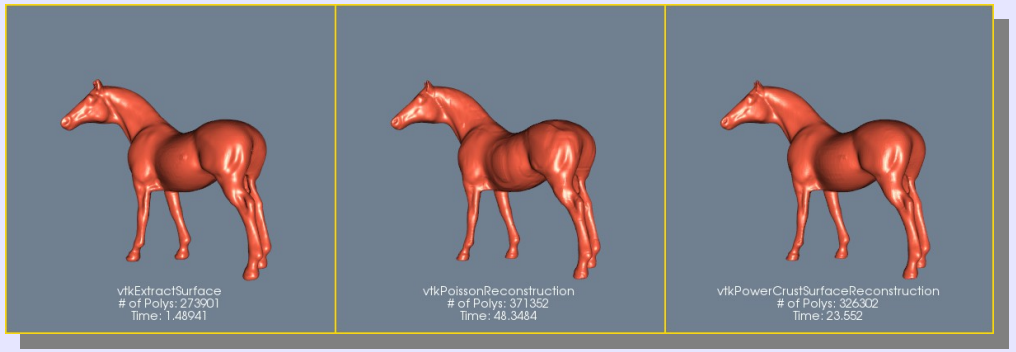
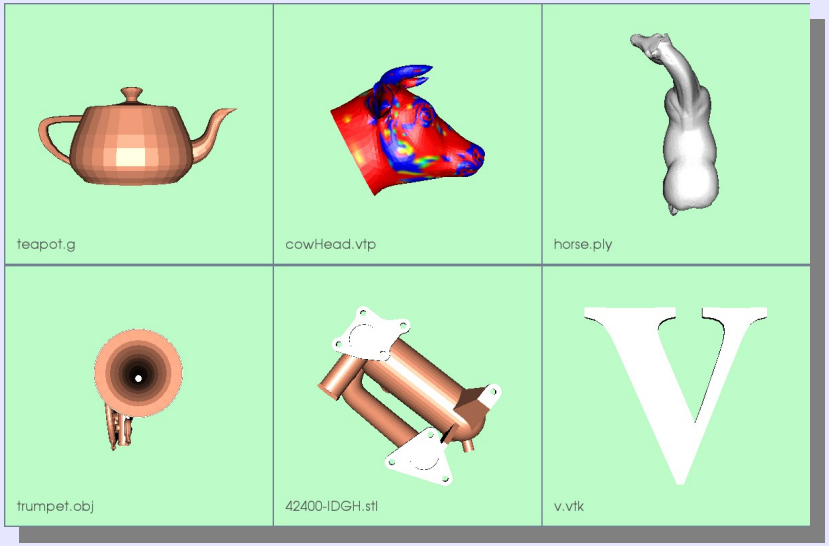
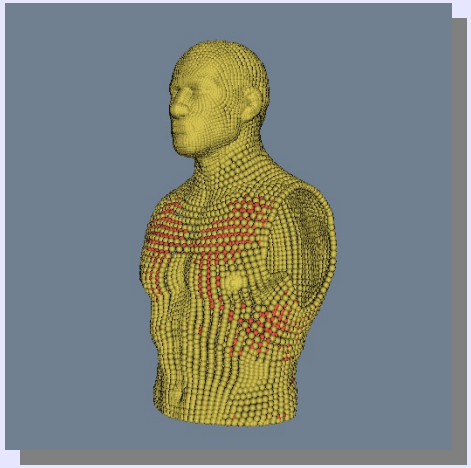
VTK Examples Moving Forward



Bill Lorensen
Noware

"It is a bad plan that admits of no modification."
— Publilius Syrus





April 27 Hack-a-thon

- The current WikiExamples have served us well for 8 years
- But...
  - Adding examples requires creating a wiki page in an archaic language
  - No mechanism to push changes to the wiki
  - Dated look and feel
  - Not mobile friendly
- But

The Old Guy Hates Change

"Change is the law of life and those who look only to the past or present are certain to miss the future."

— John F. Kennedy

"In times of rapid change, experience could be your worst enemy."

— J. Paul Getty

But He Has Seen A Lot of Change

- 1966 - Machine language
- 1967 - IBM Assembler
- 1968 - Fortran
- Fortran II
- 1978 - Fortran 4
- 1980 - C
- 1994 - C++
- 1996 - Java

- 1966 – IBM
- 1967 - IBM
- 1968 – Univac SS80
- 1970 – IBM MFT
- 1974 - PDP 11 DOS
- 1980 - GECOS
- 1994 – Vax VMS
- 1996 - Unix

There's an old saying about those who forget history. I don't remember it, but it's good.”

