C++ and Worshop – WG4

Alain Bellerive

Outline

C++ Interface... Interface... Interface...

- C++ GarfieldMainFrame (3rd attempt!!!)
- New Garfield in C++ for MPGD (the future)
- Geant4 Parameterization Framework (example)

- Plan for an RD51 'Software School‘

- Summary

C++ GarfieldMainFrame

First version 2008 by Rob Veenhof

- C++ GarfieldMainFrame
- Basic C++ wrapper of Fortran code
- Basic objects (wires and planes)

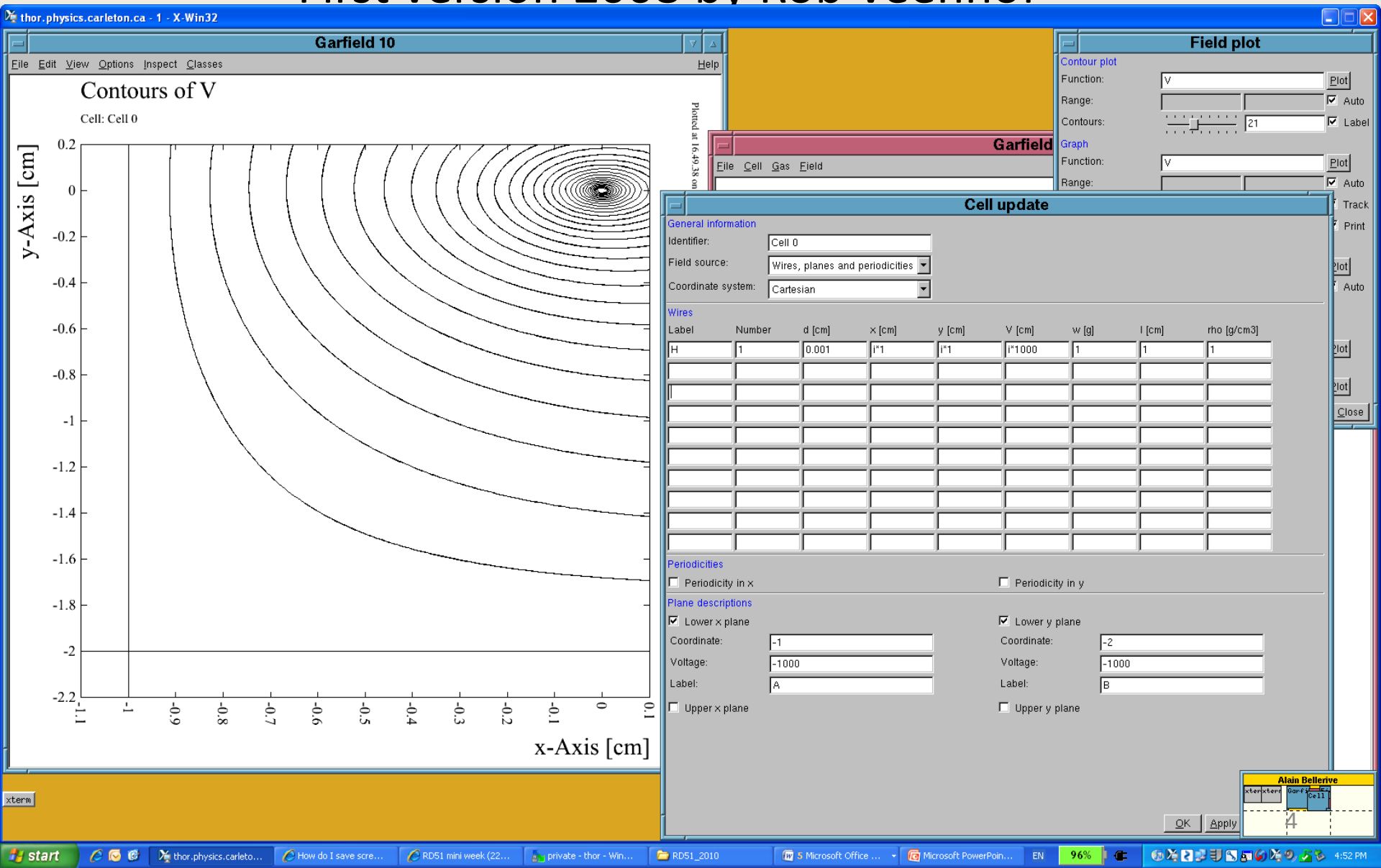
```
cell = new Cell();
dl = new DriftLine();
track = new Track();
```

