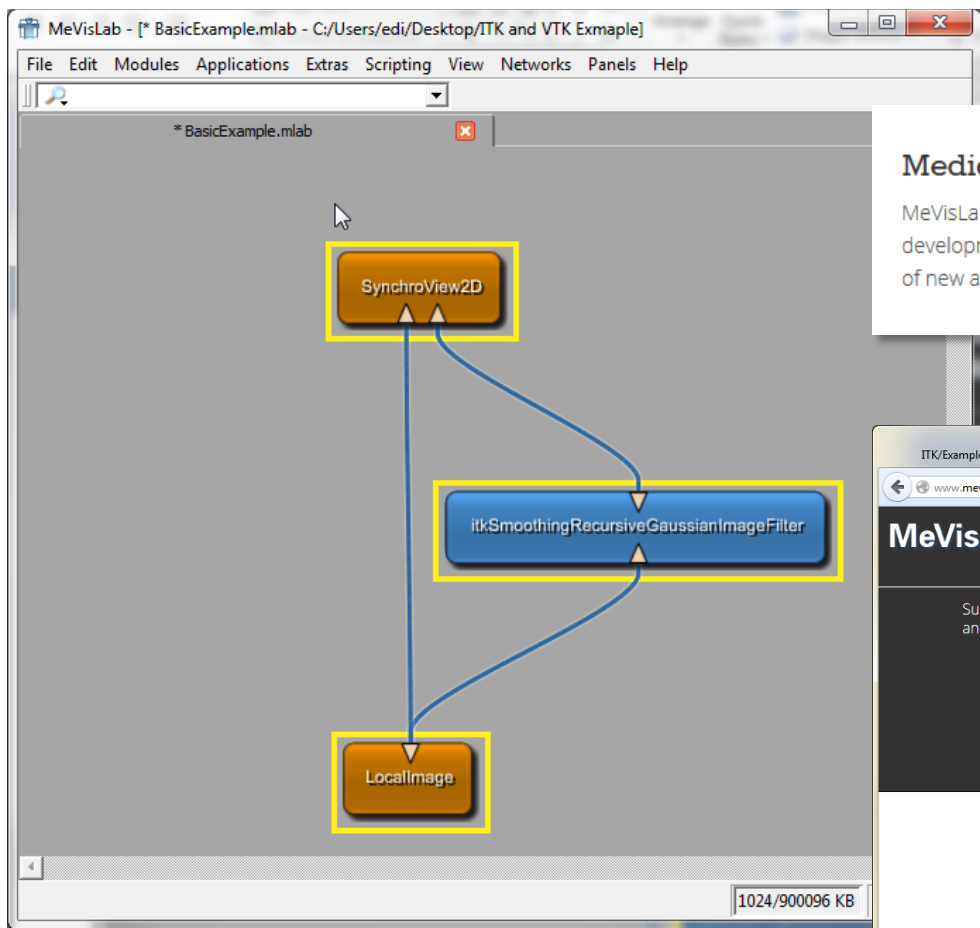
My Playground



Son's Playground

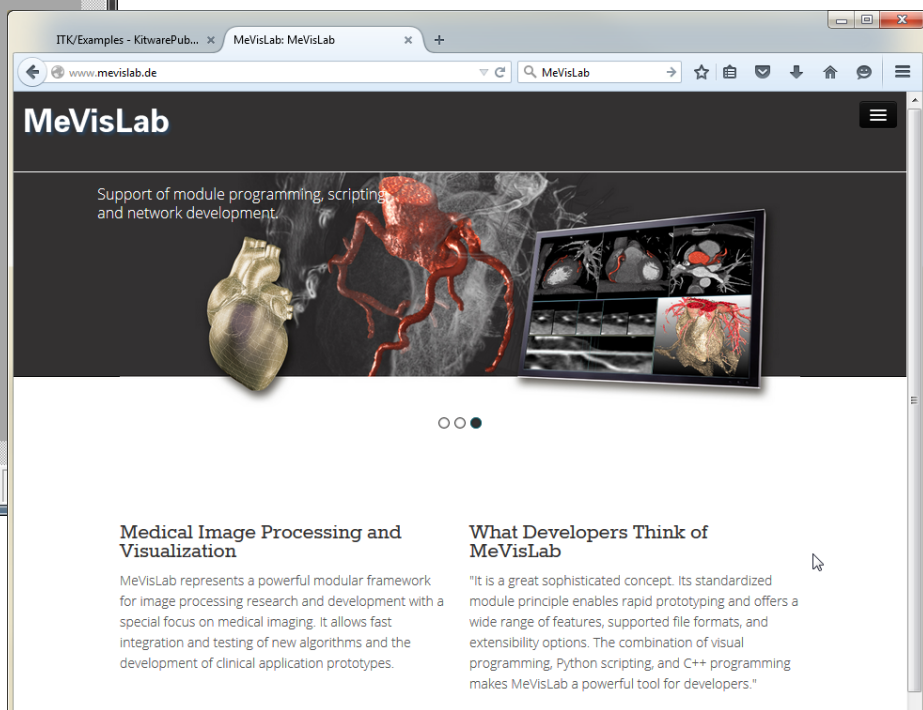


Prototyping



Medical Image Processing and Visualization

MeVisLab represents a powerful modular framework for image processing research and development with a special focus on medical imaging. It allows fast integration and testing of new algorithms and the development of clinical application prototypes.