Stephen Colbert, The Colbert Report
March 10, 2008

Reuse Some Old Technology

- Nightly testing
- Three ways to build
  - Individual example
  - Git clone the repository
  - VTK Remote Module
- Auto tarball per example

VTK Examples New Technologies

- Github pages replaces Media Wiki
- Markdown replaces wiki *language*
- MkDocs
  - Google's Material Design look and feel
  - Code hilite extension
  - Admonition extension
  - TOC extension
- Class coverage
  - Contributed by Andrew Maclean
- Google custom search engine
- Google Analytics

Somethings not possible before

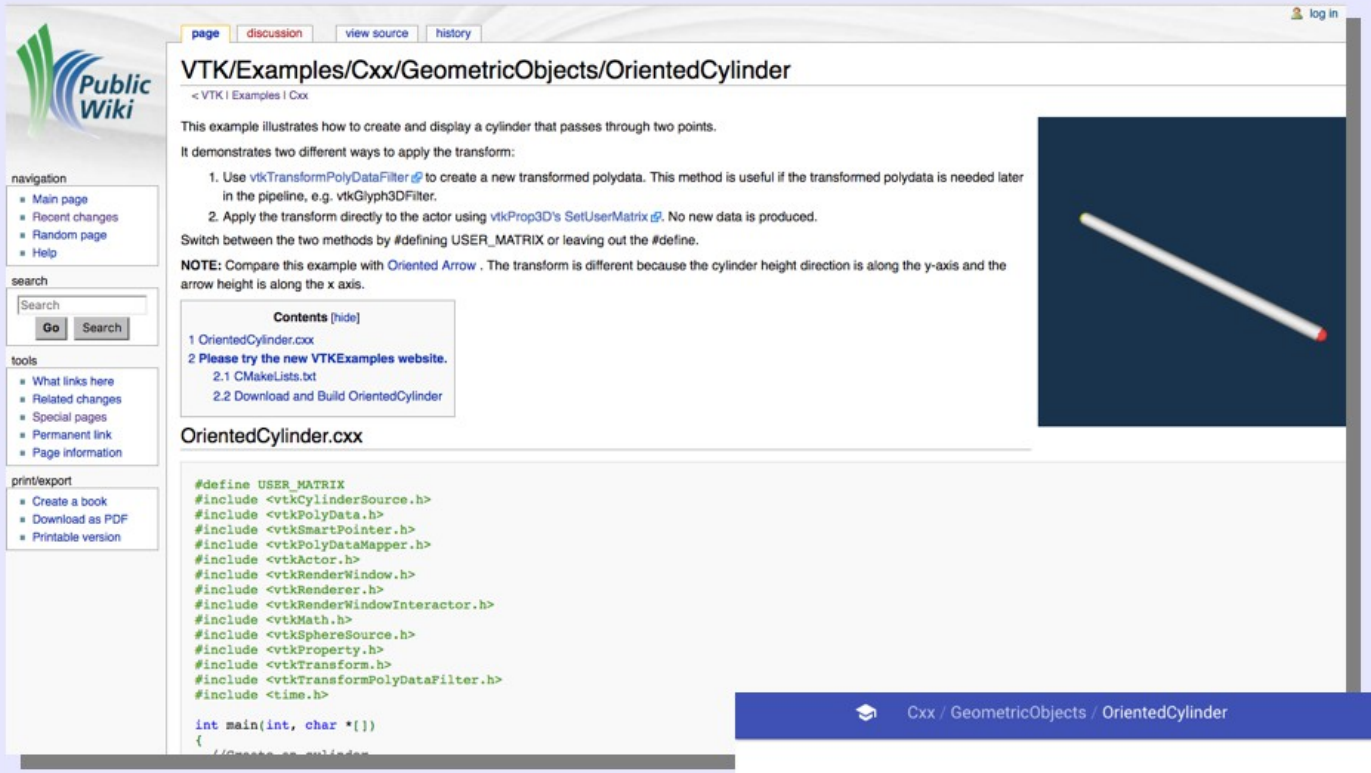
- Update all C++ examples to new code indentation
  - Each wiki page would need manual editing
- Consistent presentation of images on description pages
- No code review
  - Required watching for new pages on wiki

