Development of High-speed Iterative Refraction Calibration Method of Ultrasound Computed Tomography System for Breast Cancer Screening

We are developing an ultrasound computed tomography (USCT) system for earlier breast cancer screening. USCT differs from mammography in having great advantages of no X-ray exposure and no compression. Like echography, USCT can show a reflection boundary (structure) image. In addition, sound speed (hardness) distribution in a subject is guessed from the time-of-flight information of transmitted ultrasound waves on the basis of an X-ray CT algorithm. Considering the wave nature of ultrasound to improve image quality generally increases the calculation burden. To achieve both high quality images and high throughput, we developed an iterative refraction calibration method. This method was applied to gel phantom data measured by a USCT prototype with a ring array 10 cm in diameter. As a result, we achieved a calculation speed seven times faster than that of a conventional bent-ray reconstruction with the same contrast on a sound speed image.