

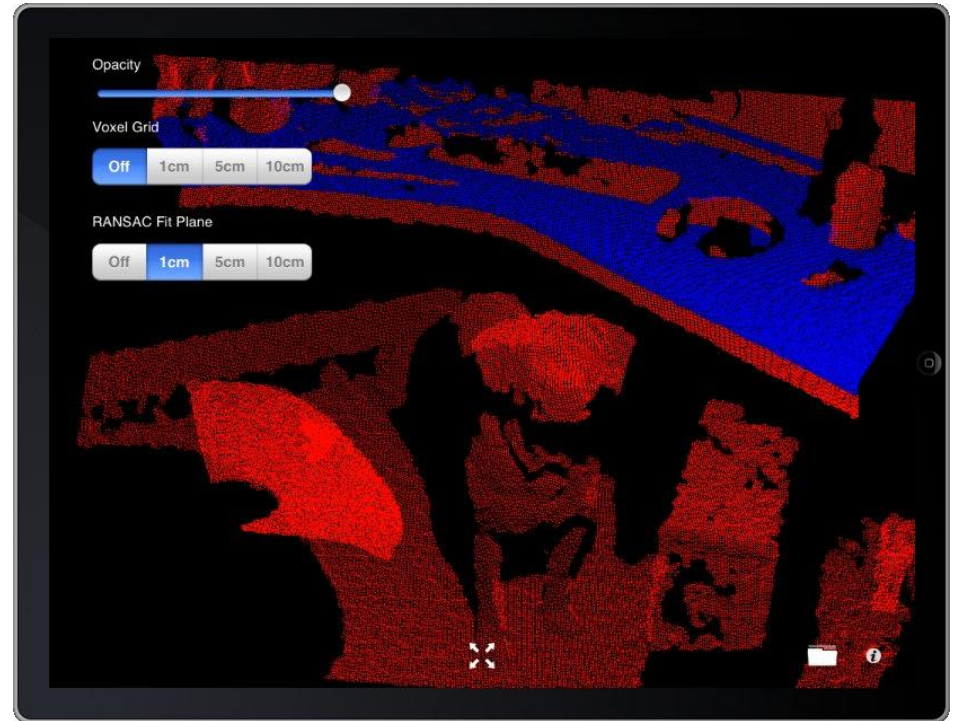
PCL goes mobile



Demo Apps



Point cloud streaming



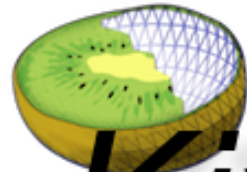
Point cloud processing

Point cloud streaming

movie: http://www.youtube.com/watch?v=pp_YZ_6O-Ps

Point cloud processing

movie: <http://www.youtube.com/watch?v=D2kq6AHDvrM>

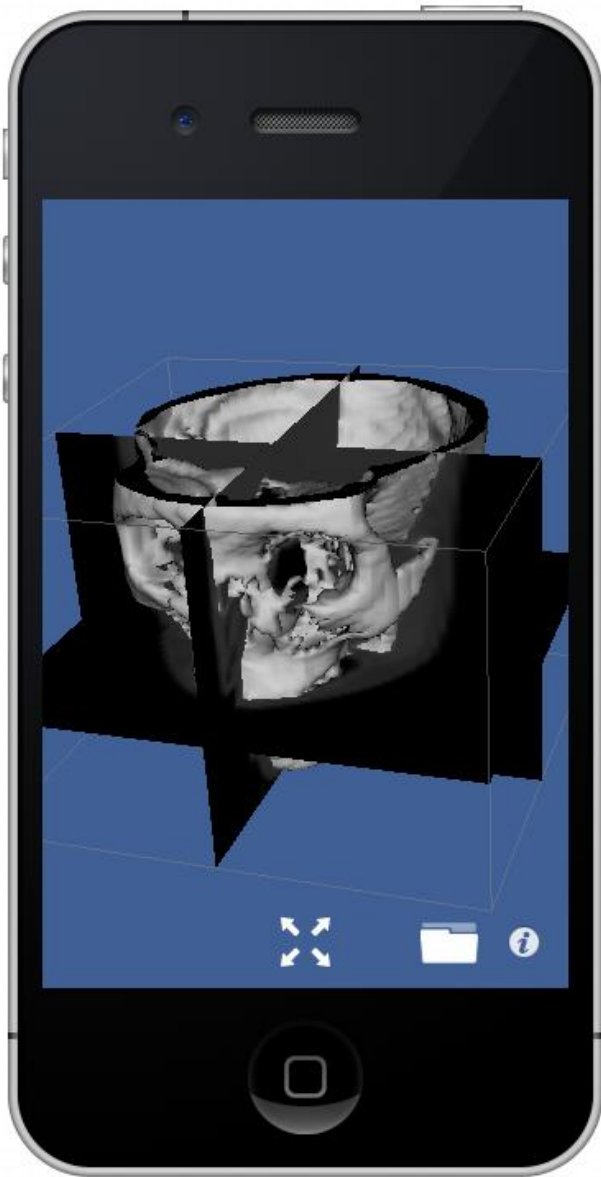


KiwiViewer

