24th IEEE Real Time Conference - ICISE, Quy Nhon, Vietnam



Contribution ID: 166

Type: Mini Oral and Poster

A 3D track reconstruction algorithm for the pre-research of STCF MDC L1 trigger

Tuesday 23 April 2024 12:35 (20 minutes)

The proposed STCF (Super Tau Charm Facility) is an electron-positron collider with high luminosity. Considering the high radiation and counting-rate environment and the pure physics event rate up to 400kHz, it becomes crucial for the Level 1 trigger system to suppress the background to an acceptable rate. Now we present the 3D track reconstruction algorithm for the pre-research of STCF MDC L1 trigger, which can reject tracks outside of the interaction region and present 3D track information to the Global Trigger Logic of L1 trigger for further analysis with other subdetectors. Using the hit information of the Main Drift Chamber (MDC) and transverse momentum and azimuthal angle from previous work of 2D reconstruction, the z (longitudinal) position of the track vertex and the polar angle (θ) concerning the z-axis are reconstructed based on a neural network approach. The phase space of transverse momentum (pt > 0.2GeV) is divided into eight intervals to achieve a high resolution. The neural network for each interval has an identical structure but different parameters. The resolution of z-vertex reconstruction of a single track (z \in [-50, 50]cm) ranges from 0.8cm to 2.7cm, supposed to reject beam background tracks with a ±3 σ interval. Two approaches will be taken to implement the neural network. One is using Verilog Hardware Description Language, which we have related work. The other approach produces an IP whose latency is less than 90ns with HLS and the Python package hls4ml. The resource utilization is still under optimization.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

Authors: FENG, Changqing (University and Science and Technology of China); LIU, Shubin (University of Science and Technology of China); DONG, Wenhao (USTC); HAO, Yidi (University of Science and Technology of China)

Co-authors: Mr ZHOU, Hang (USTC); FANG, Zhujun

Presenter: HAO, Yidi (University of Science and Technology of China)

Session Classification: Poster A

Track Classification: AI, Machine Learning, Real Time Simulation, Intelligent Signal Processing