Contribution ID: **77** Type: **not specified**

Neuromorphic image sensors for future particle detectors

The idea behind this abstract was triggered by the article entitled „Giving Machines Humanlike Eyes"[http://dx.doi.org/10.1109/MSPEC.201 in the December 2015 number of the IEEE Spectrum magazine. Of course, the idea of designing machine parts inspired by models existing in the nature is not new. However, the neuromorphic image sensors offer a completely new paradigm for computational imaging and open new doors to technological breakthroughs.

The concept of neuromorphic vision sensors exist since early 2000s. They continuously track the amplitude of each pixel and record changes of only those pixels that modify their brightness level by a pre-defined amount. This approach is called level-crossing sampling. This type of sensors is thus event-based, as opposed to the frame-based classical sensors with low and fixed sampling rate. Implementations are already commercially available at iniLabs, Switzerland [http://inilabs.com/].

The intrinsic parallelism of such sensors as well as the associated speed capabilities and extremely-low power consumption, make them interesting candidates for future particle detectors. We envisage the design and implementation of an acquisition system, using reconfigurable hardware (FPGA) and a dynamic vision sensor, allowing us to investigate the possibilities of using neuromorphic image sensors for future particle detectors.

Summary

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