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A specialized processor for track reconstruction at the LHC crossing rate

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We present the results of an R\&D study for a specialized processor capable of precisely reconstructing events with hundreds of charged-particle tracks in pixel detectors
at 40 MHz, thus suitable for processing LHC events at the full crossing frequency. For this purpose we design and test a massively parallel pattern-recognition algorithm, inspired by studies of the processing of visual images by the brain as it happens in nature. We find that high-quality tracking in large detectors is possible with sub-microsecond latencies if the algorithm is implemented in modern, high-speed, high-bandwidth FPGA devices.

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