First steps with Geant4

Report of Contributions

Contribution ID: **24** Type: **not specified**

Welcome - Introduction

How the course will proceed

Technical aspects – using Zoom breakout rooms to interact with lecturers during hands-on session

Interacting via Mattermost for questions ‘online’

Exercise follow up

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **25** Type: **not specified**

What is Geant4 ?

The toolkit / library ‘nature’ of Geant4 and how differ from radiation transport tools ?

Is there is no Geant4 ‘executable’ ? If not, why ?
Variety of existing Geant4-based application / tools.
How do you use Geant4 ?

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **26** Type: **not specified**

Describing your detector - Concepts

Presenter: COSMO, Gabriele (CERN)

Contribution ID: **27** Type: **not specified**

Introduction

Monday 15 April 2024 14:00 (1h 30m)

- scope and goal of this course
- a short introduction to Geant4
- introduction of some important Geant4 concepts such as run, event, track, etc.

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **28** Type: **not specified**

Hands-on: Examine parts of a first example

Presenters: COSMO, Gabriele (CERN); APOSTOLAKIS, John (CERN)

Contribution ID: **29** Type: **not specified**

Hands on: Adding volumes to the world

Presenters: COSMO, Gabriele (CERN); APOSTOLAKIS, John (CERN)

Contribution ID: **30** Type: **not specified**

Questions & Answers plus Homework

Contribution ID: **31** Type: **not specified**

Detector Description

Tuesday 16 April 2024 14:00 (1h 30m)

- introduction of the G4VUserDetectorConstruction interface
- introduction to the Geant4 geometry description
- introduction to the Geant4 material description

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **32** Type: **not specified**

Visualisation - lecture & hands-on

- Visualise your detector geometry

Brief overview and hands-on exercises

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: **33** Type: **not specified**

Implementation of the Detector-Construction of our application

Tuesday 16 April 2024 15:55 (2h 5m)

- we will develop the main of our application then we start to implement the mandatory components, first the DetectorConstruction, i.e. the detector geometry and material description

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **34** Type: **not specified**

Generation of primaries - lecture & hands-on

Presenter: IVANTCHENKO, Vladimir (CERN)

Contribution ID: **35** Type: **not specified**

Hands on

- Finding information in G4Step, G4Track
- Creating Sensitive Detector ProcessHits() method that extract energy deposit
- Alternative method: Built-in scorer

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: **36** Type: **not specified**

Review of homework - questions & answers

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: **37** Type: **not specified**

Extracting information: Part 2 - scoring and hits

Overview of sensitive detectors and built-in scorers.

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **38** Type: **not specified**

Complete the Detector-Construction implementation

Wednesday 17 April 2024 14:00 (1h 30m)

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **39** Type: **not specified**

Primary particle generation

Wednesday 17 April 2024 16:00 (2 hours)

- a (very basic) look behind multi-threaded Geant4
- introduction of the G4VUserPrimaryGeneratorAction and usage
- introduction of G4VUserActionInitialization interface
- implementation of the primary generator of our application

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **40** Type: **not specified**

Review of homework - questions & answers

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: **41** Type: **not specified**

Defining / using magnetic field

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **42** Type: **not specified**

Introduction to (some of) the further Geant4 user actions

Thursday 18 April 2024 16:00 (2 hours)

- recapitulation of the related Geant4 concepts (run, event, step)
- introduction of the Stepping-, Event- and Run-Actions and the related Geant4 interfaces (G4UserRunAction, G4UserEventAction, G4UserSteppingAction)
- implement the remaining user actions of our application

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **43** Type: **not specified**

Hadronic physics

Presenter: RIBON, Alberto (CERN)

Contribution ID: **44** Type: **not specified**

Hands on - Magnetic Field

Creating and registering a simple magnetic field.

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **45** Type: **not specified**

Add some flexibility to our application through UI commands

Friday 19 April 2024 14:00 (1h 30m)

- introduction to Geant4 UI commands
- implement some UI commands to allow e.g. change of the target material, thickness

Primary author: NOVAK, Mihaly (CERN)

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: **46** Type: **not specified**

Complete the primary generator implementation

Thursday 18 April 2024 14:00 (1h 40m)

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **47** Type: **not specified**

Multi-threading

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **48** Type: **not specified**

Followup topics - questions & answers

Extension of existing concepts

Presenters: RIBON, Alberto (CERN); COSMO, Gabriele (CERN); APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: **49** Type: **not specified**

Hands on - messengers

- Use of messengers

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: **50** Type: **not specified**

Hands on - EM physics

- Simple magnetic field
- EM physics exercises
- Hadronic: choose hadronic physics list + compare profile of pion shower to electron shower

Presenters: RIBON, Alberto (CERN); APOSTOLAKIS, John (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: **51** Type: **not specified**

Hands on - Hadronics

- Hadronic: choose hadronic physics list + compare profile of pion shower to electron shower

Presenters: RIBON, Alberto (CERN); APOSTOLAKIS, John (CERN); IVANTCHENKO, Vladimir (CERN)

Contribution ID: **52** Type: **not specified**

Hands on - multithreading

- Running in multi-threading mode

Presenters: APOSTOLAKIS, John (CERN); NOVAK, Mihaly (CERN)

Contribution ID: **53** Type: **not specified**

Recap

Friday 19 April 2024 15:50 (2h 5m)

- enjoy using the application that we developed together, compare the results with experimental data
- summary of the course and outlook

Primary author: NOVAK, Mihaly (CERN)

Presenter: APOSTOLAKIS, John (CERN)

Contribution ID: **54** Type: **not specified**

Preliminaries

Monday 15 April 2024 15:50 (2h 10m)

- introduction of our work environment (i.e. the virtual machine installation, demystification of Geant4 install and CMake configuration, etc.)
- recapitulation of some object oriented concept of C++ crucial for the course (such as interface and their usage)

Presenter: NOVAK, Mihaly (CERN)

Contribution ID: **55** Type: **not specified**

Checkin

Problems with Geant4 Virtual Machine ?

Issue with alternative Geant4 installation (for those with Mac computers with M1 processor.)

Session Classification: Preparation

Contribution ID: **56** Type: **not specified**

Zoom check

Session Classification: Preparation

Contribution ID: **57** Type: **not specified**

Lecturer Preparation