Track reconstruction
Hadrien Grasland 2024-03-18

News since last WP12 meeting

Acts (done)

- Build overhead issues again → Major vertexing refactor
  #2876 #2877 #2878 #2880 #2881 #2886 #2946 #2948 #2952 #2953 #2954 #2971 #2973 #3013 #3031

- 8x8 matmul merged after 2 years ! → 5 % propag. speedup

- GX²F : Major covariance bugfix + Add physmon truth tracking

- Remove old C++ examples and autodiff support

- Can now autotune seeding wrt direct perf., not just CKF

- Document track EDM and CKF

- New geometry now supports Gdml

- New CI platforms : LCG105 and macOS 13

- Seeder becomes grid-generic, can mask off grid bins

Acts (WIP)

- Major material mapping refactor #1900 #2909 #3015 #3016 #3020 #3021

- Simplify stepper extension mechanism

- Covariance transport for dense propagation

- Much bigger particle data table

- Read-only space point EDM

- New ODD version with calorimeter

- Various smaller refactors : #2722 #2814 #3012

4

Detray

- Done

  - Lots of code cleanup #625 #638 #664 #665 #667 #673
  - Dynamic grid capacity and associated builder support
  - Prepare for grid I/O with volume local surface indices
  - Material map readout and volume material

- WIP

  - Material map SVG display and volume material builder
  - Invert propagation-geometry dependency direction

traccc

- Port greedy ambires from Acts, then add physics perf writer

- Alpaka and Kokkos seed finding

- Major CLI options cleanup

- Support ODD runs via detray in CPU chain

IJCLab calo sim postdoc

- Following IML discussion, some changes in strategy
  - Same as before : 1 year contract, need previous experience
  - New : Try alternatives to GAN, which are hard to train
  - Will investigate state of the art before postdoc starts

Next steps for Sylvain

- Ideas in decreasing priority order
  - CPU ML solver (prerequisite : ONNXRuntime @ Cmake)
  - GPU greedy solver
  - Fine-grained time monitoring

- Will soon be cut off by thesis writing…

Year highlights

Acts highlights

- Acts workshop → Lots on current design, future plans
- Lots of new docs, including theoretical white papers
- Volume-based geometry builds ODD via DD4hep, imports Gdml
- Public track EDM + POD-IO/EDM4hep support
- Wire chamber support, global chi² fitter
- ML seed filter → 2x faster tracking at ~no efficiency cost
- Lots of seeding & fitting algs became faster, more generic
- Vertexing algs gained timing support, reduced build overhead

Detray highlights

- Grid-based local surface navigation

- Volume placement transforms

- Lots of progress on material support (I/O, scan, maps)

- Many new visualization features (SVG + GraphViz)

- Lots of refactoring : decoupling, organization, encapsulation...

Traccc highlights

- AoS/SoA data layout abstraction

- GPU continuous integration

- More code sharing between CUDA & SYCL

- More effcient host/device communications (sync, data trafic)

- Progress on Alpaka and Kokkos versions of algorithms

- Greedy ambiguty solver

Thanks for your attention !