SYSTEM ON A CHIP

Tomography goes live

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Positron emission tomography (PET) is a non-invasive imaging technique used to study metabolic processes in people by detecting gamma-ray emission from decaying radionuclides introduced into the body. PET detectors produce datasets that are usually stored in memory and post-processed to generate three-dimensional images of the region of interest. The quest for live image reconstruction has been limited by the lack of sufficiently powerful hardware systems and software able to process such vast amounts of data in real time. Grzegorz Korcyl and colleagues now show how field-programmable gate arrays (FPGAs) can be used to process raw data streams in order to generate real-time images.

The researchers — who are based at institutes in Poland, Italy, Austria and Iraq — use FPGAs that combine multicore processors alongside programmable logic to create a single system-on-a-chip solution. The programmable logic is used to implement data processing algorithms that organize, filter and reconstruct the raw data stream as a set of coordinates of the region of interest. The integrated processors then take this data to generate a three-dimensional point cloud and create the tomographic image in real time. The algorithms used in this approach are able to reduce the data stream volume by a factor 500, and their implementation in hardware reduces power consumption by a factor of 10, when compared to software-based approaches using conventional processors.

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