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Line Segment Tracking: Improving the Phase 2 CMS High Level Trigger Tracking with a Novel, Hardware-Agnostic Pattern Recognition Algorithm

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Charged particle reconstruction is one the most computationally heavy components of the full event reconstruction of Large Hadron Collider (LHC) experiments. Looking to the future, projections for the High Luminosity LHC (HL-LHC) indicate a superlinear growth for required computing resources for single-threaded CPU algorithms that surpass the computing resources that are expected to be available. The combination of these facts creates the need for efficient and computationally performant pattern recognition algorithms that will be able to run in parallel and possibly on other hardware, such as GPUs, given that these become more and more available in LHC experiment and high-performance computing centres. Line Segment Tracking (LST) is a novel such algorithm which has been developed to be fully parallelizable and hardware agnostic. The latter is achieved through the usage of the Alpaka library. The LST algorithm has been tested with the CMS central software as an external package and has been used in the context of the CMS HL-LHC High Level Trigger (HLT). When employing LST for pattern recognition in the HLT tracking, the physics and timing performances are shown to improve with respect to the ones utilizing the current pattern recognition algorithms. The latest results on the usage of the LST algorithm within the CMS HL-LHC HLT are presented, along with prospects for further improvements of the algorithm and its CMS central software integration.

Significance

This presentation covers a new pattern recognition algorithm, Line Segment Tracking, shown for the first time in this conference. The algorithm is developed in the context of the CMS experiment and its application and performance in the High Level Trigger of CMS will be presented in this talk for the first time ever in a conference.

References

Experiment context, if any

CMS

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