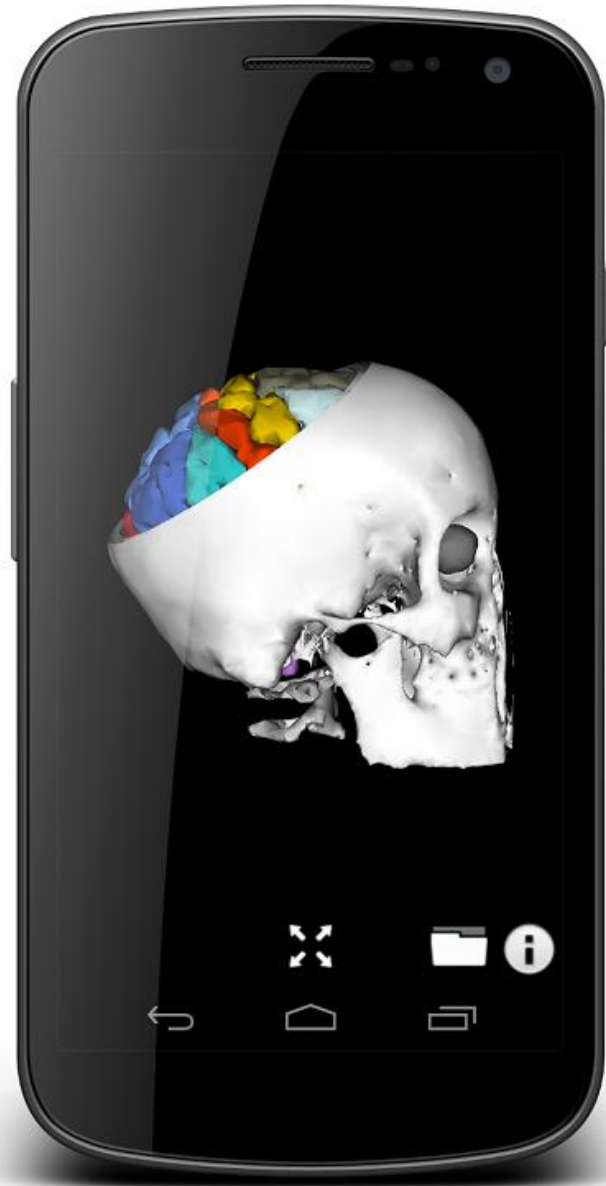


KiwiViewer

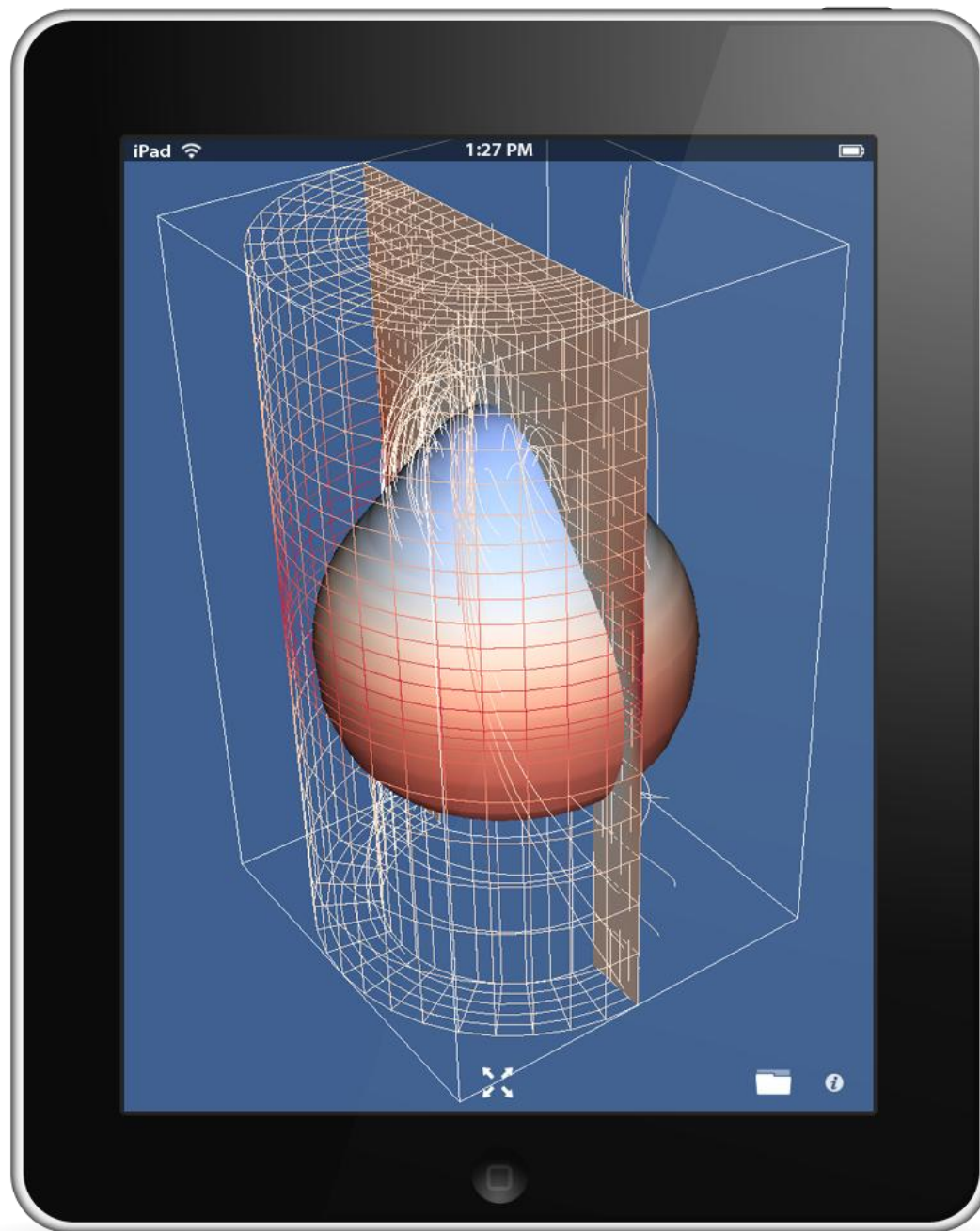




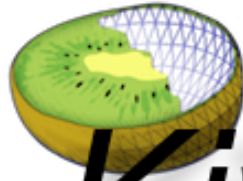
Head CT Image



SPL-PNL Brain Atlas



Visualization with ParaViewWeb



KiwiViewer



iOS



Mobile Visualization Apps

Kiwi iOS

Kiwi Android

Kiwi

VTK

VES

Open GL
ES 2.0

Mobile Visualization Apps

Objective C,
iOS APIs

Kiwi iOS

Kiwi Android

Java,
Android APIs

Kiwi

Cross platform,
C++ libraries

 VTK

VES

Open GL
ES 2.0

Vendor supplied



- Mobile devices use OpenGL ES 2.0
- ES means embedded systems
- Subset of desktop OpenGL (currently OpenGL 4.2)

- Shader based rendering pipeline
- More work, more powerful

Getting Started

Android Developer's Guide



<http://developer.android.com/guide/index.html>

Install SDKs and run the sample apps!

