21st International Conference on Computing in High Energy and Nuclear Physics **CHEP2015** Okinawa Japan: April 13 – 17, 2015

Contribution ID: **66**   Type: **oral presentation**

Kalman Filter Tracking on Parallel Architectures

Monday, 13 April 2015 15:15 (15 minutes)

Power density constraints are limiting the performance improvements of modern CPUs. To address this we have seen the introduction of lower-power, multi-core processors, but the future will be even more exciting. In order to stay within the power density limits but still obtain Moore's Law performance/price gains, it will be necessary to parallelize algorithms to exploit larger numbers of lightweight cores and specialized functions like large vector units. Example technologies today include Intel's Xeon Phi and GPGPUs.

Track finding and fitting is one of the most computationally challenging problems for event reconstruction in particle physics. At the High Luminosity LHC, for example, this will be by far the dominant problem. The need for greater parallelism has driven investigations of very different track finding techniques including Cellular Automata or returning to Hough Transform. The most common track finding techniques in use today are however those based on the Kalman Filter. Significant experience has been accumulated with these techniques on real tracking detector systems, both in the trigger and offline. They are known to provide high physics performance, are robust and are exactly those being used today for the design of the tracking system for HL-LHC.

Our previous investigations showed that, using optimized data structures, track fitting with Kalman Filter can achieve large speedup both with Intel Xeon and Xeon Phi. We report here our further progress towards an end-to-end track reconstruction algorithm fully exploiting vectorization and parallelization techniques in a realistic simulation setup.

Primary authors: Prof. YAGIL, Avi (Univ. of California San Diego (US)); Dr RILEY, Daniel Sherman (Cornell University (US)); Prof. WUERTHWEIN, Frank (UCSD); CERATI, Giuseppe (Univ. of California San Diego (US)); MACNEILL, Ian (Univ. of California San Diego (US)); MCDERMOTT, Kevin (Cornell University (US)); TADEL, Matevz (Univ. of California San Diego (US)); Dr ELMER, Peter (Princeton University (US)); WITTICH, Peter (Cornell University (US)); LANTZ, Steven (Cornell University)

Presenter: CERATI, Giuseppe (Univ. of California San Diego (US))

Session Classification: Track 2 Session

Track Classification: Track2: Offline software