Summary of HEP and Accelerator physics part of panel discussion on Large Scale Simulations

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Abstract. I present a summary of the discussion that took place after the presentations in the panel discussion session covering large scale simulations in high energy, accelerator and astrophysics.

INTRODUCTION

In the panel discussion on large scale simulations, Pavel Murat described the CDF Monte Carlo (1), which now has an extensive GEANT component. This was followed by Gregory Graham(2) of DØ who described the status of simulations software of that experiment. Hans Wenzel(3) described the CMS Monte Carlo and Fred Luehring(4) the Atlas Monte Carlo. The accelerator talk by Daniel Elvira(5) covered muon Cooling and transportation code for the Muon Collider/Neutrino factory project.

The discussion period in the sessions was lively and included insights into the problems common to astrophysics and particle physics as well as those common to particle physics experiments.

SUMMARY OF DISCUSSION SESSION

One of the items that stood out during the joint astrophysics HEP panel discussion is the commonality of clustering algorithms between HEP and Astrophysics. In HEP, one needs to cluster calorimeter cells with energy deposited in them to form jets. The clustering should ideally be done in three dimensions- in pseudo-rapidity, azimuthal angle and depth. In astrophysics, an identical problem occurs when trying to cluster stars found by the Sloan Digital Sky Survey for instance, where one has to associate stars into clusters also in three dimensions. Some joint algorithm development and/or sharing would be helpful. Perhaps some joint working groups can be set up to investigate this matter further.

The other problem that became evident in HEP simulation and reconstruction is the absence of the use of a common database to describe geometry of the detectors in simulation and reconstruction. Almost all the HEP experiments mentioned above use one geometry database to simulate the detector and another one to reconstruct the data. Much time and effort is spent in trying to ensure that the information contained in either is the same as the other. What is lacking is a well defined suite of routines that will serve the purposes of both simulation and reconstruction that use the same set of numbers to describe the geometry. Such a database should also be able to handle alignment information and calibrations.

The question then arose as to why the full power of C++ is not utilized to provide generic reconstruction programs (generic track finders and, calorimeter reconstructors). Already we use GEANT3 and GEANT4 as generic simulation tools. So why should one not strive for a suite of programs that will contain the optimal algorithms for tracking in non-uniform magnetic fields that handle multiple scattering errors correctly and produce the best estimate for the momenta of tracks. Why is the wheel being re-invented so many times?

The answer to this question seems to be that once the geometry data base tool is developed, then perhaps we would get to a situation where generic reconstruction programs will be available. But such programs are much easier to write and develop than GEANT3/4 and so reinventing the wheel would never be fully abolished, especially since it is so much fun and is also educational.

ACKNOWLEDGMENTS

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REFERENCES

1. Pavel Murat, these proceedings.

2. Gregory Graham, these proceedings.
3. Hans Wenzel, these proceedings.
4. Fred Luehring, these proceedings.
5. Daniel Elvira, these proceedings.