Old versus New

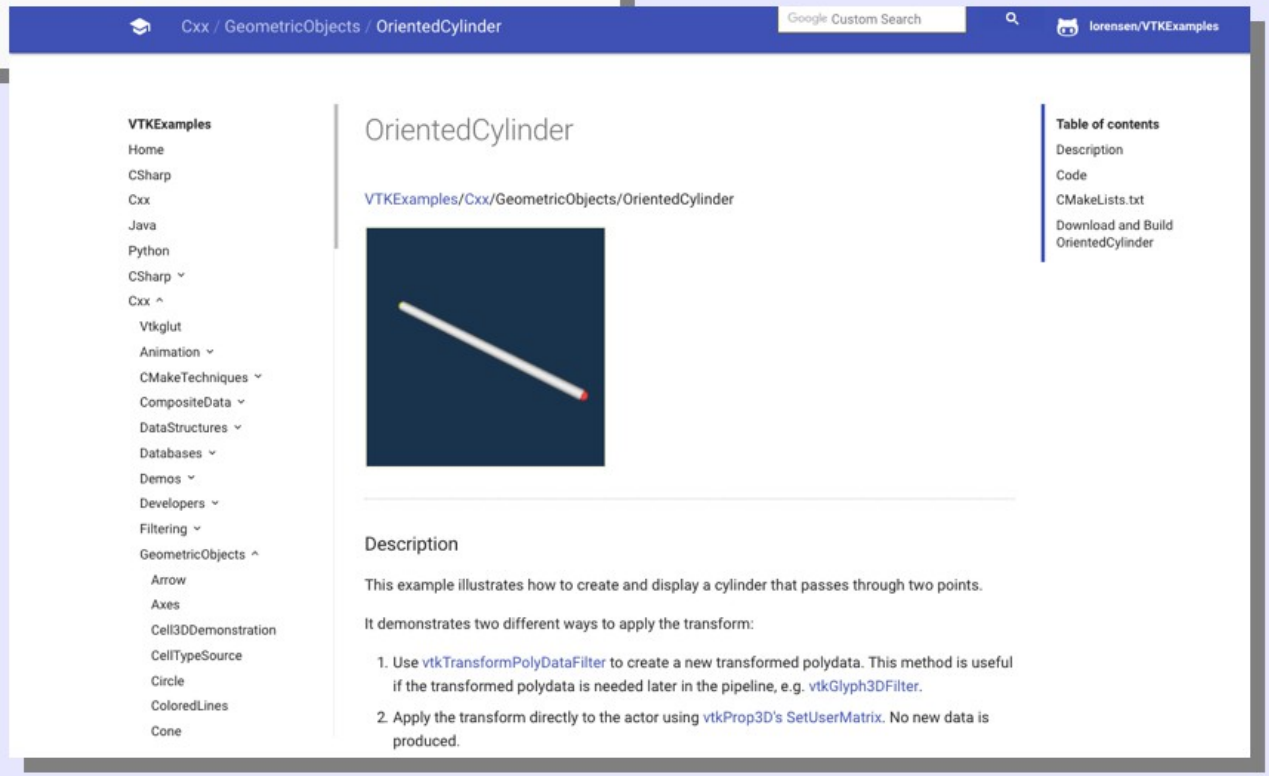
- Old Way
  - The wiki contains the example code and description
  - The wiki holds the master copy of each example
  - As examples are added to the wiki, they are automatically placed in the git repo each night, compiled and tested (no review)
- New Way
  - The git repo contains the example code and description
  - The repo holds the master copy
  - Examples are added using git merge

Make it easier to write examples

- Developer
  - Write code for example and description and push to github
  - Generate a merge request
- ScrapeRepo
  - Auto insert example images into descriptions
  - Auto insert thumbnails into language summary pages
  - Auto link any vtk class references to doxygen
  - Auto highlight code lines with vtk classes
- Reusable snippets



Wiki Examples



VTK Examples

Lots of Hyperlinks

DensifyPoints

vtkDensifyPointCloudFilter

Add points to a point cloud.

Detailed Description

add points to a point cloud to make it denser

vtkDdensifyPointCloudFilter adds new points to an input point cloud. The new points are created in such a way that all points in any local neighborhood are within a target distance of one another. Optionally, attribute data can be interpolated from the input point cloud as well.

A high-level overview of the algorithm is as follows. For each input point, the distance to all points in its neighborhood is computed. If any of its neighbors is further than the target distance, the edge connecting the point and its neighbor is bisected and a new point is inserted at the bisection point (optionally the attribute data is interpolated as well). A single pass is completed once all the input points are visited. Then the process repeats to the limit of the maximum number of iterations.

Warning

This class can generate a lot of points very quickly. The maximum number of iterations is by default set to =1.0 for this reason, increase the number of iterations very carefully. Also the MaximumNumberOfPoints data member can be set to limit the explosion o also recommended that a N closest neighborhood is used.

This class has been threaded with **vtkSMPTools**. Using TBB or other non-sequential type (set in the CMake variable VTK_SMP_IMPLEMENTATION_TYPE) may improve performance significantly.

See also

vtkVoxelGridFilter **vtkEuclideanClusterExtraction** **vtkBoundedPointSource**

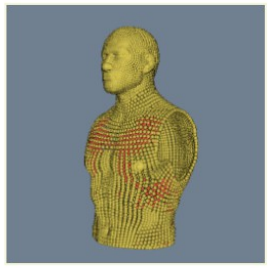
Tests:

vtkDensifyPointCloudFilter (Tests)

Definition at line **57** of file **vtkDdensifyPointCloudFilter.h**.