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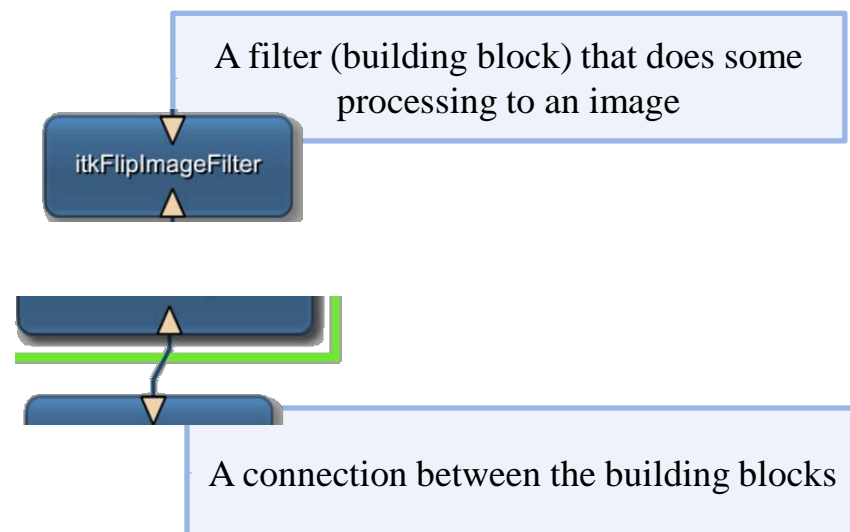
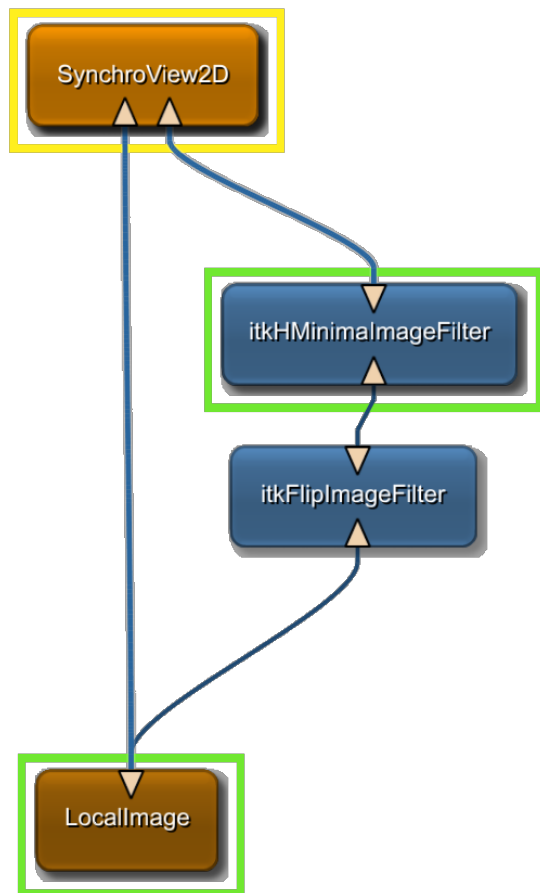
What Developers Think of MeVisLab

"It is a great sophisticated concept. Its standardized module principle enables rapid prototyping and offers a wide range of features, supported file formats, and extensibility options. The combination of visual programming, Python scripting, and C++ programming makes MeVisLab a powerful tool for developers."

Drag-drop interface to create customized algorithms from building blocks

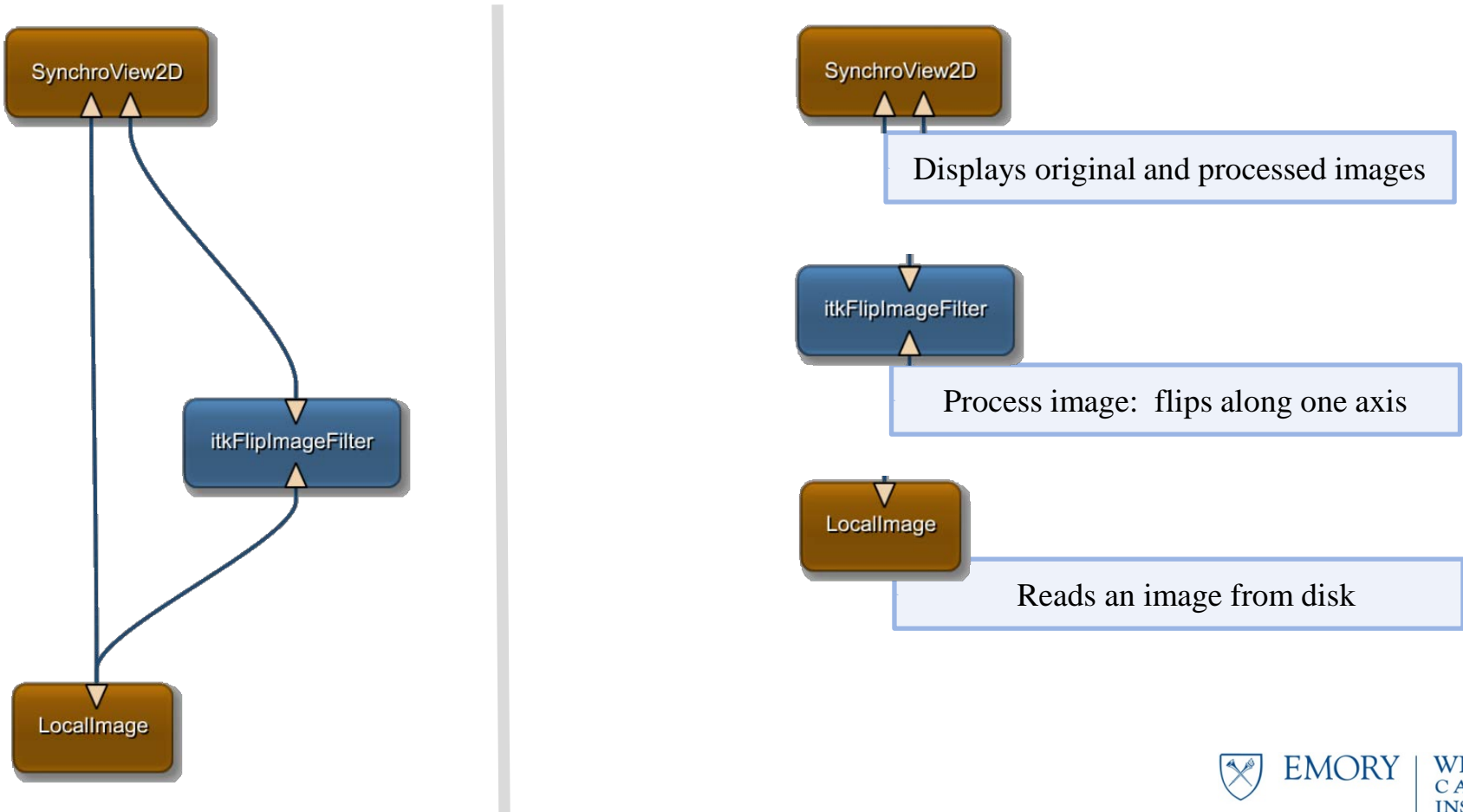
Why Lego Analogy ?

Libraries are a collection of “building blocks” that can be connected to **your** needs.



