Gieβen March 20th, 2015

Universita'
di Pavia
Italy

Summary of the Pattern Recognition Workshop

Gianluigi Boca

Universita' di Pavia and INFN, Italy

INFN
Istituto Nazionale
di Fisica Nucleare

On last Monday there was a workshop dedicated to Pattern Recognition software issues :

Secondary Vertices Pattern Recognition

Pattern Recognition in the Forward Detector

Pattern Recognition in the Central Detector

Quality Assurance task

The T_0 task task

Secondary Vertices Pattern Recognition

The hyperons channels are very important for the Panda physics program and the $\Lambda \rightarrow p\ \pi^-$ reconstruction is a very challenging task.

Long presentation by Lia Lavezzi on the status of her secondary vertex pattern recognition that now includes Stt, Mvd and Gem

Ideas presented by Walter Ikegami Andersson focussed on a pattern recognition efficient for secondaries decaying in the Stt system (no Mvd nor forward detectors hits, particularly important for instance for Ω^-)

Discussion on possible synergies between these two tasks to avoid duplications of efforts.

Pattern Recognition in the Forward Detector

Talk by Piotr Poznanski from Cracow University of Technology on four different approaches to the PR with the Forward Tracker.

Time of delivery of a working package I hope a few months (?)

Recommendation of looking at Martin's work in order to avoid duplications of efforts.

From conversations I had later I learned it is possible that Martin comes back into the game after his graduation.

Also Ivan Kisel expressed interest of his group in writing a Cellular Automaton algorithm for foward PR.

Pattern Recognition in the central detector

Talk by Tobias Stockmanns on a new fast Hough trasform algorithm based on Mvd hits to which later the axial Stt hits are added.

Talk by Gianluigi Boca on the progress made in the 'Cleanup Procedure' necessary to the 'Road Finding' algorithm when the 20 MHz interaction rate pileup is turned on.

Talk by Ludovico Bianchi on the implementation of an Online Pattern Recognition on GPUs

Quality Assurance task

There is the need to define criteria and to implement a task for assessing the track reconstruction efficiency of a given PR algorithm : degree of spurious hits and fake tracks, momentum resolution etc. and to judge how good is an algorithm in comparison with another.

It is possible that different algorithms are the ‘best’ for different topologies (for instance : low $P_{\perp}$ tracks, high momentum tracks, etc) and in the end we may want to use them all to try to reconstruct the largest number of tracks.

NEED OF A QUALITY ASSURANCE TASK !

Quality Assurance task

Presentation by Lia Lavezzi on the criteria to use (true hits, spurious hits, missing hits etc.) and a detailed implementation in a `Pandaroot` class:

`PndMCTrackTrackAssociator`

and

`PndTrkQualityAssuranceTask`

Quality Assurance task

Presentation by Tobias Stockmanns on the criteria to use and a detailed implementation in a `Pandaroot` class using Fairlinks :

`PndTrackingQualityData`

Lia and Tobias agreed to cooperate and come up with a proposal of a class to use as MC associator/Track quality

The T_0 task issue

The time at which an interaction happened (T_0) is an essential piece of information for all pattern recognition algorithms : it is necessary in order to assign a hit to an event, to determine correctly the drift time in STT etc.

Two presentations on this subject.

The T_0 task issue

Yutie Liang presented a method based only on the Stt hits belonging to a track, for extracting the T_0 information of that track.

This method can run fast on FPGA and it can be used for online PR (and also for the offline PR !) and is very useful when T_0 cannot be provided by other detectors (for instance if there are no SciTil hits)

The T_0 task issue

Michael Papenbrock presented a project to use the info from different detectors (SciTil, Mvd, Dirc, Gem…) in the offline code to extract a T_0 for any topology of events interesting for Panda.

Conclusions

A lot of interesting talks during all day of Mondays showing the progress made in all areas of the Pattern Recognition software;

the issue of the Pattern Recognition in the Forward Spectrometer is being addressed by the Cracow group and also the Frankfurt group is interested in it;

we are addressing the crucial issues of a Quality Assurance task and the T_0 task