DensifyPoints

VTKExamples/Cxx/Points/DdensifyPoints



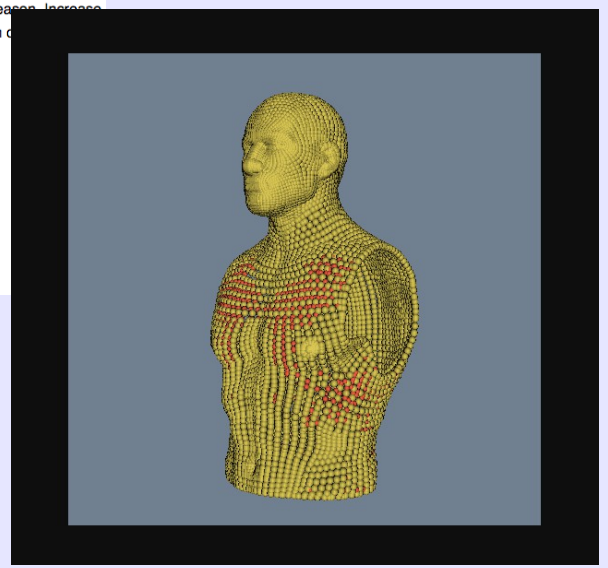
Description

In this example, the original points are yellow and the added points are red.

The image was produced using this torso dataset

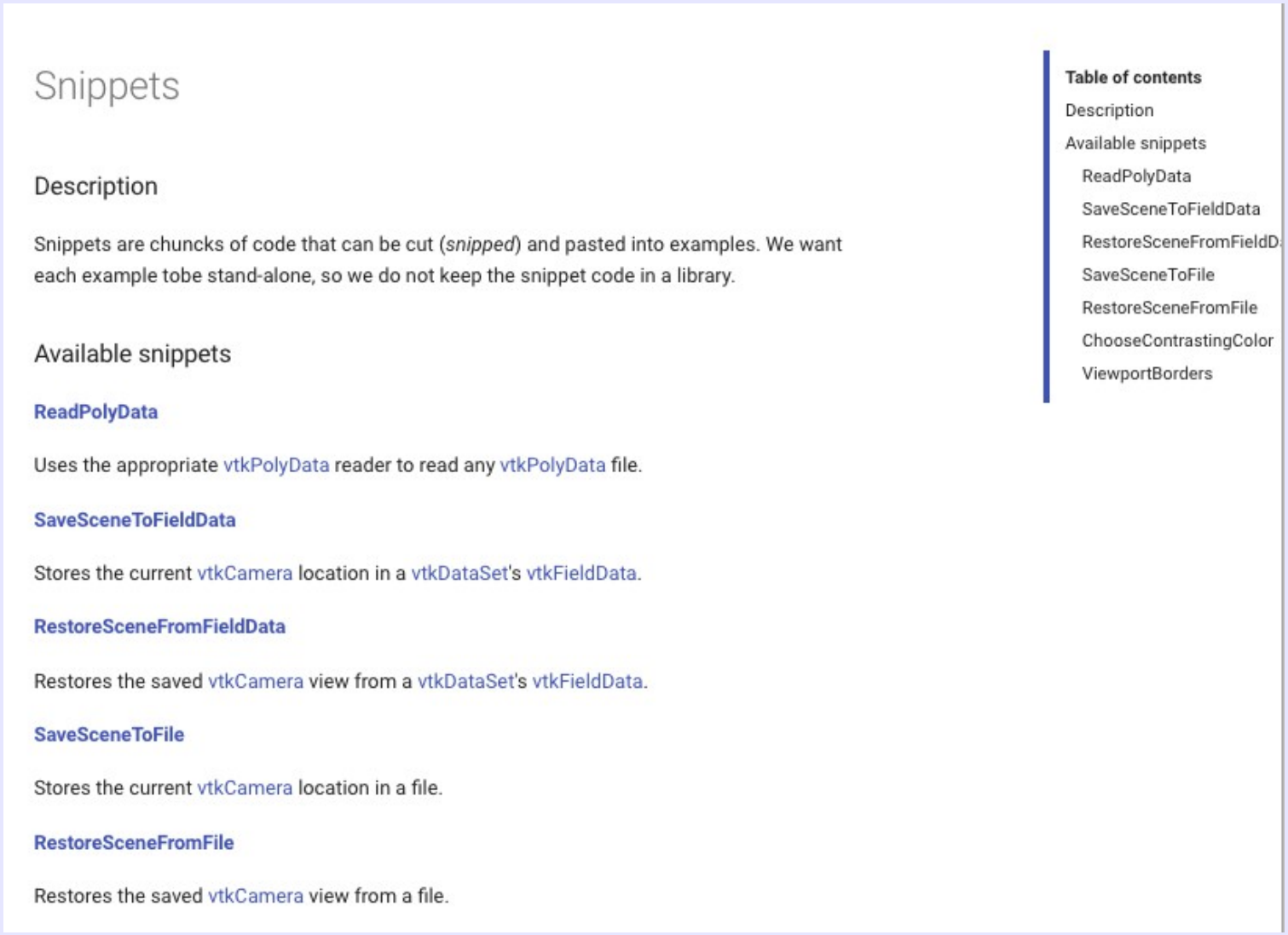
Warning
This example requires vtk 7.1 or greater.

Code



Introducing Snippets

- Procedures that can be snipped/pasted into examples



Snippets

Description

Snippets are chuncks of code that can be cut (*snipped*) and pasted into examples. We want each example tobe stand-alone, so we do not keep the snippet code in a library.