Example

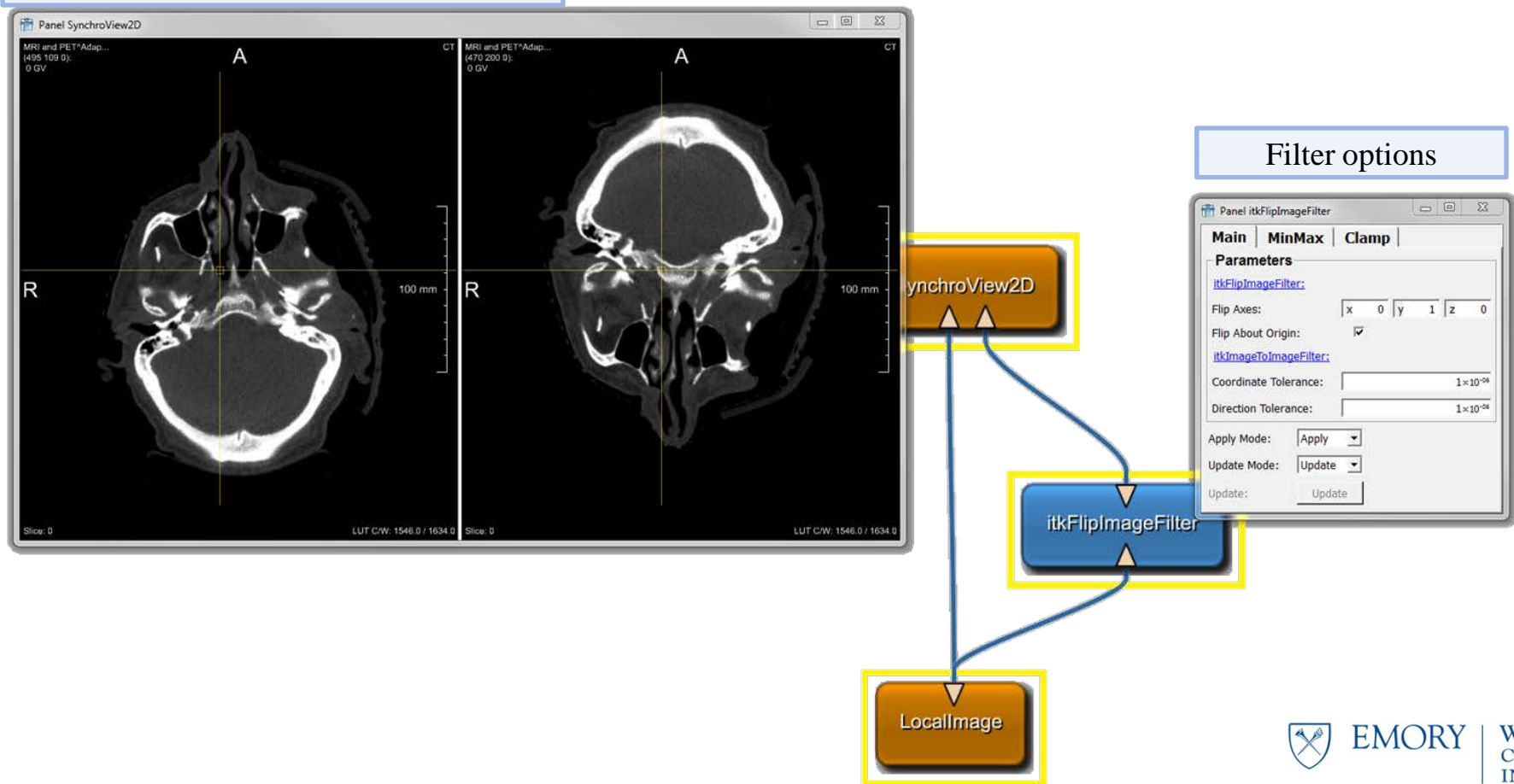
The itkFlipImageFilter will flip an image along a user specified axis.



Example

Easy to change setting to experiment on your images

Displays original and processed images



Example

Parameters

[itkFlipImageFilter:](#)

Flip Axes:

x 1 y 0 z

Flip About Origin: ☒

Filter options

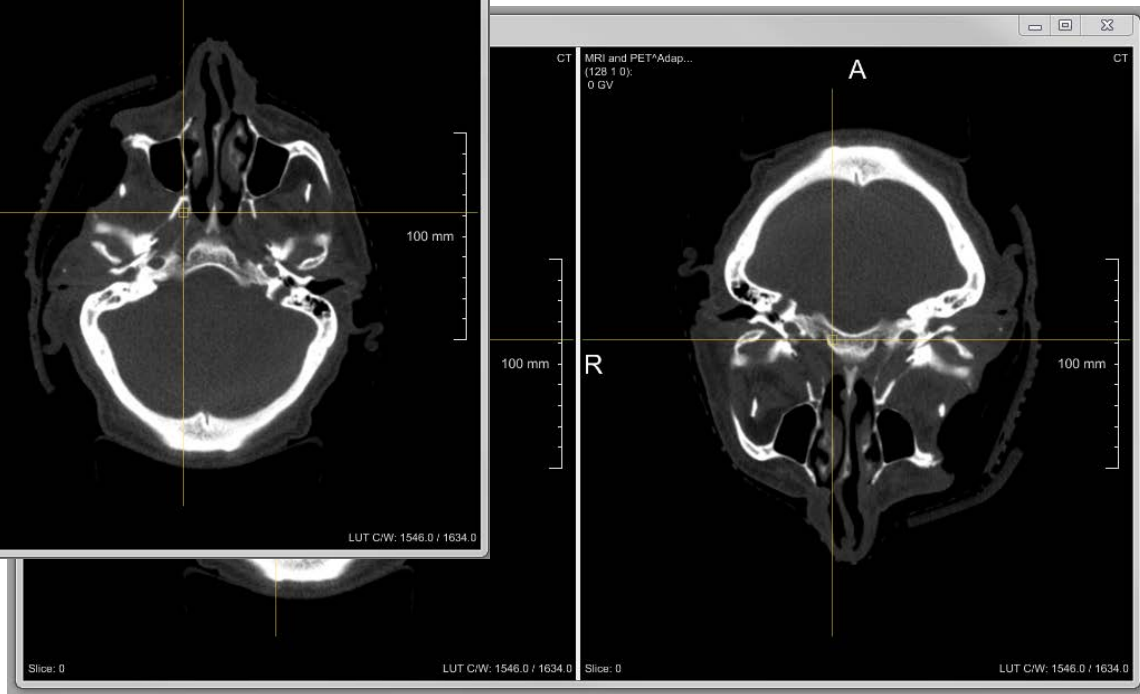
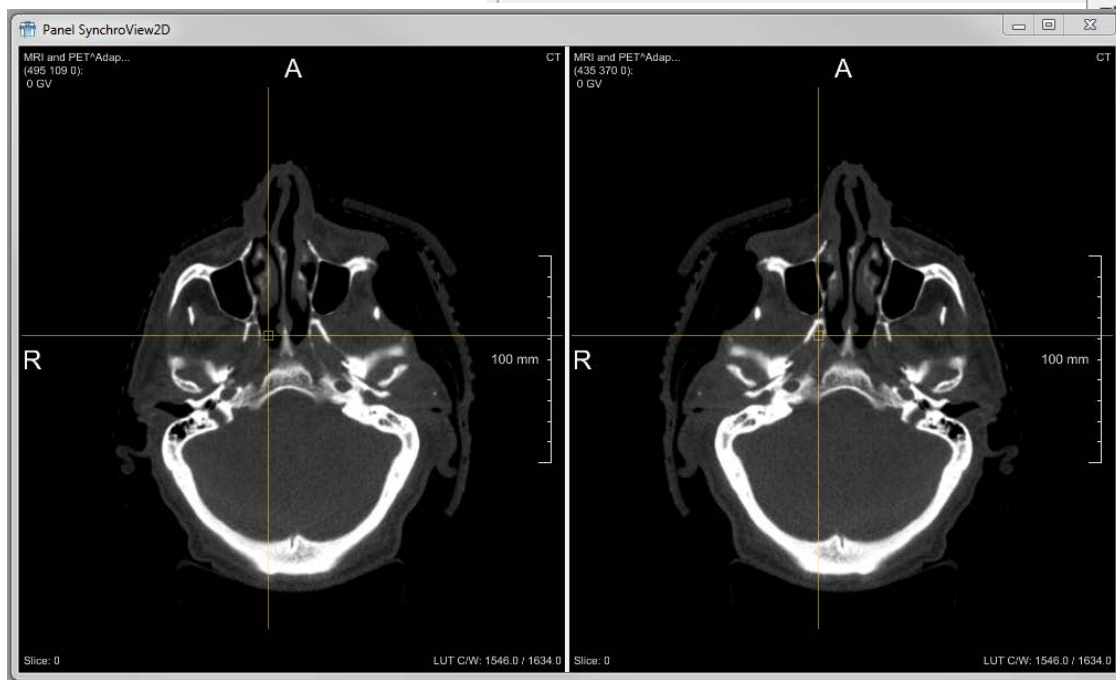
Parameters