- To allow interface with **ROOT (?)**
- Objects for **Geant4 (!)**
- **GarfieldMainFrame not maintain and obsolete**

Need to consolidate in future with C++ (next)

C++ GarfieldMainFrame

First version 2008 by Rob Veenhof



New Garfield in C++ for MPGD

Heinrich Schindler and Rob Veenhof

- In development (hopefully more soon)!!!
- Totally **new** C++ code specific for MPGD
- More robust
- Need to consolidate C++ platform

Objects:

AvalancheMC or AvalancheMicroscopic

ComponentFieldMap

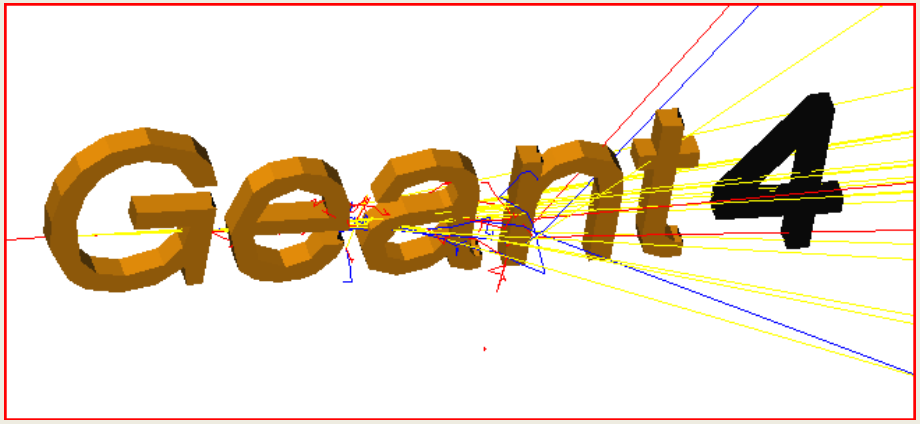
New Garfield in C++ for MPGD

Heinrich Schindler and Rob Veenhof

Allow specific study of MPGD:

- Field calculation (100 micron scale)
- Gas properties
- Calibration
- Understanding small scale physics
- Generic charge collection, transport and gain
- Avalanche, signals etc...
- Several application domains

Interface to Geant4



For the design of complex and large scale detectors

Strengths:

- Detector Construction/Geometry
- Visualization
- Accessibility
- Lots of built in features

Weaknesses:

- Transport through Gases
  - Accuracy
  - Speed
- Limited support for EM fields
  - Only uniform fields or user entered field maps

Weaknesses severely limit simulations of gas detectors!

The Team

A. Bellerive: Hardcoded (2007)

S. Guindon: Interface with C++ GarfieldMainFrame (2008)

N. Shiell & A. Bellerive: G4 FastSim GarfieldModel (2009)

R. Veenhof: Author C++ GarfieldMainFrame

Heinrich Schindler: New C++ ‘Garfiled’ code

P. Gumplinger: G4 Consultant (TRIUMF lab)

Plan: Was release in January 2010... Update summer 2010

Allow Garfield to propagate primary and daughter particles in gas volume for Geant4 !!!

- Primary Particle
- Detector geometry
- Visualization

- Primary Particle
- Ionized electron Paths
- Trajectory

Need to create Garfield Simulation in Geant4:

