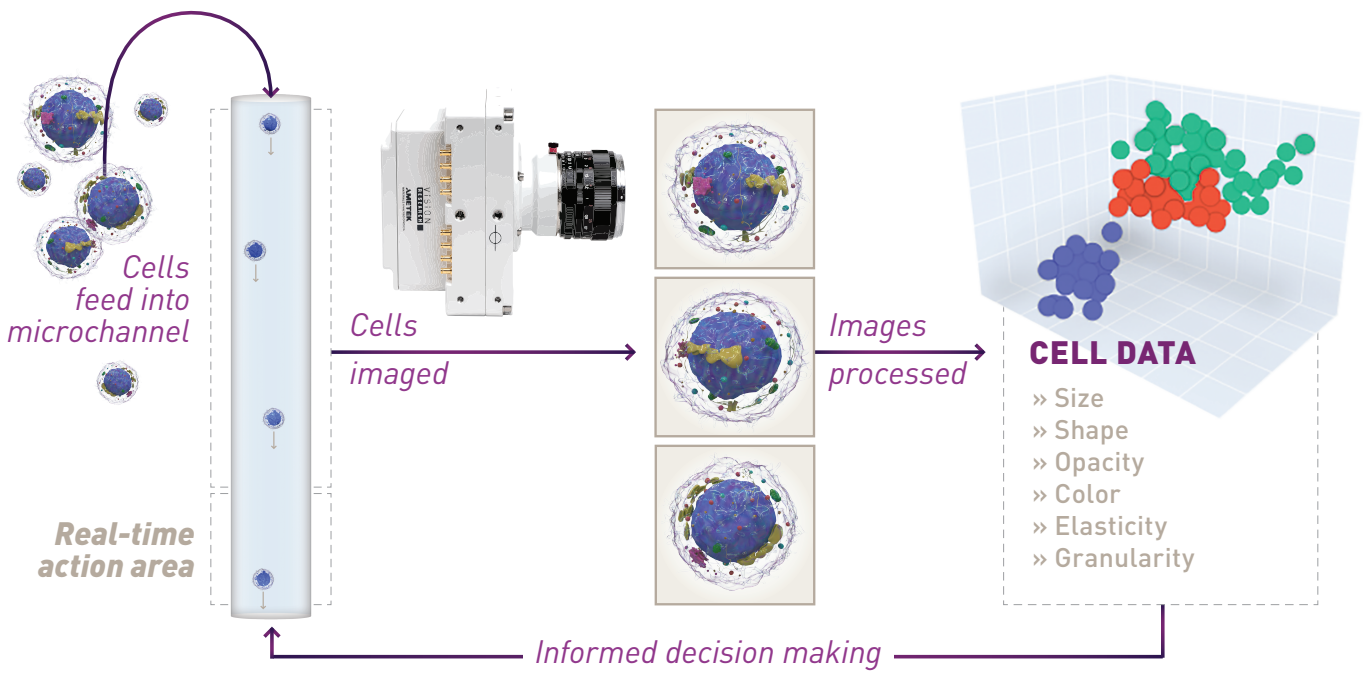
HIGH-SPEED IMAGE CYTOMETRY

This emerging alternative to conventional fluorescence cytometry combines high-speed imaging and microfluidics techniques to characterize individual cells in real time.

HOW IT WORKS

A high-speed camera captures a series of images of individual cells as they pass through a transparent micro-channel. Image processing then reveals a variety of physical characteristics for each cell. Real-time image processing uses the detected biomarker data to determine which actions should be performed on the individual cells.

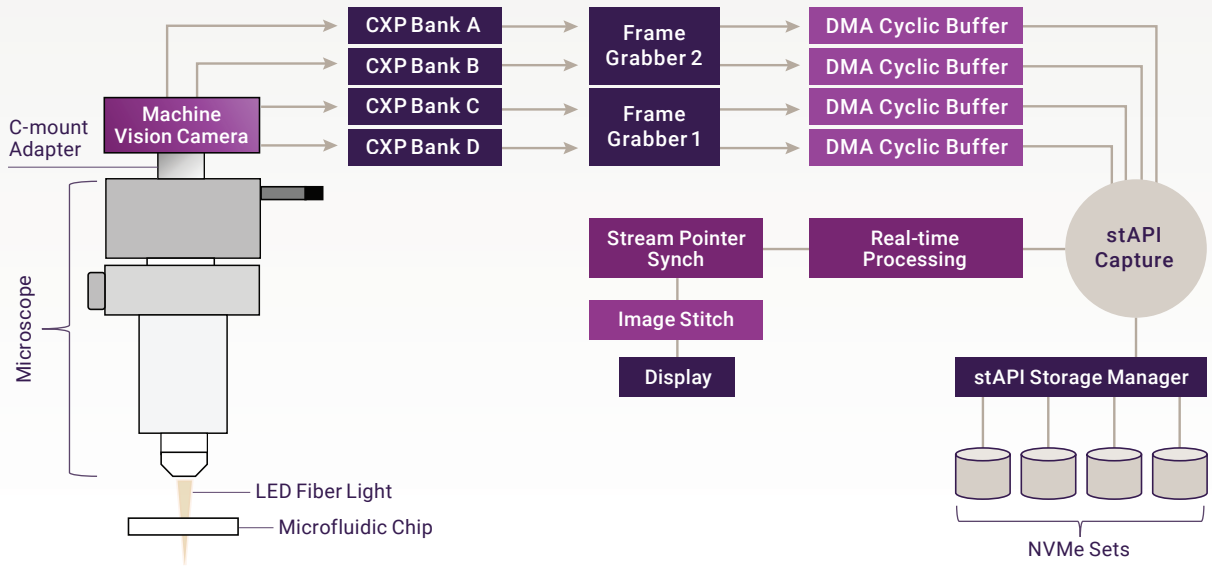


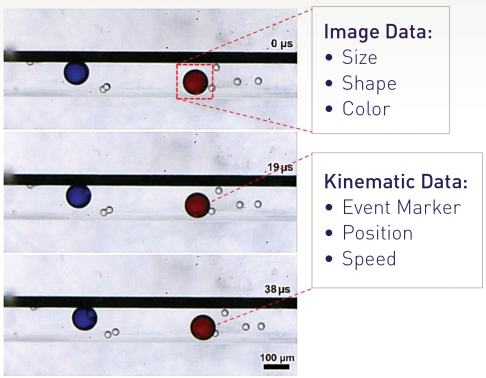
BRIGHT-FIELD VS FLUORESCENCE-BASED IMAGING

Fluorescence imaging does a good job characterizing the amount and position of a cell's key biomolecular species, but the low light of fluorescence relative to the necessary camera integration times imposes throughput limitations. Researchers pushing the limits of high-throughput imaging are turning to bright-field imaging, which does not suffer from these throughput limitations.

THE SETUP

Here's an overview of the hardware and software architecture for real-time image cytometry. The machine vision camera streams images out from the microscope-cytometry hardware into backend hardware and software capable of handling high-throughput image processing.





DEMONSTRATION SYSTEM

This demonstration system flows red-, blue- and clear-colored polystyrene beads through a 200 µm-wide microchannel. A Phantom S710 camera captured the images, shooting at 52,000 fps and 18 µs exposure through a microscope set to 13.5x magnification. A Spicatek backend station processes the imaging data in real time. Capable of capturing up to 16 CXP channels on two frame grabbers, the station stores up to 45 minutes of uncompressed video at these high speeds.