Design Talk: Compression Improves Data Bandwidth Bottlenecks and Costs in Medical Imaging Systems

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In the pursuit of superior image quality, ultrasound and CT manufacturers are expanding the transducer channel count in their systems. This requires higher-resolution analog-to-digital converters (ADCs) and higher frame rates from their image processing. These demands not only create bottlenecks within the data acquisition subsystems of these machines, but also jeopardize manufacturers' ability to use commodity PC components to control development costs. New signal compression techniques are being developed that directly address these concerns across the range of medical imaging equipment from handheld devices, using PDA form factors to advanced 3D consoles.

Manufacturers are also very concerned by the impact that signal quality has on image resolution. Therefore, compression must be able to support a lossless mode, particularly for initial adoption by the market. However, it has recently been proven that if a compression algorithm can be controlled to maintain signal quality metrics, such as signal to noise, it can be clinically used without affecting diagnostic accuracy. This new development has a significant impact on reducing equipment costs while maintaining high levels of image quality.

A prime example of this type of algorithm is Prism. It is a low-complexity, real-time lossless and lossy compression algorithm that provides the flexibility, scalability,

and cost advantages attractive for medical imaging systems. Prism's lossless mode delivers nearly a 3:1 compression on raw ultrasound echoes from the ADC. Also, the total data acquisition storage requirements are reduced by 75% for raw data, meaning the portable machine is able to perform four times as many scans before docking.

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