Topic5– Installing gVirtualXRay

IBSim-4i 2020 Dr Franck P. Vidal 13th Aug 2020

How to compile and install gVirtualXRay Suite

Requirements

Make sure you have:

- CMake 3.12 or newer (see http://www.cmake.org/);
- A C++ compiler; and
- A GPU that supports OpenGL (integrated GPUs are fine).

For GNU/Linux

The examples below are for openSUSE Leap but you can adapt them for your own distro.

- 1. You need cmake and a compiler:
- \$ sudo zypper in cmake-full gcc-c++
- 2. You need some system libraires:

```
$ sudo zypper in libX11-devel \
    libXi-devel \
    libXcursor-devel \
    libXinerama-devel \
    libXrandr-devel \
    libXxf86vm-devel \
    glu-devel
```

3. For unit testing, SimpleGVXR and wrappers (optional):

\$ sudo zypper in Mesa-libEGL1 Mesa-libEGL-devel libgbm1 libgbm-devel

4. For unit wrappers (optional):

```
$ sudo zypper in swig \
   ruby-devel \
   tcl-devel \
   python3 python3-devel \
   java-11-openjdk \
   octave-devel \
   R-core R-base R-core-devel R-base-devel
```

Mac OS X:

- 1. Install XCode from the Mac App Store.
- 2. Install the Command Line Tools package via the Terminal application using
- \$ xcode-select --install command.
- 3. Install CMake from https://cmake.org/download/
- 4. For Wrappers, you may want to install SWIG and Python 3. I use homebrew for that purpose, see https://brew.sh/

Microsoft Windows

- Install Visual Studio from https://visualstudio.microsoft.com/vs/
 Make sure to select the C++ language
- 2. Install CMake from https://cmake.org/download/
- 3. You may want to install a git client, e.g. https://git-scm.com/download/win
- 4. You may want to install a SVN client, e.g. TortoiseSVN from https://tortoisesvn.net/downloads.html
- 5. For Wrappers, you may want to install Python 3 from https://www.python .org/downloads/ Make sure to install the development libraries.

Download the latest version of the source code

- The latest release (gVirtualXRay-1.1.3-Source.zip) available at https://sourceforge .net/projects/gvirtualxray/files/1.1/gVirtualXRay-1.1.3-Source.zip /download or
- The latest version from SVN at https://svn.code.sf.net/p/gvirtualxray /code/trunk

Installation from the source code

GNU/Linux and Mac OS X

Assuming the system is ready.

- 1. Open a terminal and choose where the binaries should be installed. It must be a directory where you can write. If you can't, make sure you use sudo make rather than make in Steps 5 and 6. In the example below, I install it in my home directory in gvxr-install.
- \$ export GVXR_INSTALL_DIR=\$HOME/gvirtualxray-install
- 2. go in the directory where you want to build the gVirtualXRay, e.g.

```
$ mkdir ~/gvxr
$ cd ~/gvxr
```

3. Download the latest release:

```
$ wget https://sourceforge.net/projects/gvirtualxray/files/1.1/gVirtualXRay-
1.1.3-Source.zip/download
$ mv download gVirtualXRay-1.1.3-Source.zip
$ unzip gVirtualXRay-1.1.3-Source.zip
```

4. Create a directory where the binaries will be created and go in this directory.

```
$ mkdir gvxr-bin
$ cd gvxr-bin
```

Configure the project using CMake. Use cmake, ccmake or cmake-gui depending on you preferences. ccmake and cmake-gui are interactive.
 cmake:

```
 cmake
```

```
-DCMAKE_BUILD_TYPE:STRING=Release \
-DCMAKE_INSTALL_PREFIX:STRING=$GVXR_INSTALL_DIR \
-DBUILD_TESTING:BOOL=ON \
-DBUILD_WRAPPER_CSHARP:BOOL=ON \
-DBUILD_WRAPPER_JAVA:BOOL=ON \
-DBUILD_WRAPPER_OCTAVE:BOOL=ON \
-DBUILD_WRAPPER_PERL:BOOL=ON \
```

```
-DBUILD_WRAPPER_R:BOOL=ON \
    -DBUILD WRAPPER RUBY:BOOL=ON \
    -DBUILD_WRAPPER_TCL:BOOL=ON \
    -S .. \
    -B $PWD
- ccmake:
$ ccmake \
    -DCMAKE_BUILD_TYPE:STRING=Release \
    -DCMAKE_INSTALL_PREFIX:STRING=$GVXR_INSTALL_DIR \
    -S .. \
    -B $PWD
— cmake-gui:
$ ccmake \
    -DCMAKE BUILD TYPE:STRING=Release \
    -DCMAKE_INSTALL_PREFIX:STRING=$GVXR_INSTALL_DIR \
    -S .. \
    -B $PWD
```

```
6. Compile the project.
```

```
$ make -j16
```

I used a parallel build with 16 jobs as I got 16 cores in my CPU. Adjust -j depending on your computer. Once the project is made, it is also installed. 7. Run the unit tests (optional)

```
$ make test
```

8. Install

```
$ make install
```

or at your own risk as root using:

```
$ sudo make install
```

If you built the python wrapper, add its path to PYTHONPATH:

```
$ PYTHONPATH=$GVXR_INSTALL_DIR/gvxrWrapper-1.0.1/python3:$PYTHONPATH
```

And to make it permanent:

Summary of all the commands:

```
export GVXR_INSTALL_DIR=$HOME/gvirtualxray-install
mkdir ~/gvxr
cd ~/gvxr
wget https://sourceforge.net/projects/gvirtualxray/files/1.1/gVirtualXRay-
1.1.3-Source.zip/download
mv download gVirtualXRay-1.1.3-Source.zip
unzip gVirtualXRay-1.1.3-Source.zip
mkdir gvxr-bin
cd gvxr-bin
cmake ∖
    -DCMAKE_BUILD_TYPE:STRING=Release \
    -DCMAKE_INSTALL_PREFIX:STRING=$GVXR_INSTALL_DIR \
    -DBUILD_TESTING:BOOL=ON \
    -DBUILD_WRAPPER_CSHARP:BOOL=OFF \
    -DBUILD_WRAPPER_JAVA:BOOL=OFF \
    -DBUILD_WRAPPER_OCTAVE:BOOL=OFF \
    -DBUILD_WRAPPER_PERL:BOOL=OFF \
    -DBUILD_WRAPPER_PYTHON3:BOOL=ON \
    -DBUILD_WRAPPER_R:BOOL=OFF \
    -DBUILD_WRAPPER_RUBY:BOOL=OFF \
    -DBUILD_WRAPPER_TCL:BOOL=OFF \
    -S .. \
    -B $PWD
make -j16
```

For Windows

I recommand to use 64 bits for all the components, including for Python 3.

- Download and extract gVirtualXRay's code from https://sourceforge.net /projects/gvirtualxray/files/1.1/gVirtualXRay-1.1.3-Source.zip /download.
- 2. Open CMake's gui.
- 3. Select where the source code is. This is the top directory of the repository that contains CMakeLists.txt.
- 4. Select where the binaries are going to be compiled. It CANNOT be a subdirectory of the source directory chosen in the previous step.
- 5. Press configure, then choose which compiler you want to use and which architecture. I used Visual Studio 15 2017's native compilers, and x64 (for 64 bits).
- 6. Click on Configure. There'll be an error, but don't worry about it.
- 7. Search for install.
- 8. Change the variable CMAKE_INSTALL_PREFIX into a path where you are allowed to write. Click on configure. If it does not work, change the path and make sure you have write privilege for that path.

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- 9. If you want to build a wrapper, e.g. for Python 3, go to BUILD and tick the right option(s) (in my case BUILD_PYTHON£_WRAPPER). Now you can click on Configure, then Generate, then Open Project.
- 10. It will open Visual Studio. Change Debug into Release.
- 11. Do a right click on BUILD_ALL or press the F7 key to build the project.
- 12. Go and make some coffee, it's gonna take a bit of time... At the end, in the output, you should see something like

======= Build: 4 succeeded, ...

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Illustration

Installation directory content in Windows

On Windows, you Should see $4~{\rm or}~5$ directories in the installation directory depending on wrappers:

- bin
- third_party
 - include
 - lib (Windows) or lib64 (GNU/Linux and Mac OS X???)

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Illustration

- gVirtualXRay-1.1.3

 - Bin2C.cmake
 CreateHeaderFiles.cmake
 - gVirtualXRayConfig.cmake
 - include
 - lib
 - LICENSE.txt
 - test
 - third_party

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Illustration



- UsegVirtualXRay.cmake
- SimpleGVXR-1.0.1
- include
- lib

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- SimpleGVXR-doc.i
- SimpleGVXRConfig.cmake
- test
- UseSimpleGVXR.cmake
- gvxrWrapper-1.0.1

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- BUILD_WRAPPE	R_LUA						
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datapython3



Illustration

Installation directory content in GNU/Linux and Mac OS ${\bf X}$

On Unixes, you Should see 3 or 4 directories in the installation directory depending on wrappers:

- third_party
 - include
 - -~ lib (Windows and Mac OS X) or lib64 (GNU/Linux)
- gVirtualXRay-1.1.3
 - Bin2C.cmake
 - CreateHeaderFiles.cmake
 - gVirtualXRayConfig.cmake
 - include
 - lib
 - LICENSE.txt
 - test
 - third_party
 - UsegVirtualXRay.cmake
 - SimpleGVXR-1.0.1
 - include
 - lib

- SimpleGVXR-doc.i
- SimpleGVXRConfig.cmake
- test
- UseSimpleGVXR.cmake
- gvxrWrapper-1.0.1
 - data
 - python3

Test the Python wrapper

- 1. Go to gvxrWrapper-1.0.1/python3,
- 2. Execute the test script. You should see something like:



The X-ray image is displayed using linear, log and power law colour scales using Matplotlib.

- 3. Press <Q> to close this window and the real-time viewer will open:
- 4. Use the mouse wheel to zoom-out:
- 5. Use the mouse left button and move the mouse around to adjust the view:
- 6. Press $\langle B \rangle$ to hide/show the X-ray beam:
- 7. Press <W> to view the 3-D object in solid/wireframe mode:



Illustration









Illustration



- 8. You can also press <N> to display the X-ray image in negative or positive and <H> to hide/show the X-ray detector.
- 9. Press <Q> or <ESC> to exit. When the script ends, there'll be two new files:
- xray_image-0.mha: contains the X-ray image. MHA fies can be viewed with the popular scientific image viewer tool ImageJ/Fiji.

- lbuffer-0.mha: contains the length of X-rays crossed in the 3-D object.
- 10. If you want to create your own simulations, have a look at the script. You can find it at https://sourceforge.net/p/gvirtualxray/code/HEAD/tree /trunk/Wrappers/python3/test.py.

Back to main menu

Click here