Available snippets

ReadPolyData

Uses the appropriate vtkPolyData reader to read any vtkPolyData file.

SaveSceneToFieldData

Stores the current vtkCamera location in a vtkDataSet's vtkFieldData.

RestoreSceneFromFieldData

Restores the saved vtkCamera view from a vtkDataSet's vtkFieldData.

SaveSceneToFile

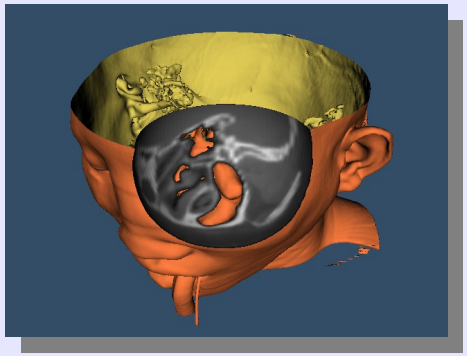
Stores the current vtkCamera location in a file.

RestoreSceneFromFile

Restores the saved vtkCamera view from a file.

Table of contents

Description
Available snippets
ReadPolyData
SaveSceneToFieldData
RestoreSceneFromFieldD
SaveSceneToFile
RestoreSceneFromFile
ChooseContrastingColor
ViewportBorders



src/

.png

```
### Description
This example uses two vtkClipDa
lens" affect. First, a sphere i
spherical hole in the extracted
samples the original volume dat
scalar point data is used to cl
isosurface value.
```

.md

```
// Clip the lens data with the isosu
vtkSmartPointer<vtkClipDataSet> lens
  vtkSmartPointer<vtkClipDataSet>::N
lensClip->SetInputConnection(lensPro
lensClip->SetValue(500);
lensClip->GenerateClipScalarsOff();
lensClip->Update();

// Define a suitable grayscale lut
vtkSmartPointer<vtkLookupTable> bwLu
  vtkSmartPointer<vtkLookupTable>::N
bwLut->SetTableRange (0, 2048);
bwLut->SetSaturationRange (0, 0);
bwLut->SetHueRange (0, 0);
```

.cxx

```
###CMakeLists.txt
```cmake
cmake_minimum_required(VERSION 2.8)

PROJECT(XXX)

find_package(VTK REQUIRED)
include(${VTK_USE_FILE})

add_executable(XXX MACOSX_BUNDLE XX

target_link_libraries(XXX ${VTK_LIB
```
```

.txt

ScrapeRepo

.tar

Tarballs/

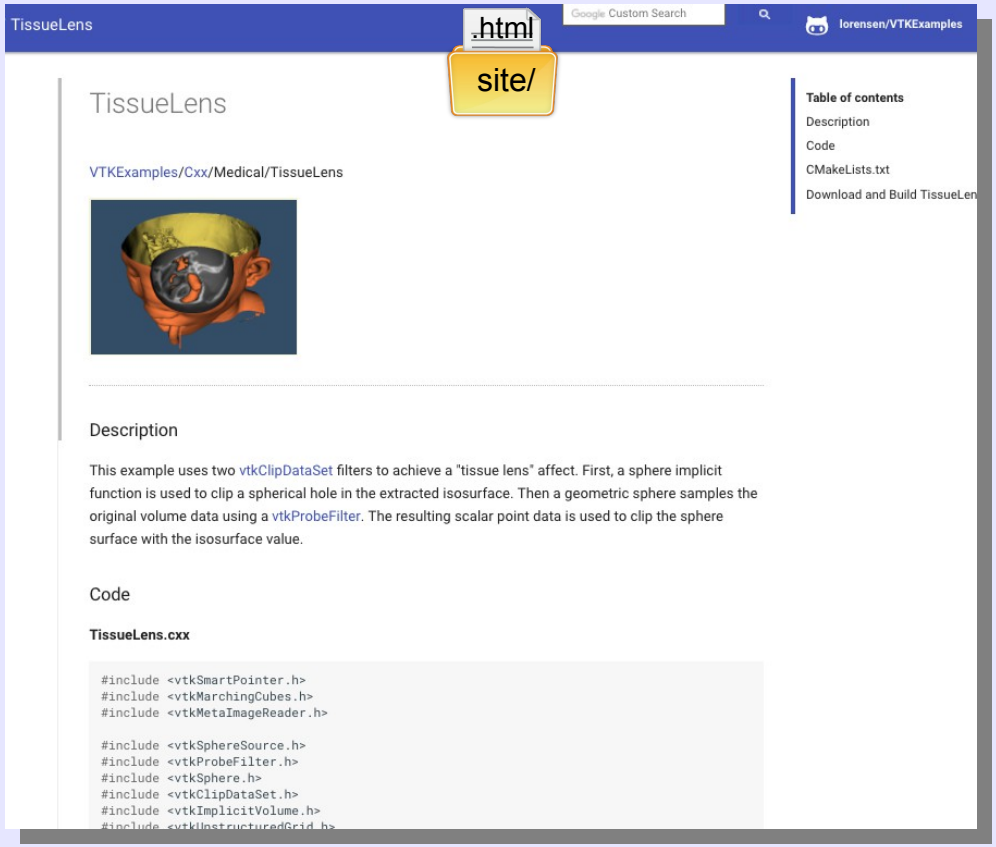
.md

docs/

MkDocs

.html

site/



Performance Improvements

- Lazy image loading via javascript
  - Initial implementation loaded all summary images and hit github limits
- Use tiny url's for summary pages
- Htmlmin reduces page sizes by ~30%

