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A fast inference platform on FPGA for the control of particle accelerators

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The required flexibility of modern particle accelerators to provide novel and exceptional beams, an increased number of operation modes, and better performance in simultaneously more compact accelerators demand advanced control methods.
In this context, machine learning algorithms are expected to find autonomously the best operating conditions. If the system under study exhibits fast dynamics, low latency inference is needed in order to perform actions in a comparable time frame.
In this talk, the preliminary development of this kind of fast inference platform based on the novel Xilinx Versal architecture will be presented. The final goal will be the integration of this system with present fast beam diagnostic instrumentation like KAPTURE and KALYPSO, developed and built at KIT, in order to use Reinforcement Learning algorithms to control microbunching instabilities at the KARA accelerator.
Finally, the KINGFISHER platform will be briefly discussed. Taking advantage of current high-level synthesis tools, the ultimate goal is to allow the programming of the full system, including the FPGA. Using only high-level programming languages like C++ and Python, might pave the way to make this platform accessible to non-FPGA experts.

Summary

Proceedings

Es darf veröffentlicht werden wie vorgetragen

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