Summary of the pattern recognition workshop

Michael Papenbrock

Uppsala University
for the PANDA collaboration

PANDA collaboration meeting
Hyperon session
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The workshop

- Has been in planning for a couple of months
- Different teams working on similar projects
- $\rightarrow$ Coordinate efforts, find synergies!
- Find agreement on certain tasks (e.g. quality assurance)

Progress on the pattern recognition for secondary particles (Lia Lavezzi)

- Secondary track finder addressing several issues:
  - displaced vertices
  - low momentum particles
  - forward boost / low θ
- Tested with displaced vertices for pions and protons (particle gun)
- Tested with $\Lambda\bar{\Lambda}$ events, both phase space and forward boosted
- Secondary track finder shows better performance far away from the IP and in low θ region compared to primary track finder
- Primary track finder still better in certain regions
- Development in progress!

Hyperon Tracking with the Skewed Straws in the Straw Tube Tracker (Walter Ikegami Andersson)

- Hyperon events can contain tracks leaving only hits within the STT (no MVD, GEM)
- Most prominent in case of $\bar{p}p \to \Omega^- \overline{\Omega^+}$ (29.5%!!!)
- Extraction of p_z information from the STT only required for complete event reconstruction
- $\to$ Development started using skewed straws

Quality assurance task (Lia Lavezzi and Tobias Stockmanns)

- Performance of different track finders needs to be tested and compared ⇒ quality assurance task
- Different quality aspects under consideration
  - Association of reconstructed track with MC tracks
  - Number of hits found, contamination of hits from other tracks, etc.
  - Clone tracks
  - Momentum resolution
- Data sets used as input: Generic (e.g. box generated), physics channels (input from physics groups)
- Efforts joined for further development
- In the end should help making a decision about which algorithms for pattern recognition / tracking to use

Pattern Recognition FTS (Piotr Poznański)

- Different methods under consideration
  - Pattern Matching
  - Hough Histogram
  - Circle-Line-Tangent Filter
  - Circle-Tangent Region
- (Partially) implemented
- Combination of methods may be required
- Adjustment of methods and efficiency tests in the future

T_0 extraction (Yutie Liang and Michael Papenbrock)

- T_0 base requirement for determination of STT isochrones
- Method based on optimisation of isochrones to track (Yutie)
- Method based on projecting track to SciTil to calculate T_0 from SciTil time signal and particle time of flight
- Further consideration: TimeGapEventBuilder using solely MVD information would miss a significant number of Hyperon events and higher momenta

Status of Genfit2, the Kalman tracking tool (Elisabetta Prencipe)

- Kalman equations in PandaRoot provided by genfit
- Update to genfit2
- Announced to work with every B field (solenoid and dipole)
- Successfully ported in PandaRoot
- Improvement at low momenta (pions, $p = 0.15\text{GeV}/c$)

Even more!

- Status of the Cleanup code for the Road Method pattern recognition (Gianluigi Boca)
- Circle Hough algorithm pattern recognition (Tobias Stockmanns)
    - Focussed on primary track right now
    - Modification for secondary tracks generally possible, high combinatorics though
    - $\rightarrow$ Has to be decided based on performance of other secondary track finders
- Updates on Online Tracking algorithms with GPUs (Ludovico Bianchi)
- Discussions!

The End

Thank you for your attention!