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LHCb's Forward Tracking algorithm for the Run 3 CPU-based online track reconstruction sequence

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In Run 3 of the LHC the LHCb experiment faces very high data rates containing beauty and charm hadron decays. Thus the task of the trigger is not to select any beauty and charm events, but to select those containing decays interesting for the LHCb physics programme. LHCb has therefore implemented a real-time data processing strategy to trigger directly on fully reconstructed events. The first stage of the purely software-based trigger is implemented on GPUs performing a partial event reconstruction. In the second stage of the software trigger, the full, offline-quality event reconstruction is performed on CPUs, with a crucial part being track reconstruction, balancing track finding efficiency, fake track rate and event throughput. In this talk, LHCb's CPU-based track reconstruction sequence for Run 3 is presented, highlighting the "Forward Tracking", which is the algorithm that reconstructs charged particle trajectories traversing all of LHCb's tracking detectors. To meet event throughput requirements, the "Forward Tracking" uses SIMD instructions in several core parts of the algorithm, such as the Hough transform and cluster search. These changes led to an event throughput improvement of the algorithm of 60%.

Consider for young scientist forum (Student or postdoc speaker)

Yes

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