**PRESENT DAY ULTRASOUND TECHNOLOGY**

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Medical sonography, commonly known as ultrasound, is a diagnostic medical imaging technique that uses high frequency sound waves to help reveal the structure of muscles, tendons and internal organs. Its real-time imaging capability is particularly useful for fetal imaging, enabling important parameters such as fetal heartbeat to be monitored. However, ultrasonic images can be distorted by human tissue, resulting in blurred and inaccurate images that can lead to misdiagnosis. Researchers have adapted a digital processing approach initially developed for seismic exploration of the earth to suit multi-channel ultrasound imaging for medical or materials testing purposes. The technology estimates the velocity of an ultrasound signal as it changes in different structures of the body, thus enabling the recognition of anomalies and resulting in more accurate and higher-quality images

Despite today's sophisticated, high-tech systems, ultrasound remains a science built upon the simple sound wave. By beaming high-frequency sound waves into the body, physicians can translate the "echoes" that bounce off body tissues and organs into "sound you can see," colorful, visual images that provide valuable medical information. Heart disease, stroke, abnormalities in the abdomen or reproductive system, and more - all exhibit telltale signs that ultrasound can help to detect.

As an adjunct to mammography, ultrasound can be a primary breast imaging application for women under the age of 40 who have dense breasts, or breast implants or breastfeed. Ultrasound can also help doctors assess masses that are detected in mammograms, aid in the detection of cysts and guide breast biopsies. If you are 35, physicians suggest a breast exam each year as a part of your routine health regimen.

In children ultrasound plays a central role in the diagnostic imaging of the urinary tract. It is used most frequently and as a primary diagnostic option. Consequently, innovations in ultrasound technology and ultrasound contrast media have major impact on pediatric urosonography. Harmonic imaging is a modality that produces artifact-free images with high resolution. It has been shown that harmonic imaging is superior to fundamental mode in many urosonographic indications. Color Doppler is an established imaging modality, but its application for diagnosis of stones in the urinary tract, especially in children, is relatively new. The so-called twinkling sign, a color Doppler artifact at the site where one normally expects the acoustic shadow to be, enhances the conspicuity of the stone. A further development is three-dimensional (3D) ultrasound. It offers better volume measurement of the bladder and kidneys than 2D ultrasound. Contrast-enhanced voiding urosonography has already proven to be a valuable alternative in the diagnosis of vesico-ureteral reflux. Thus, a significant decrease of radiation exposure has become possible as it replaces the radiological methods. With the introduction of contrast-specific ultrasound imaging modalities, further improvements in voiding urosonography are emerging.

With modern-day ultrasound equipment you can virtually biopsy any nodule that you can see. The ability to introduce a needle into the ultrasound field and follow it through with the ultrasound equipment to know precisely where you are at any point in time. With this kind of machine you can readily evaluate small nodules or nodules that are deep within the thyroid gland, which would be difficult to get to using older equipment. The ability to use color to identify vascular structures and its higher resolution gives a sense for micro-calcifications or cystic areas filled with fluid or other adjacent structures.

The improved ultrasound imaging technique has the following benefits:

1. Superior image definition compared with current state-of the-art ultrasound

2. Low computational overhead, enabling real-time imaging to be delivered

3. Principal compatibility with existing hardware.

4. An increased number of transducer elements in ultrasound transducers, leading to higher lateral resolution.

5. Higher center frequencies in the 10 to 15 MHz range, leading to higher lateral resolution.

6. Broadband transducers and increased scanner bandwidth, resulting in higher axial resolution and allowing shifting the center frequency and frequency compounding to reduce noise.

7. Increased sophistication of signal processing routines, leading to better images with lower noise and higher contrast