Adding a Summary Line

- Old

|-

| [[VTK/Examples/Cxx/Medical/TissueLens|TissueLens]] || {{VTKDoxygenURL|vtkMarchingCubes}} {{VTKDoxygenURL|vtkClipDataSet}} {{VTKDoxygenURL|vtkProbeFilter}} ||Cut a volume with a sphere

- New

[TissueLens](/Cxx/Medical/TissueLens) | vtkMarchingCubes vtkClipDataSet vtkProbeFilter | Cut a volume with a sphere

And... If the example has an image, you get a thumbnail for free

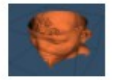
Medical

Example Name	VTK Classes Demonstrated	Description
MedicalDemo1	vtkMarchingCubes	Create a skin surface from volume data
MedicalDemo2	vtkMarchingCubes	Create a skin and bone surface from volume data
MedicalDemo3	vtkMarchingCubes	Create skin, bone and slices from volume data
MedicalDemo4	vtkFixedPointVolumeRayCastMapper	Create a volume rendering
TissueLens	vtkMarchingCubes vtkClipDataSet vtkProbeFilter	Cut a volume with a sphere

Old

New

Medical

Example Name	Classes Demonstrated	Description	Image
MedicalDemo1	vtkMarchingCubes	Create a skin surface from volume data	
MedicalDemo2	vtkMarchingCubes	Create a skin and bone surface from volume data	
MedicalDemo3	vtkMarchingCubes	Create skin, bone and slices from volume data	
MedicalDemo4	vtkFixedPointVolumeRayCastMapper	Create a volume rendering	
TissueLens	vtkMarchingCubes vtkClipDataSet vtkProbeFilter	Cut a volume with a sphere	

