

ATTRACT TWD Symposium: Trends, Wishes and Dreams in Detection and Imaging Technologies



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Heterogeneous computing for real-time systems

The main idea of this proposal is to exploit, in the same hardware, the computing power offered by computing units of different nature, as GPU, FPGA, Associative memories, DSP arrays and ASIC. In standard computing the algorithms are designed for a single type of processor trying to adapt the logic of the processing to the architecture of the hardware, in heterogeneous computing the processing is split according to the different kinds of specialized computing units. In such a scheme particular care is devoted to data transportation and resource sharing in order to take full advantage of the computing power offered by processing units designed with different architecture. Moreover, the software structure able to fully enable the hardware abstraction of this kind of system, will be completely design exploiting the progress obtained in recent years in the field of high performance computing.

Last but not least, particular care will be devoted to data transportation, both for bandwidth and latency issues, by exploiting new communication busses and protocols that are arriving on the market (as, for instance, NVLINK by NVIDIA).

The direct application of this idea will be in the design of next generation high performance low level triggers in High Energy Physics experiments. In this application the need to move more and more the intelligence of online data selection to the front end electronics, asks to imagine computing systems that are able to extract the interesting features of the physics events with a predictable low-latency. This kind of system can find application in different fields where hard real-time responses are essential. The most natural place are robotics, automatic control, high computing simulation, computer vision, imaging reconstruction for medical application.

Summary

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