[itkFlipImageFilter:](#)

Flip Axes:

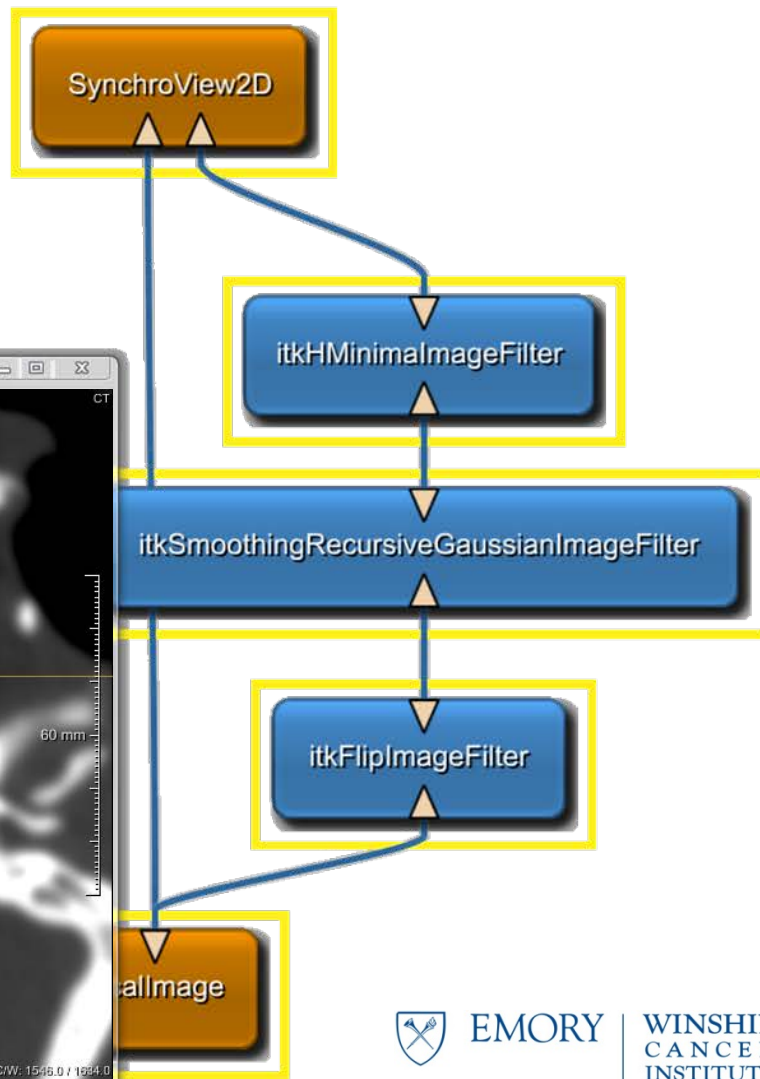
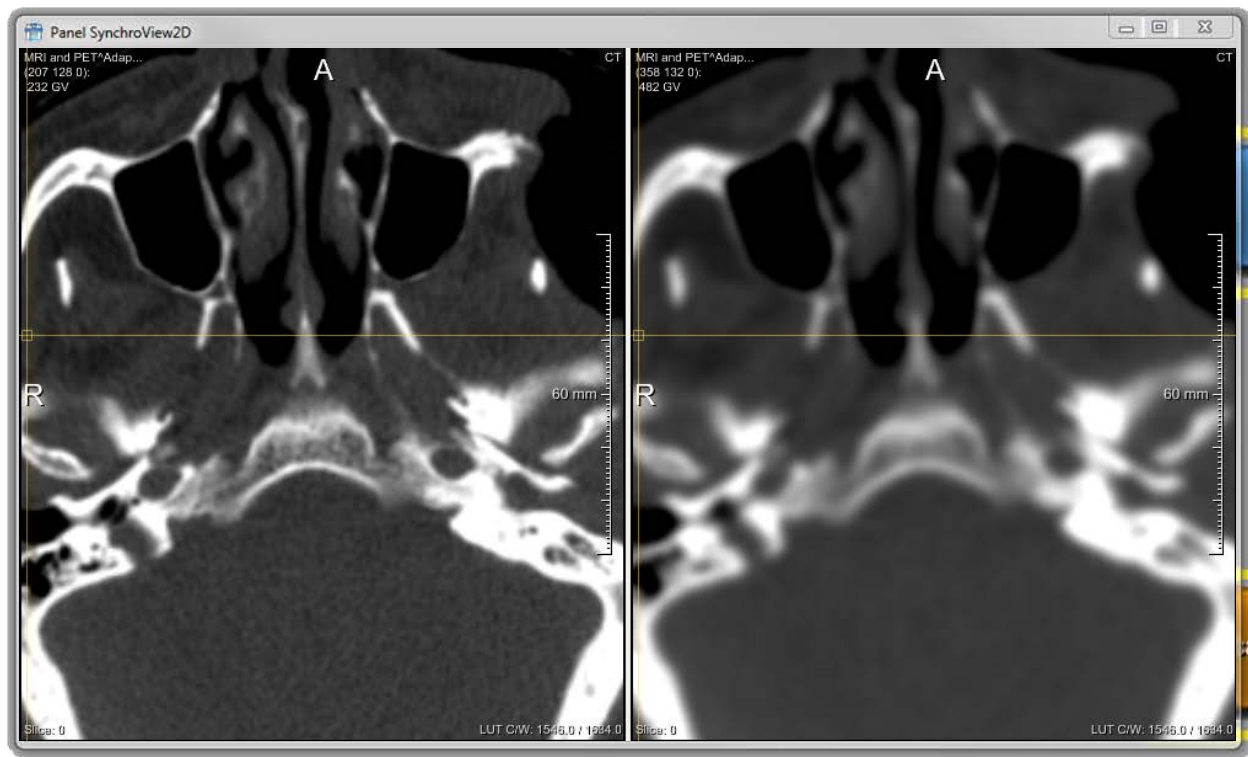
x 0 y 1 z 0