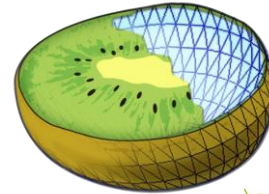
iOS Dev Center



<https://developer.apple.com/devcenter/ios/index.action>

Getting Started

VES Developer's Guide

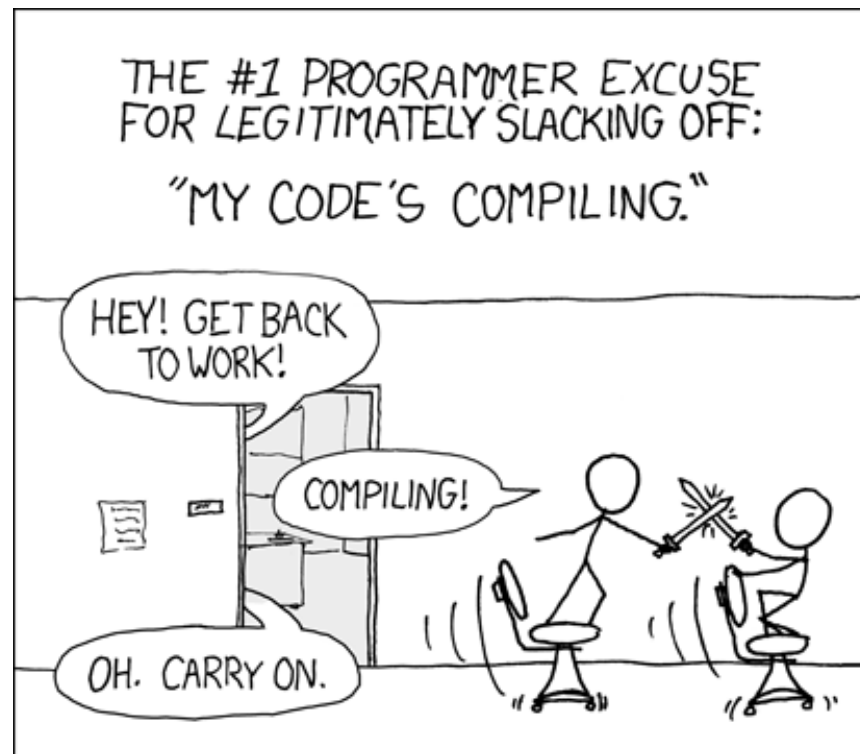


iOS



http://www.vtk.org/Wiki/VES/Developers_Guide

Cross-Compiling fun



Get to know your device SDKs

- `/opt/android-ndk-r7`
- `/Developer/Platforms/iPhoneOS.platform/Developer/SDKs/iPhoneOS5.0.sdk`

Explore...

```
$ find . -name math.h
```


Cross-compiling with CMake

- `-DCMAKE_TOOLCHAIN_FILE=<toolchain.cmake>`
- cmake runs with restricted search paths
- want to find `/usr/local/android/install/boost`,
not `/usr/include/boost`

Starting a new App

- Extend or copy an existing app
- there will be boilerplate code

- cmake... eclipse... xcode...



Point cloud streaming



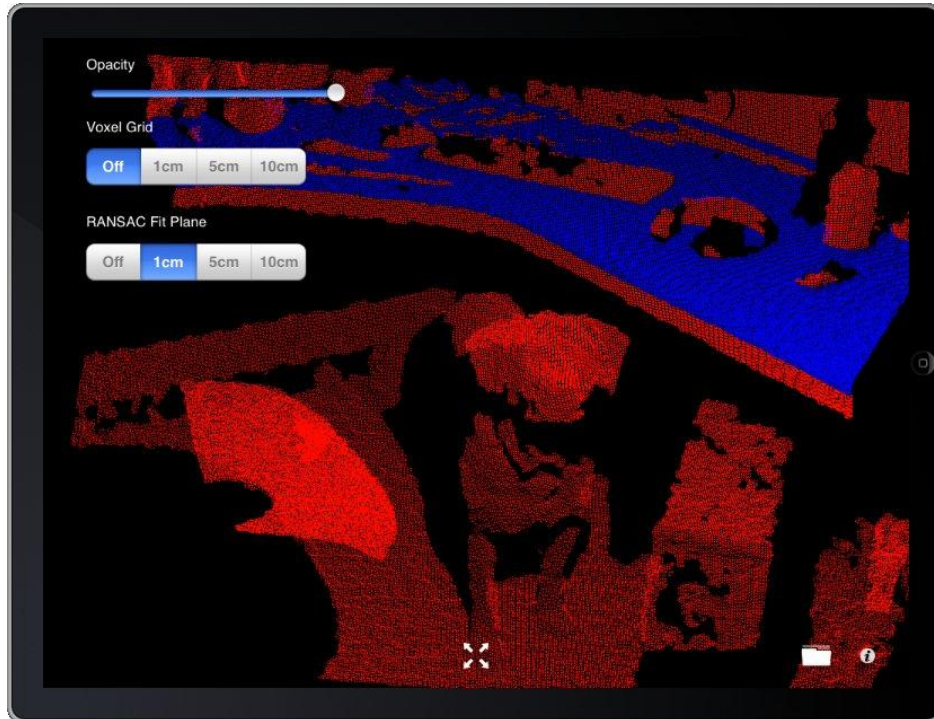
- 2 megabytes/second
- 9 bytes per point (xyzrgb with short encoding on xyz)
- ~ 200k points/second
- at 10 fps, ~20K points per cloud

- other compression schemes possible
need fast decoding on device though

Tutorial: http://pointclouds.org/documentation/tutorials/mobile_streaming.php

APK Download: ...

Point cloud processing



- Voxel Grid on Denver Pipes, 3.8 million points
- RANSAC plane segmentation on voxel grid output < 1 second
- iPad 2 viewer rendered 5 million points
- ~10 fps on 1 million points
- 60 fps rendering on Kinect sized point clouds, ~250K points

Dev guide: http://vtk.org/Wiki/VES/Point_Cloud_Library

Getting Help

- VES mailing list: <http://vtk.org/Wiki/VES>
- PCL mailing list: <http://www.pcl-users.org/>



Live Demo