

How?

Geant4 Pointers for Medical Physicists
A bunch of links to resources

Joseph Perl

G4NAMU Meeting

at the

52nd Annual Meeting of AAPM

Philadelphia 18 July 2010

Does Life Have to be So Difficult?

- Using the Scoring Classes
examples/extended/runAndEvent/RE01
<http://www-geant4.kek.jp/lxr/source/examples/extended/runAndEvent/RE01/>
- Command-based Scoring
examples/extended/runAndEvent/RE02
<http://www-geant4.kek.jp/lxr/source/examples/extended/runAndEvent/RE02/>
- Easier Gun for Certain Purposes
Geant4 General Particle Source
but be aware that all particles originate from surface, so may not be ideal for all uses
<http://reat.space.qinetiq.com/gps/>
<http://www-geant4.kek.jp/lxr/search?string=G4GeneralParticleSource>
- CAD to GDML Geometry
Paper by Magdalena Constantin et. al
<http://dx.doi.org/10.1088/0031-9155/55/8/N03>

Can I See What's Going On?

- Visualization Talks

Introduction

<http://geant4.slac.stanford.edu/Presentations/vis/G4VisIntroduction.pdf>

Commands

<http://geant4.slac.stanford.edu/Presentations/vis/G4VisCommands.pdf>

Advanced

<http://geant4.slac.stanford.edu/Presentations/vis/G4VisAdvanced.pdf>

- Visualization Tutorials

OpenGL

<http://geant4.slac.stanford.edu/Presentations/vis/G4OpenGLTutorial/G4OpenGLTutorial.html>

HepRApp

<http://geant4.slac.stanford.edu/Presentations/vis/G4HepRAppTutorial/G4HepRAppTutorial.html>

DAWN

<http://geant4.slac.stanford.edu/Presentations/vis/G4DAWNTutorial/>

[G4DAWNTutorial.html](http://geant4.slac.stanford.edu/Presentations/vis/G4DAWNTutorial.html)

gMocren

<http://geant4.kek.jp/gMocren>

<http://geant4.slac.stanford.edu/SLACTutorial09/DICOMandMocren.pdf>

Can I Truly Understand History?

- You can set up Geant4 so that at time of scoring you are told the complete particle history.
<http://geant4.slac.stanford.edu/PueblaTutorial2010/Kernel2.pp>

Can I Trust My Intuition?

- About Speed? No
- About Memory Use? Probably not that either
- Use Profiling Tools.
Every operating system provides some. Pick one and use it.
- On the Mac: XCode
from Activity Monitor
click on a process to get process window
then hit the "sample button"
- IgProf
general purpose CPU and Memory profiling tool for use in Geant4.
Not quite ready for public release yet, but soon
I will send mail to G4NAMU when it is ready
Mike Kelsey's notes on using this profiling tool
<http://www.slac.stanford.edu/~kelsey/geant4/igprof-slac.notes>

Is There an App for That?

- Geant4 Comes with a Large Number of Examples
- Talks about the Examples
 - <http://geant4.slac.stanford.edu/PueblaTutorial2010/ExampleDoc1.pdf>
 - <http://geant4.slac.stanford.edu/PueblaTutorial2010/ExampleDoc2.pdf>
- Browse the Examples
 - <http://www-geant4.kek.jp/lxr/source/examples/>

Can I Make Things Move

- Makoto's Rotation Example
<http://www.slac.stanford.edu/~asai/Rot.tar.gz>

Can I Tell If Geometry is Overlapping?

- Makoto's talk on geometry checking tools
<http://geant4.slac.stanford.edu/PueblaTutorial2010/Geometry2.ppt>

Do I Need to Wait for Every Single Interaction?

- Makoto's talk on Advanced use of the Geant4 Particle Stacks
<http://geant4.slac.stanford.edu/PueblaTutorial2010/Kernel2.ppt>

Can I Apply Variance Reduction

- Mike's talk on Event Biasing
<http://geant4.slac.stanford.edu/PueblaTutorial2010/EventBiasing.pdf>
- Bremsstrahlung Splitting Exercise
<http://geant4.slac.stanford.edu/PueblaTutorial2010/HandsOn5/>

Can I Manage Random Seeds for Large Numbers of Jobs

- See how we did it for the NRCC Electron Scattering Benchmark
`examples/extended/medical/electronScattering2`

<http://www-geant4.kek.jp/lxr/source/examples/extended/medical/electronScattering2/>

Should I Bother Upgrading to the Newest Geant4 Release?

- Joseph's talk on Updating your Release
<http://geant4.slac.stanford.edu/PueblaTutorial2010/Upgrading.pdf>

Can I Believe?

- EM Validation Web
<http://www-zeuthen.desy.de/geant4/web/verification3.php>

Can I tell What's Changed from Release to Release?

- The LXR source browser can compare any two versions for you
<http://www-geant4.kek.jp/LXR/>
- Joseph's EM Changes summary (somewhat outdated)
<http://www.slac.stanford.edu/cgi-wrap/getdoc/slac-tn-08-002.pdf>

Can I Meet the People Who Keep Making All These Changes?

- Collaboration Meeting, October 4-8
ESA Research Center (ESTEC), Noordwijk, Netherlands
- Collaboration members only, but others allowed by special invitation
Contact Joseph

Can I Go Lower?

- Geant4-DNA Project (led by Petteri Nieminen and Sebastien Incerti)
Web page about the collaboration
<https://twiki.cern.ch/twiki/bin/view/Geant4/LoweDNAMOU>
Publication describing the project
<http://www.worldscinet.com/ijmssc/01/0102/S1793962310000122.html>
Web page about the relevant physics processes
<https://twiki.cern.ch/twiki/bin/view/Geant4/LoweMigratedDNAProcesses>
- Paul Gueye, who is here tonight, is a member of the project

Can I Go Higher?

- Geant4 Space Users Workshop, August 18-20
Boeing Aerospace, Seattle
<http://active.boeing.com/events/GEANT4/index.cfm>

Can I Escape the Bounds of our Single Universe?

- Geant4 supports Parallel Geometry
<http://www-geant4.kek.jp/lxr/source/examples/novice/NO7/>

Can I Get some Water?

- Vladimir's Comments on home-made Water versus G4_Water
<http://hypernews.slac.stanford.edu/HyperNews/geant4/get/geometry/1014/1.html>

Am I Alone?

- Hypernews Forums
<http://hypernews.slac.stanford.edu/HyperNews/geant4/cindex>
- G4NAMU Mailing List
<http://geant4.slac.stanford.edu/g4namu/>
- G4EMU
<http://g4emu.wikispaces.com/>
- SLAC Geant4 Group
<http://geant4.slac.stanford.edu/>
- Next Tutorial by the SLAC Geant4 Team:
January 10-14, 2011, Texas A&M University
will be announced on G4NAMU mailing list
and Geant4 Users mailing list
and Geant4 Home Page
and SLAC Geant4 Group Home Page

Can I Become a Better Person?

- Answer questions on Geant4 Hypernews
Geant4 developers really appreciate when you do this.
- Join the Geant4 Collaboration
Just requires that you define a meaningful contribution
talk to Joseph
or any Geant4 Working Group Coordinator
- Help test the parts of Geant4 that really matter for Medical Physics
See next talk