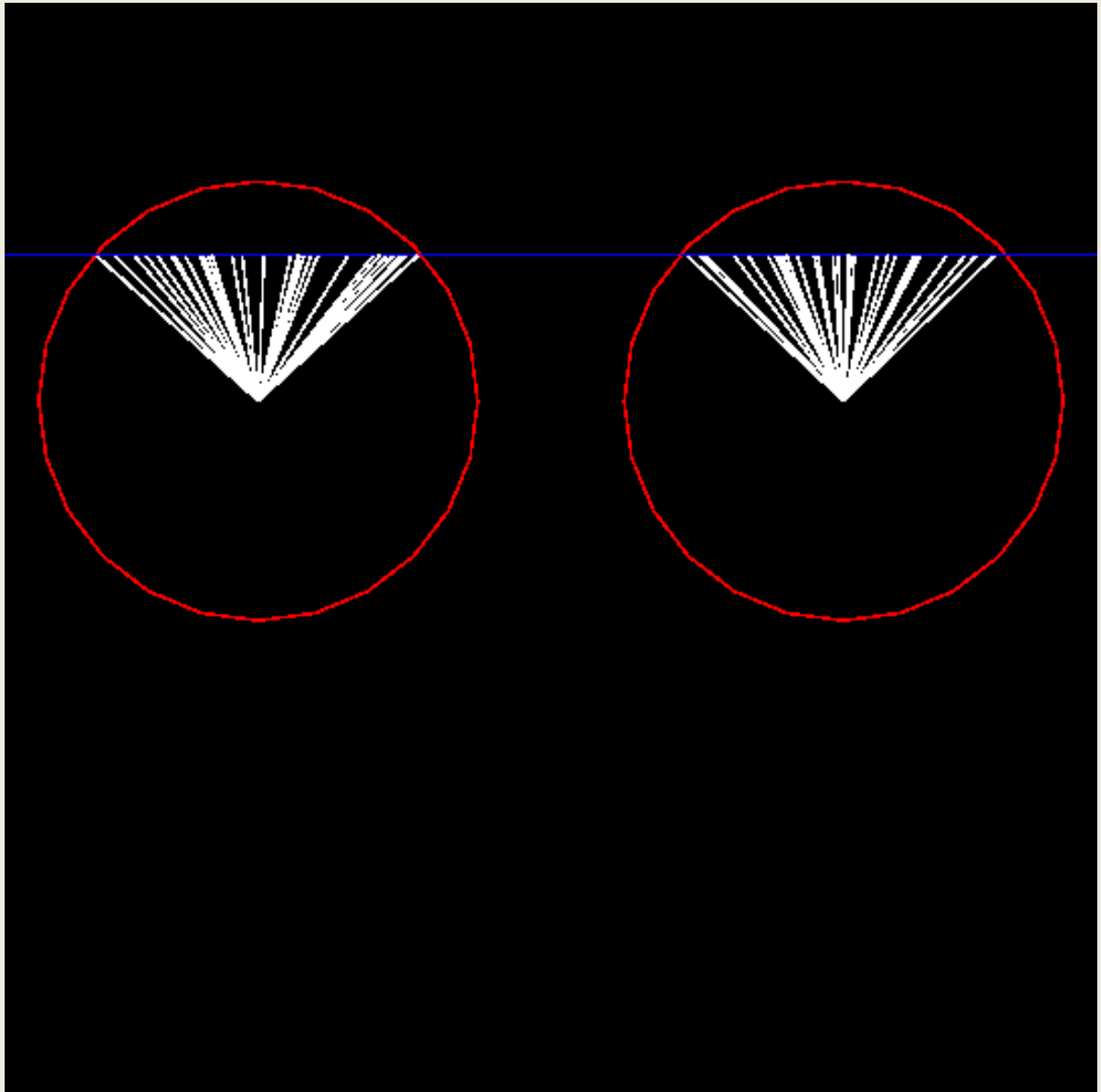
- Cell
- Gas
- DriftLine
- Track

Want to do this using **G4FastSimulationModel**:

- Define constructors
- Define pure virtual functions
  - isApplicable
  - ModelTrigger
  - DoIt

Example: Results

Visualization of Electron Paths in Geant4:



Example: Code!!!

Simple version of the code described in the RD51 talk:
http://www.physics.carleton.ca/~alainb/G4Parameterizing.pdf

G4VFastSimulationModel which invokes GARFIELD to
propagatea particle when it enters a gas detector.
Get the file at:
http://www.physics.carleton.ca/~alainb/G4MuonTube.tar.gz

In your local GEANT directory, create a directory named N02
and copy G4MuonTube.tar.gz in this directory.

All instruction in G4alainb_README

Summary (C++)

Plan of Activities C++ specific

- Consolidate C++ code... Maintain, distribute, tag, etc...

- Interface with Geant4
  - In place: cell with wires and planes with G4FastSimulation
  - Missing: generic field calculator for any geometry
  - Missing: automatic gas definition properties
  - Merge GarfieldMainFrame in C++ platform
  - Be more MPGD specific (!)

- C++ data analysis platform (test beam)

Simulation and SoftwareWorshop

Early 2011 (mini-week)

General gas detector physics

Statistical data analysis

Linux

C++

ROOT

GARFIELD (Heed/Maxwell/Margzbolz)

GEANT4

Field calculation and Boundary Element Method

Discharge / Transport

General

for junior students

Advance

for senior students

Simulation and SoftwareWorshop

Requirements and open questions

- Invited speakers (pedagogical)

- Prepare examples and lectures

- Linux laptop or fast connection to lxplus (or fast connection to remote machine)

-Standard software installed (to be defined)

- Survey the ‘level’ of the workshop (simulation & software)

- Location: at CERN (to be confirmed)

- When : to be defined