Flip About Origin: ☒



Example

Example of simple pipeline to smooth a CBCT dataset



Example Coding

From prototype to coding

```
int main (int argc, char *argv[])
{
    //define the image type
    typedef itk::Image< long, 3 >      ImageType;

    //read an image
    typedef itk::ImageFileReader< ImageType > ReaderType;
    ReaderType::Pointer imageReader=  ReaderType::New();
    imageReader->SetFileNames ("c:\\myFile.dcm");

    //smoothing filter
    typedef itk::SmoothRecursiveGaussianFilter< ImageType, ImageType > SmoothFilter;
    SmoothFilter::Pointer smoothFilter = SmoothFilter::New();
    smoothFilter->SetInput( imageReader->GetOutput() );
    smoothFilter->Update();
}
```



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Template Code

It's easy to readapt to code to new situations

ITK Definition:

```
template< class TPixel, unsigned int VImageDimension >
Image< TPixel, VImageDimension >
::Image()|
{
    m_Buffer = PixelContainer::New();
}
...
```

Your Code:

```
int main (int argc, char *argv[])
{
    typedef itk::Image< long, 2 >      SliceType;           // a CT slice
    typedef itk::Image< long, 3 >      VolumeType;          // a CT volume
    typedef itk::Image< long, 4 >      Scan4DType;          // a 4D CT scan
    typedef itk::Image< float, 3 >     DoseType;             // a dose volume
}
```



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Your Own Filter

Deriving a filter from the ITK objects makes my life easier.

Deriving a new inherited filter

```
template< class TImage>
class MyOwnImageFilter:public ImageToImageFilter< TImage, TImage >
{
    public:
```

Implementing your own equation, $f(x) = x^{1.23456}$

```
inline TOutput operator() (const TInput & A) const
{
    const double input = ( static_cast< double >( A )) ;
    const double output = pow(input,1.23546);

    return static_cast< TOutput >( output );
}
```



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Catalog of ITK Features



- Image IO
- Image processing
 - Canny Edge
 - Hough Transform (lines/ellipsoids)
 - Variable Conductance Diffusion
- Geometry IO/representation/processing (Spatial Objects)
- Statistics
- Registration/Segmentation
- Numerics (VXL)
- Optimizers
- Finite Element Simulation

A Big Library



- Mostly written in C++
- Mature, well-established codebase
- Very large, active development team
- Well-commented source code
- Stable Y-O-Y development activity

[Insight Toolkit, updated Jul 05, 2015](#)

more at [Open HUB](#)

itk ITK - Segmentation & Regi... x +

www.itk.org Search

Kitware Search

PROJECT RESOURCES HELP OPEN SOURCE

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News [More News >](#)

12.16.2014 Kitware Announces a Virtual Surgery System to Help Surgeons Treat...

10.09.2014 Kitware Receives Award to Develop Retinal Image Management System...

ITK
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Insight Toolkit - Project Cost

Include	Avg. Salary
Markup And Code ▾	\$ 55000 /year
Codebase	Effort (est.)
1,702,264 Lines	487 Person Years
Estimated Cost	\$26,785,280

[Updated Jul 05, 2015](#)

more at [Open HUB](#)

Where To Find Help



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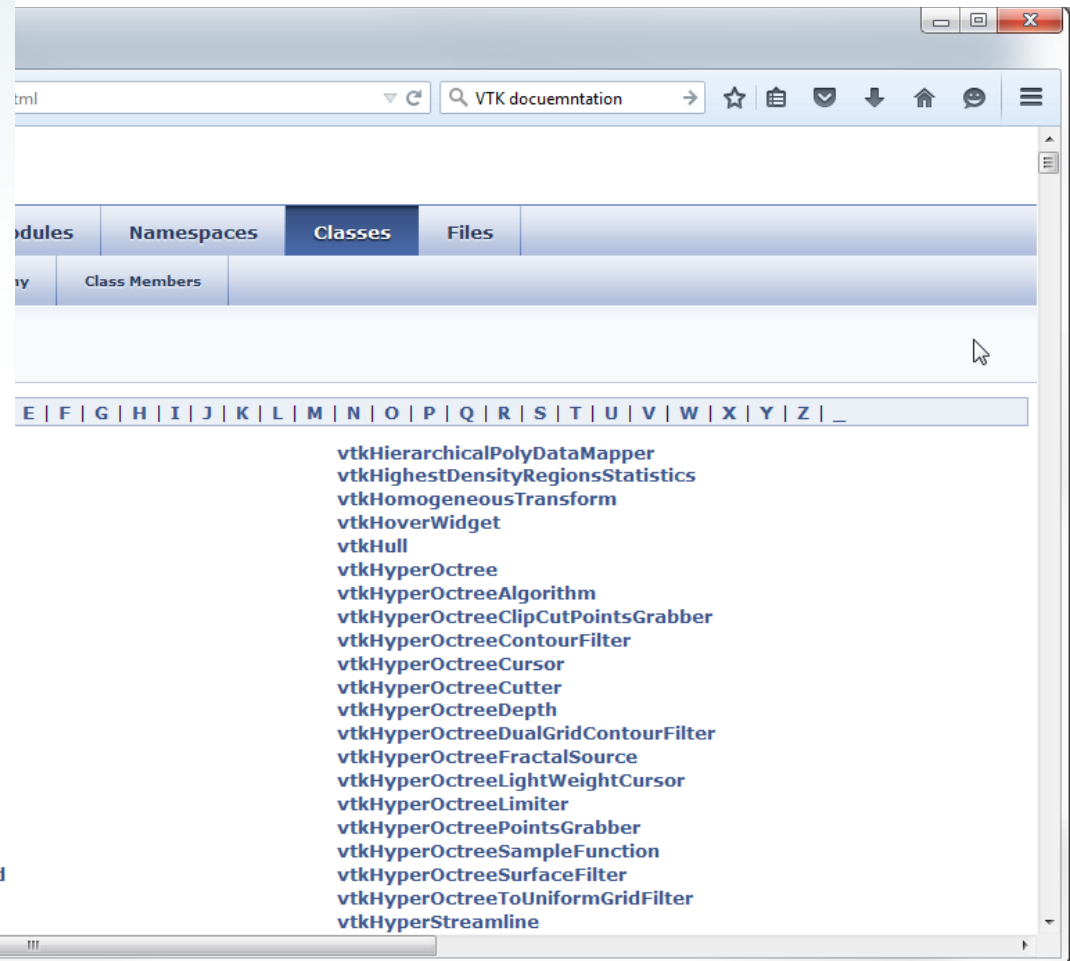


