

Ultra-fast, single-blood-cell imaging detects blood cancers earlier

Imaging Flow Cytometry

While early detection and analysis are keys to successful treatment of cancers of the blood, it's not easy to do because there may be very few cancerous blood cells to observe. At the University of Hong Kong (HKU), researchers are tackling this problem by developing imaging flow cytometry techniques with extremely high throughput rates and single-cell imaging. When coupled with deep-learning neural networks, artificial intelligence, and automated "big-data" analysis, imaging flow cytometry promises to dramatically reduce test times while achieving high statistical accuracy.

High Throughput with Pulsed Laser Imaging

The HKU researchers' goal was to substantially reduce the time and cost of blood screenings. This has been achieved using pulsed laser line-scan imaging that performs a line-scanning rate of 10M lines/second at a sample flow speed of 7 m/s. HKU chose SP Devices' ADQ7DC 14-bit, 10-Gsample/s digitizers to process the enormous quantities of resulting data—up to 100,000 single-cell images/s and 1 TB of image data in 1-2 minutes.

For HKU, a key attribute of the ADQ7DC digitizers is their on-board FPGAs. The ability to incorporate custom FPGA implementations enables detection of cancer cells within the input signal (a 2D image stream formed by stacking lines of 1D samples) using sophisticated triggering techniques that are not otherwise possible. Additionally, the cancer-cell images require real-time adaptive cropping at the full sampling rate, which is essential in maintaining the real-time data flow for further processing by external hardware such as GPUs. The ADQ7DC digitizers' peer-to-peer streaming capability facilitates this direct transfer of data to the GPUs without loading down the system CPU.

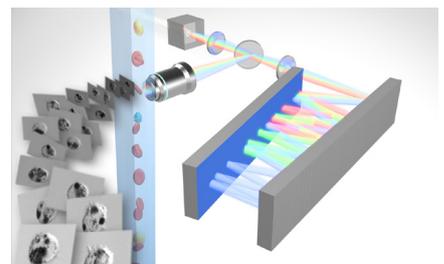


+ Custom laser by HKU

Highlights

+ The massive throughput of the ADQ7DC digitizers reduces test time by at least 100 times compared with current technologies.

+ HKU's imaging system achieves line scan rates of 10M lines/s vs. 23k frames/s for high-speed CMOS cameras.



+ Unmatched scan rates