VTK Examples
By the Numbers

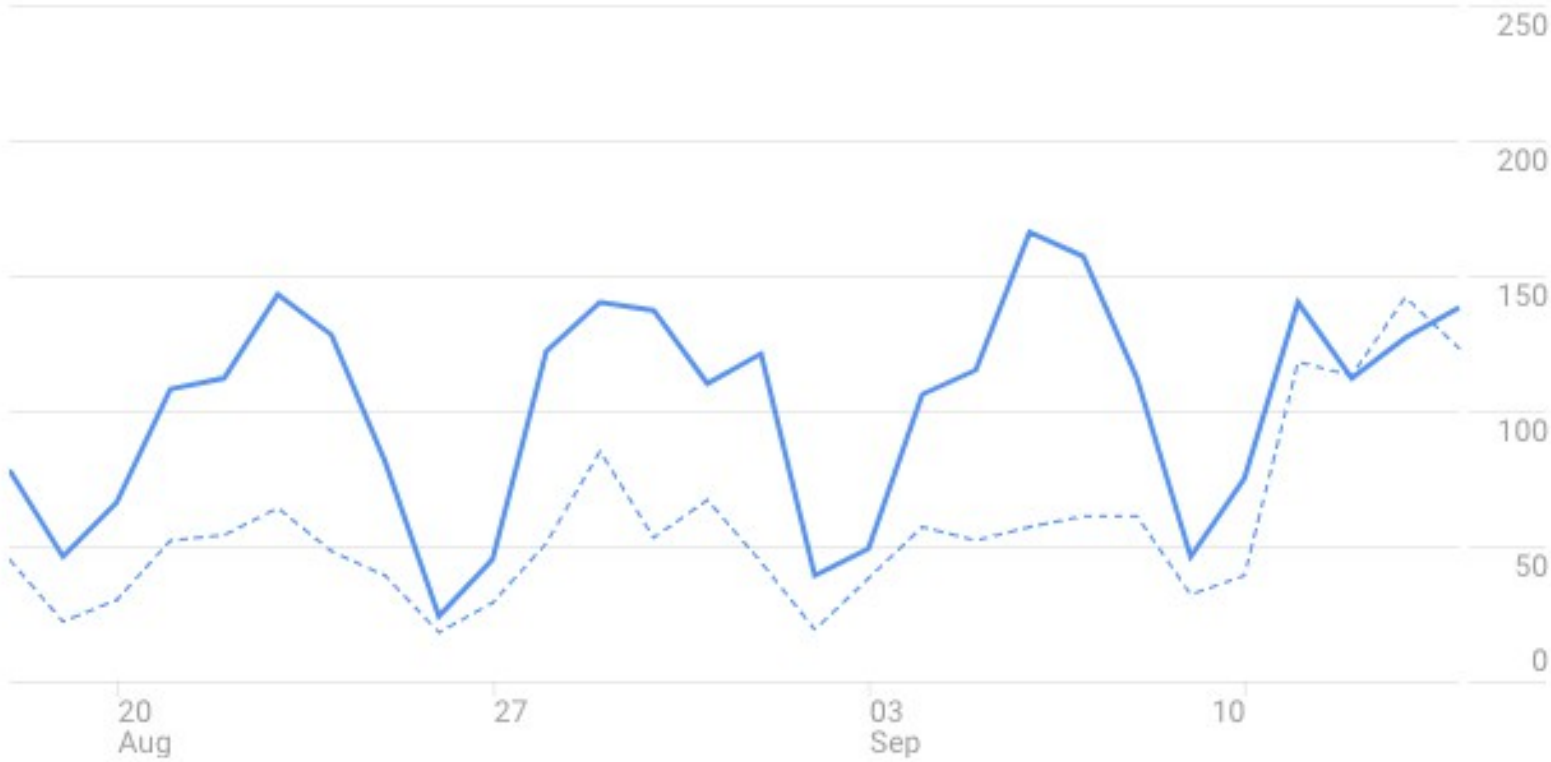
ScrapeRepo Summary

- C++ examples: 835
- CSharp examples: 121
- Python examples: 139
- Java examples: 18
- Total examples: 1113
- Doxygen links added: 1229
- Thumbnails added: 1075
- Nightly Tests: 750

Google Analytics Home

INTELLIGENCE

Users	Sessions	Bounce Rate	Session Duration
1.8K	4K	29.81%	5m 48s
↑71.2%	↑85%	↑0.8%	↓4.5%
vs last 28 days			

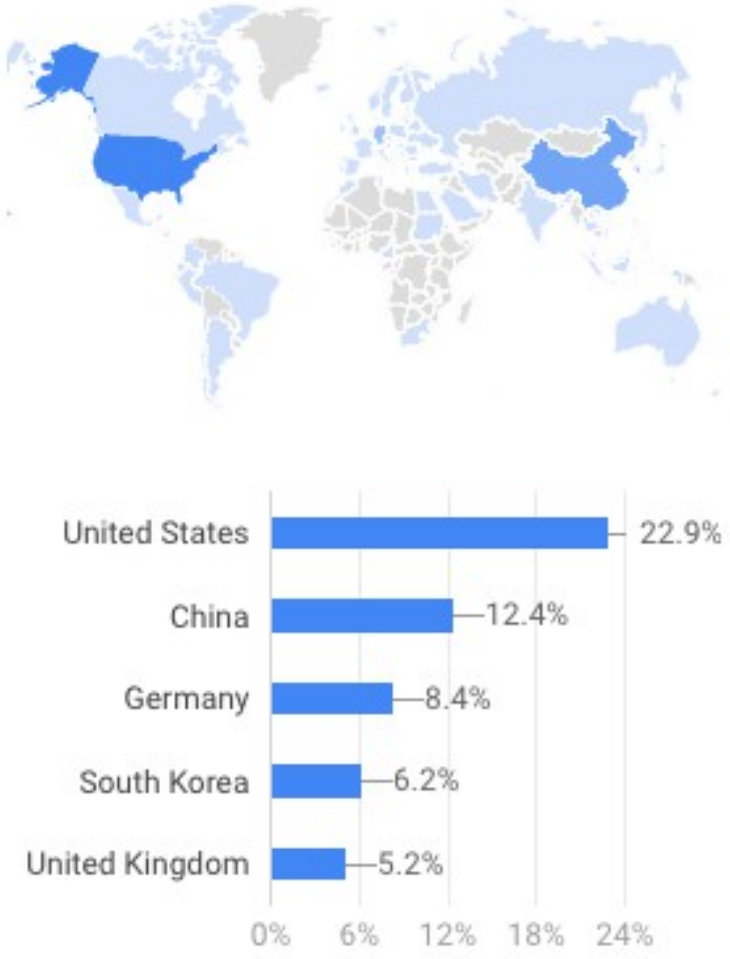


Last 28 days

AUDIENCE OVERVIEW

Where are your users?

Sessions by country

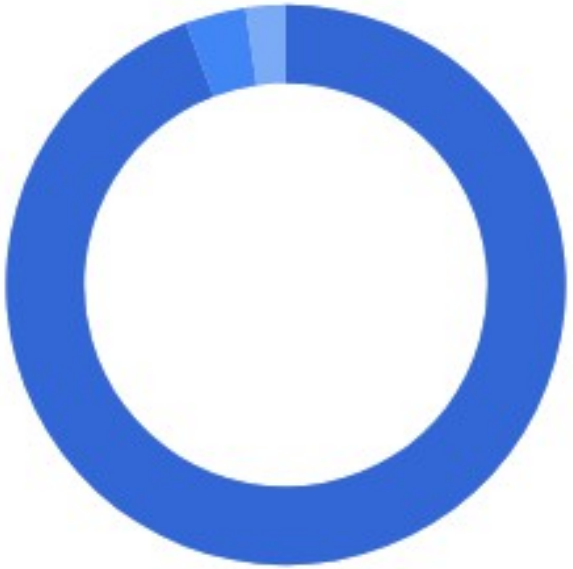


Last 28 days

LOCATION OVERVIEW

What are your top devices?