Buy the [ITK Software Guide](#)

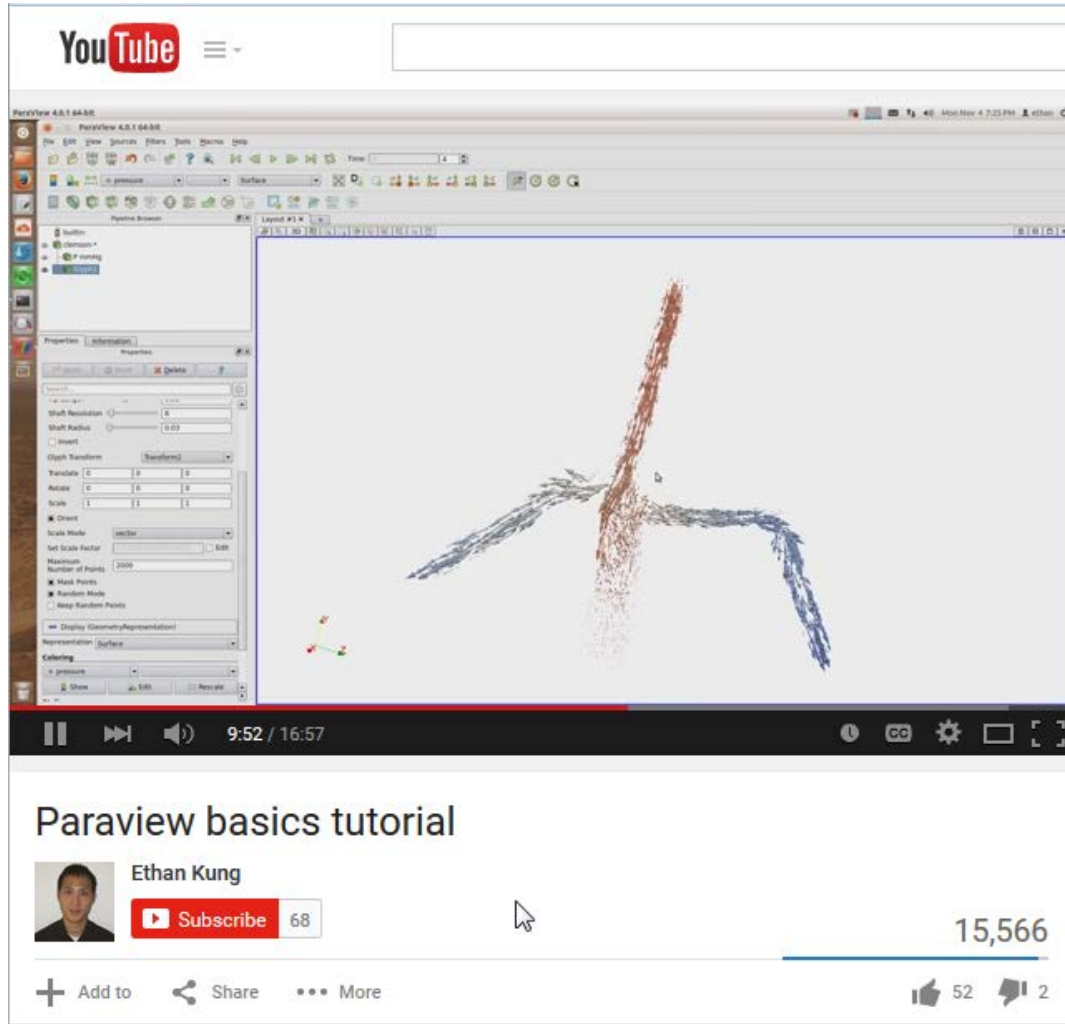
vtk3DImporter
vtk3DWidget



vtkABI
vtkAbstractArray
vtkAbstractCellLocator
vtkAbstractContextBufferId
vtkAbstractContextItem
vtkAbstractElectronicData
vtkAbstractGridConnectivity
vtkAbstractImageInterpolator
vtkAbstractInteractionDevice
vtkAbstractInterpolatedVelocityField
vtkAbstractMapper
vtkAbstractMapper3D



Lots of Documentation



YouTube

Paraview 4.3.1 64-bit

Paraview 4.3.1 64-bit

9:52 / 16:57

Paraview basics tutorial

Ethan Kung

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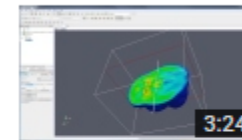
15,566

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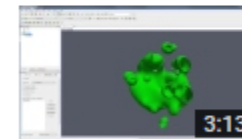
52 2



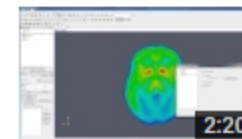
[ParaView] Basics of Keyframe Animation
by UM3DLab
6,277 views



