AbstractID: 8661 Title: Micro angiographic and fluoroscopic real-time image data handling using parallel coding techniques in LabVIEW

Purpose:
Multicore programming coding techniques have been designed to meet the high-speed requirements of a High-Sensitivity, Micro Angiographic-Fluoroscope (HSMAF) detector for 30 fps acquisition, image-processing, display, and rapid frame transfer of high-resolution, region-of-interest (ROI) images.

Method and Materials:
The HSMAF detector was built by our group using a CsI(Tl) phosphor, a light image intensifier, and a fiber-optic taper coupled to a charge-coupled device (CCD) camera which provides real-time 12 bit, 1k x 1k images capable of greater than 10 lp/mm resolution. A graphical user interface (GUI) was developed to control the system and enable real-time acquisition, image-processing, display, and rapid storage of high-resolution images. To accommodate all these processes working in real-time, parallel coding methods, such as instruction pipelining and task parallelism, were designed and used to take advantage of the available multicore processors (dual and quad cores).

Results:
The parallel coding techniques of the GUI can handle radiographic procedures that require on-the-fly image processing at 30fps such as Roadmapping, Digital-Subtraction-Acquisition (DSA), and rotational DSA. On a 2.4 GHz dual processor a high resolution image is acquired, processed and stored in less than 30ms. Recursive temporal filtering, as well as gain correction can be added to the above procedures and still maintain the required high frame rates when a quad-core processor is used. Moreover, the overall system design offers virtually unlimited memory for acquisition and huge, expandable storage capacity.

Conclusion:
The ability of high frame-rate acquisition, image processing and display for this unique high-resolution detector along with the user friendly implementation of the interface should provide angiographers and interventionalists with a new capability for visualizing details of small vessels and endovascular devices such as stents. Such capability should enable more accurate diagnoses and image guided interventions.

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