Sessions by device

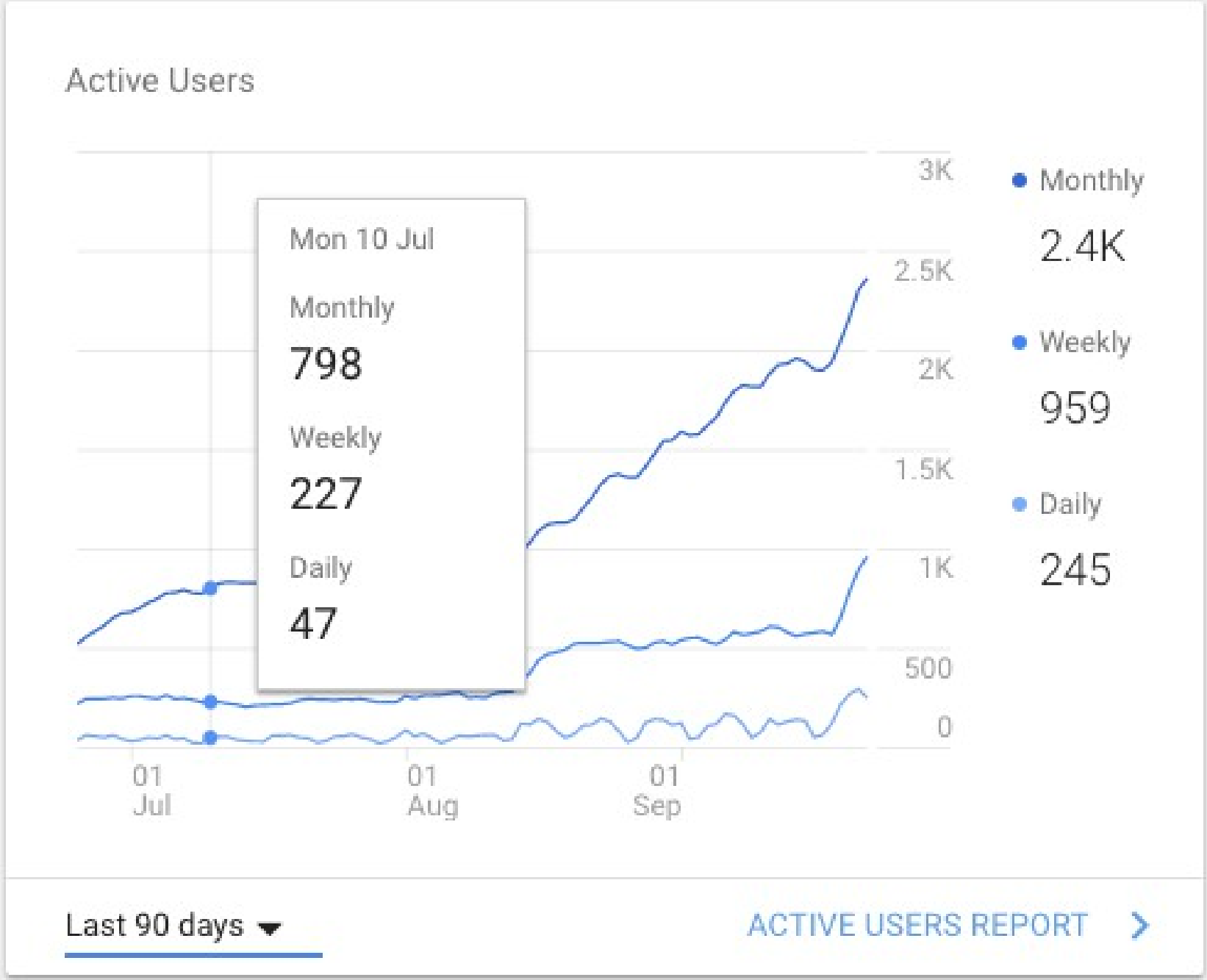


Desktop	Mobile	Tablet
94.2%	3.5%	2.3%
↑1.4%	↓1.1%	↓0.2%

Last 7 days

MOBILE OVERVIEW

How are your active users trending over time?



Issues

- Google needs to discover the VTK Examples
  - Added some links from the old Wiki Examples to the VTK Examples
- Deprecate VTK Wiki Examples
  - Redirect to VTK Examples (**DONE**!)
- Convert or retire remaining VTK/Examples
- Cannot get Google Search to generate image results
- Need more Administrators
  - Instructions are being prepared

Quick Demo