[ParaView] Basics of Clipping
by UM3DLab
4,098 views



[ParaView] Creating IsoSurfaces
by UM3DLab
5,544 views



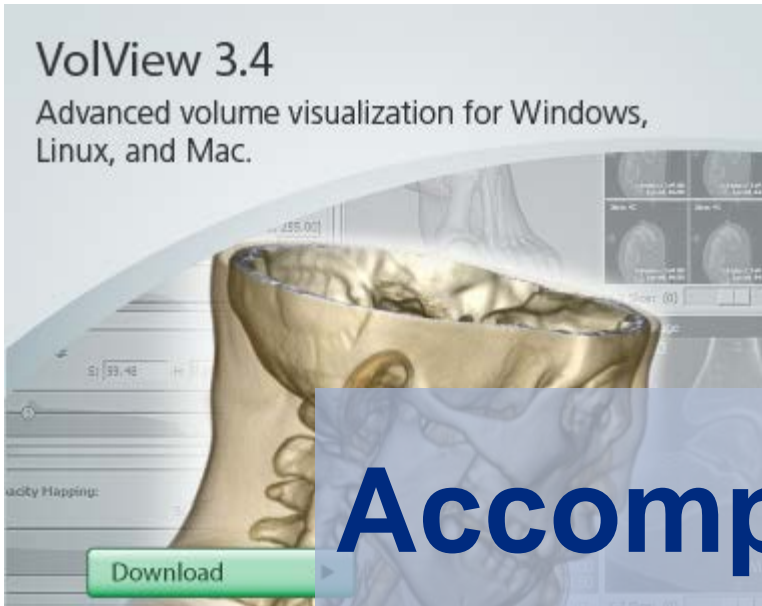
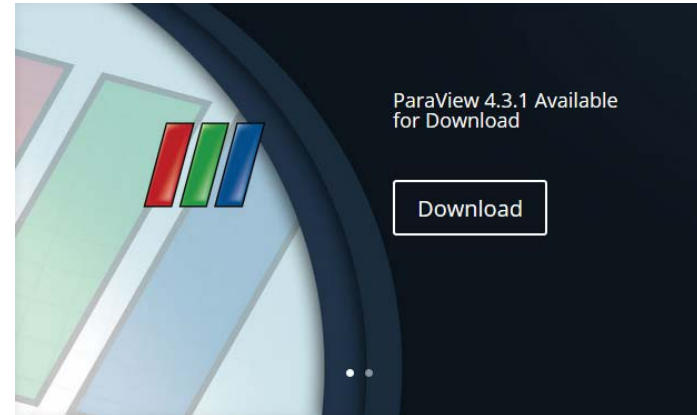
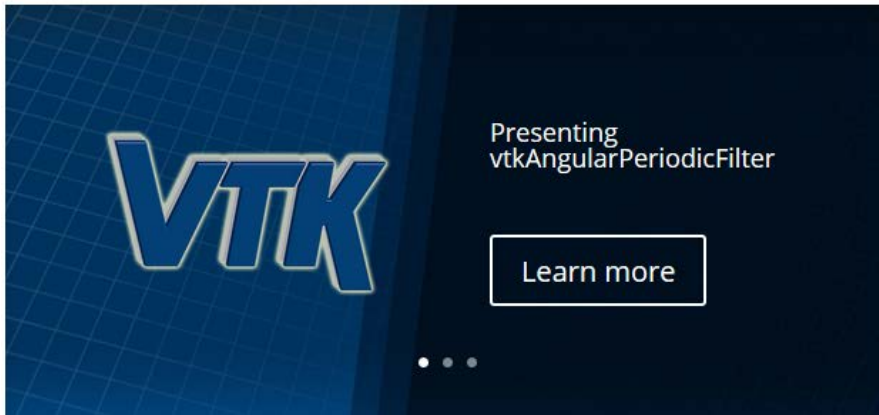
[ParaView] Basics of Slicing and Planar Plots
by UM3DLab
4,329 views



