Object Oriented Tracking Software for the ATLAS Experiment

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Abstract

The LHC experiments will be bigger and more complex than current HEP experiments, in detector size and complexity, number of physicists, event size, bunch crossing rate and almost certainly experiment lifetime. It is therefore crucial that all elements of an experiment should be designed, built and maintained to the highest engineering standards. Correctness of software has not been a major issue untill now. It must be taken very seriously at LHC because complex software will be part of each LHC experiment's trigger.

Software development for the LHC experiments has already started using methods traditionally used in HEP for many years. The experience from this software indicates that the software to be used during LHC operation should be done on a different basis.

The Moose Collaboration (RD41 at CERN) has been established to study the viability of the Object Oriented approach for software development for High Energy Physics reconstruction and analysis code at the LHC.

After the first training period the ATLAS part of the Moose Collaboration has started to build a prototype whose goal is the creation of a software package for tracking electrons in the ATLAS Electromagnetic Calorimeter and the Inner Tracker.

The Moose environment is covered in other talks. This talk will concentrate on the Prototype itself.

The main stream of work concerns the analysis, design and coding of the tracking part of the program. Starting form the Problem statement, following schemas have been designed:

- **Calorimetry** for defining a seed, which serves as one of the starting points for the definition of the Road in which Pattern Recognition is performed.
- **Tracking** for implementing of the tracking algorithm itself.

- **Helix-fit** for the fitting the track parameters and judging the quality of potential hit association.
- **Circular-Pattern-Recognition** for the recognition of more complicated sets of tracks.
- **Geometry** and **Media** for the organizing and accessing data.
- **Input**, **Events**, **Raw-Data** and **Trees** as service schemas.
- **MOP** to add Persistency to objects.
- **Math**, **IO**, etc. as basic service class libraries

The Prototype reads the data generated by the standard simulation program (Geant) and can write output using ntuples and MOP.

The Prototype can also be run together with the current ATLAS software by linking Fortran and Eiffel with a small number of C interface functions. This is important to be able to test our software in the current environment and to ease transition of software (as well as people) from the current code to the Object Oriented system. There is a risk of this approach in the propagation of badly structured legacy code into the new software.

After the first year of existence, the ATLAS part of the Moose Colaboration already has a running prototype which is based on the Object Oriented Paradigm.

Parallel Session Suggestion: Tools, Languages, and Software Development Environment
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