Diagnostic Imaging Horizons: A Constantly Moving Target

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The use of imaging technologies in the diagnosis of health concerns is experiencing very exciting growth and advancement. The technology displays images in much greater quality and in real time. However, the amount of data that is required for this enhanced imaging capability can create new problems. This article will examine these challenges and review processing solutions that are alleviating the data flow bottlenecks.

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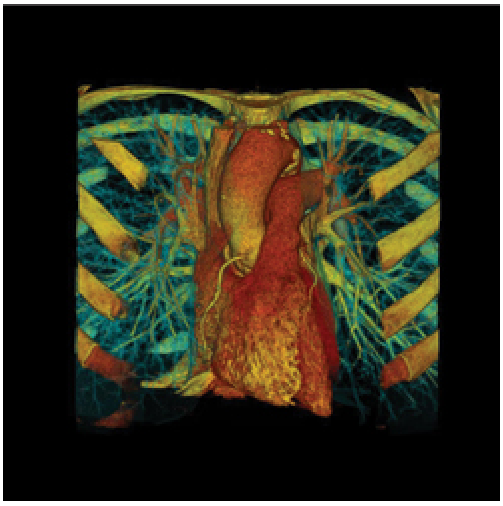

3D rendering of the rib cage created using Calgary Scientific's ResolutionMD advanced visualization software and rendered on GPU-based servers powered by NVIDIA's Quadro FX graphics solutions.

As with most industries, healthcare organizations are investing more in research and development, looking at ways to become more efficient, reduce medical equipment costs, and at the same time, advance applications and medical diagnosis.

As the medical imaging industry transitions to a fully digital environment, the prospects for faster, more accurate analysis and better patient care are improving. Using the latest imaging technology, medical professionals are receiving unprecedented image quality, revolutionary tools to analyze images and workflow improvements resulting in earlier detection, and better treatment planning and diagnosis.

Imaging modalities across the board are making important advancements on multiple fronts, such as real-time diagnostic imaging, 4D imaging, and fusion imaging. Real-time imaging can help identify and prevent stroke and heart attacks, both time-critical. Fusion imaging provides physicians with a more complete picture of what's going on in the body. Finally, 4D imaging provides 3D images of critical moving anatomy.

In addition, new scanner technology has resulted in massively boosted image quality, opening doors to more advanced visualization applications to picture difficult anatomy with more accuracy.

But such advancements involve the processing of much larger amounts of data at constantly increasing speeds. As medical professionals continue to push the frontiers of diagnostic imaging, they are confronting workflow bottlenecks with conventional computing technologies. The benefits of advanced imaging can begin to seem like empty promises when lengthy wait times are involved.

With added graphics memory and 30-bit color, the ultra-high end NVIDIA Quadro FX 4800 graphics card gives physicians, researchers, and medical technicians the right toolset to generate higher quality imaging, with processing time going from minutes to seconds leading to a quicker, more accurate diagnosis.

To overcome processing bottlenecks that ultimately slow down workflow, expensive custom hardware solutions have been applied, such as field-programmable gate arrays (FPGAs) and clustered central processing units (CPUs). Even using massive CPU clusters or FPGAs, pre-processing can take over twenty minutes, and post-processing can require hours. Neither solution scales well to meet the exploding data requirements.

A technology that is making a huge impact in the imaging chain is the graphics processing unit (GPU). Designed to advance real-time and off-line graphics, the inherently parallel architecture of a GPU has enabled a new level of programmability and performance, resulting in the capability to process much larger amounts of data and deliver an unprecedented level of graphics realism at ever increasing speeds. Many of the algorithms used to reconstruct and process CT, MRI, x-ray, and ultrasound imaging data are highly parallel and greatly benefit from the GPUs parallel processing nature, leading healthcare professionals to earlier detection and classification of disease, enhanced treatment planning, and faster, higher quality diagnosis.

Moreover, The GPU has evolved into not only a graphics engine but also a compute engine. Imaging modalities that feed advanced visualization, such as CT, MRI, ultrasound, and PET, all benefit from the GPUs massive parallel processing architecture, advanced graphics and cost/performance in comparison to legacy architectures. Real-time advanced visualization is now within the realm of possibility and in some cases, like CT, already a reality.

Medical device manufacturers, as well as healthcare professionals, using advanced GPU technology will benefit from a new level of programmability and performance. The latest professional GPUs house up to 240 CUDA parallel processing cores for massive computational tasks as well as state of the art graphics for advanced visualization.

For the medical industry, this means better generation of higher quality imaging with processing time going from minutes to seconds. For medical device designers, this advanced imaging and processing capability will inevitably lead to better and more innovative designs. Not only does it enable more thorough consideration of various design options, it makes more accurate analysis of research possible.

In an interdependent chain of sophisticated medical devices, the arrival of powerful solutions, such as the GPU, spurs development on multiple fronts. It won't be long before real-time advanced visualizationalready here in areas such as CTis introduced for all forms of diagnostic imaging.

Online

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