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Online track reconstruction at hadron colliders

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Real time event reconstruction plays a fundamental role in High Energy Physics experiments. Reducing the rate of data to be saved on tape from millions to hundreds per second is critical. In order to increase the purity of the collected samples, rate reduction has to be coupled with the capability to simultaneously perform a first selection of the most interesting events. A fast and efficient online track reconstruction is important to effectively trigger on leptons and/or displaced tracks from b-quark decays. This talk will be an overview of online tracking techniques in different HEP environments: we will show how H1 experiment at Hera faced the challenges of online track reconstruction implementing pattern matching and track linking algorithms on CAMs and FPGAs in the Fast Track Processor (FTT). The pattern recognition technique is also at the basis of the Silicon Vertex Trigger (SVT) at the CDF experiment at Tevatron: coupled to a very fast fitting phase, SVT allows to trigger on displaced tracks, thus greatly increasing the efficiency for the hadronic B decay modes. A recent upgrade of the SVT track fitter, the Gigafitter, can perform more than 1 fit/ns and further improves the CDF online trigger capabilities at high luminosity. At SLHC, where luminosities will be 2 orders of magnitude greater than Tevatron, online tracking will be much more challenging: we will describe CMS future plans for a Level-1 track trigger and the Fast Tracker (FTK) processor at the ATLAS experiment, based on the Gigafitter architecture and designed to provide high quality tracks reconstructed over the entire detector in time for a Level-2 trigger decision.luminosity. At SLHC, where luminosities will be 2 orders of magnitude greater than Tevatron, online tracking will be much more challenging: we will describe CMS future plans for a Level-1 track trigger and the Fast Tracker (FTK) processor at the Atlas experiment, based on the Gigafitter architecture and designed to provide high quality tracks reconstructed over the entire detector in time for a Level-2 trigger decision.We will describe the GF architecture, its performance, the impact on the CDF physics program and its use in the future FTK processor for Atlas.

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