

**AbstractID: 3783 Title: A PC-based 3-dimensional Ultrasound Software Package A PC-Based Portable Three-Dimensional Ultrasound System For Thyroid Cancer Screening**

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**Purpose:** Although ultrasound imaging is integral to a number of applications (such as prostate localization during radiation treatment and thyroid cancer screening in remote counties), portable ultrasound units lack 3-dimensional (3D) image display, thus limiting the usefulness of the imaging modality. The purpose of this study was to design and test a freehand 3D image processing and visualization software package, Ultra3D, to work with an existing ultrasound unit that lacks 3D capability.

**Method and Materials:** The Ultra3D system was designed to work with any ultrasound units, especially the laptop-PC based Terason Smart Probe. The Ultra3D software system is mainly composed of two components: the user interface developed with Visual Basic and the Image Processing and Visualization library (IPVL) developed using Visual C++. The Ultra3D package has four major functions: image acquisition, 3D image reconstruction, image preprocessing, and 3D visualization. When the software is integrated with the Terason SmartProbe™ system, a series of 2D images is captured using free-hand scanning method. These 2D images are then registered at different viewing angles, and their composite images are displayed by different volume and surface rendering techniques. Automatic 3D segmentation allows the interested regions to be better visualized.

**Results and Conclusion:** This Ultra3D system has been successfully integrated with many different ultrasound units. The integration with the laptop-PC based Terason Smart Probe allows 3D image manipulation to be possible at restricted working environments that require portability and user-friendliness. 3D image processing and visualization show that, this program, with a digital image-capture system, a semi-automatic contours highlight method, and variant volume rendering techniques, greatly speeds up the reconstruction and visualization process, and gives the doctor more intuitive images. Future efforts include application of the system for prostate localization during radiation treatment and thyroid cancer screening in remote counties.