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Accompanying Libraries

Visualization Tool Kit

Features ▾

Resources ▾

D

Open Source

Platform Agnostic

Language Agnostic

Data Model

Visualization

Modelling

Imaging

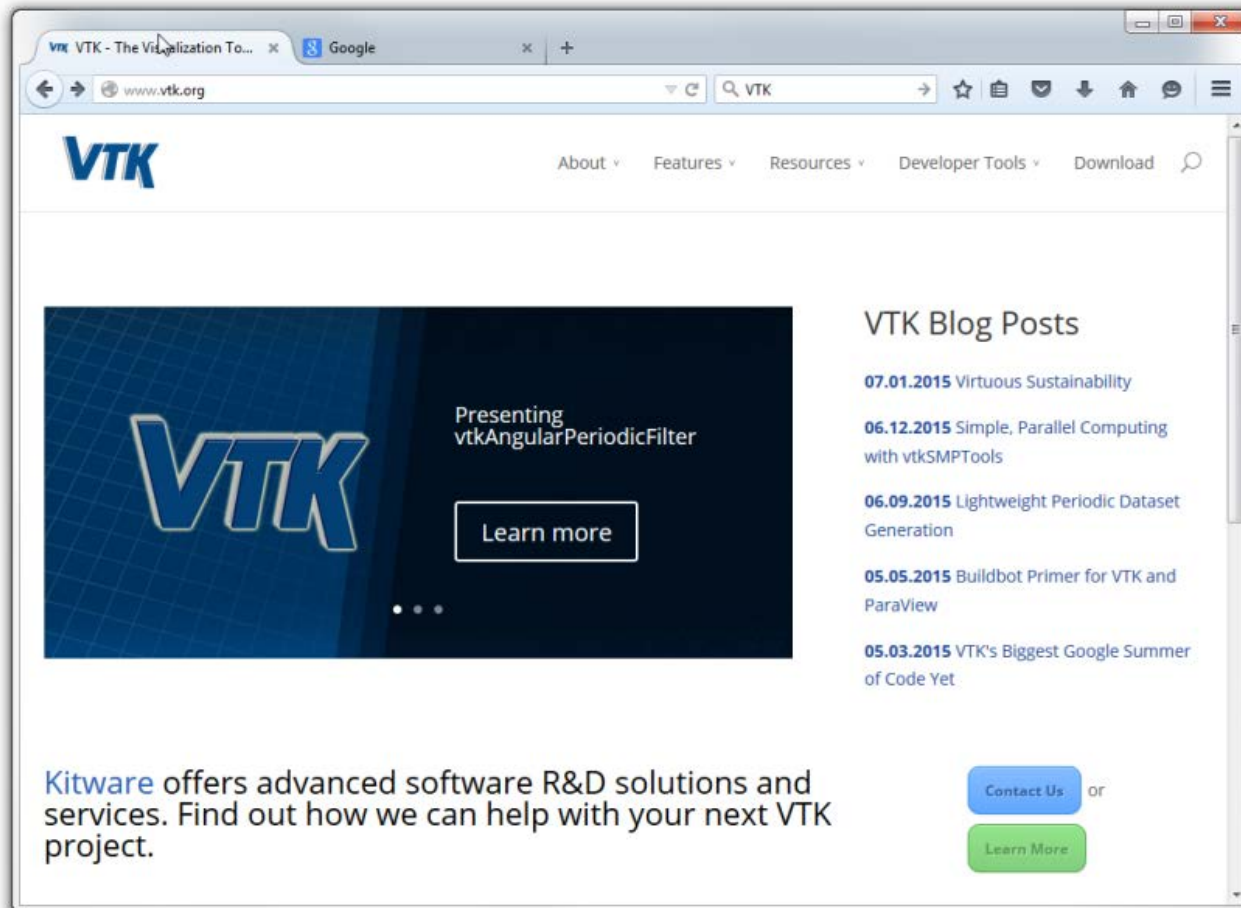
3D Graphics

2D Plots and Charts

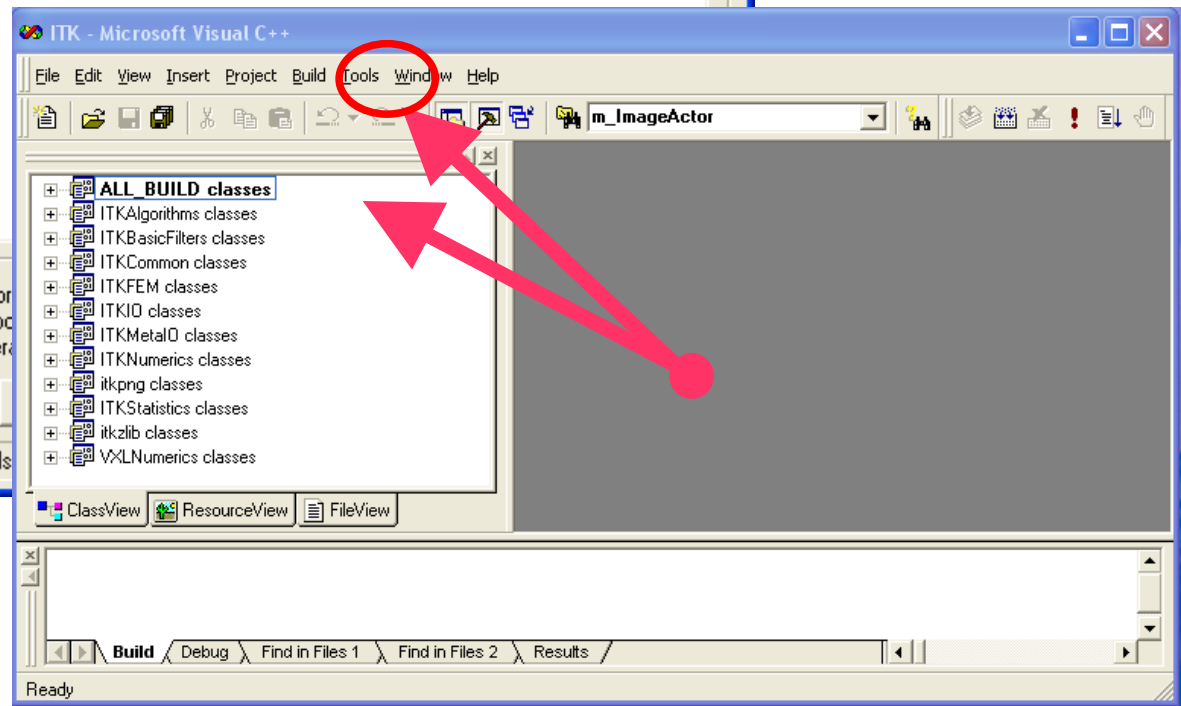
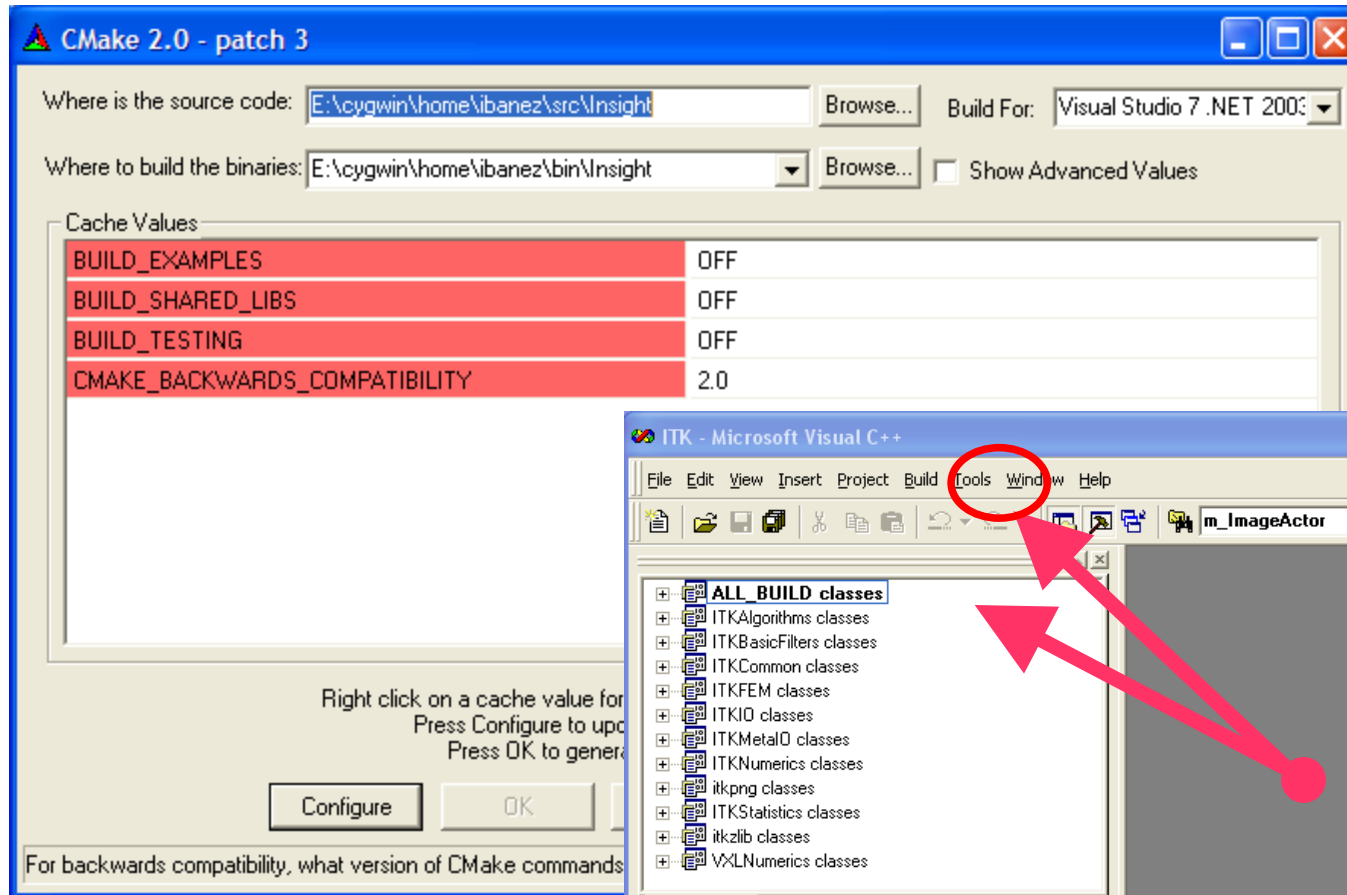
Interaction

InfoVis

Parallel Processing



CMake



Where to start

The logo for MeVisLab, featuring the text "MeVisLab" in white on a dark gray background.

MeVisLab

www.mevislab.de

The logo for VolView, featuring a stylized blue and green sphere icon followed by the text "VolView" in blue and green.

VolView

www.volview.org

The logo for ParaView, featuring three vertical bars in red, green, and blue followed by the text "ParaView" in black.

ParaView

www.paraview.org



www.itk.org

The logo for VTK (Visualization Toolkit), featuring the text "VTK" in a bold, blue, italicized font.

www.itk.org

The logo for CMake, featuring a stylized triangle icon with red, green, and blue segments followed by the text "CMake" in black.

CMake

www.cmake.org



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