Simulation of ultrasound images based on computed tomography (CT) data has previously been performed with different approaches. Shadow effects are normally pronounced in ultrasound images, so they should be included in the simulation. In this study, a method to capture the shadow effects has been developed, which makes the simulated ultrasound images appear more realistic.

The method using a focused beam tracing model gives diffuse shadows that are similar to the ones observed in measurements on real objects. Ultrasound images of a cod (Gadus morhua) were obtained with a BK Medical 2202 ProFocus ultrasound scanner (BK Medical, Herlev, Denmark) equipped with a dedicated research interface giving access to beamformed radio frequency data.

CT images were obtained with an Aquilion ONE Toshiba CT scanner (Toshiba Medical Systems Corp., Tochigi, Japan). CT data were mapped from Hounsfield units to backscatter strength, attenuation coefficients, and characteristic acoustic impedance. The focused beam tracing model was used to create maps of the transmission coefficient and scattering strength maps. FIELD II was then used to simulate an ultrasound image of 38.955.34.5 mm, using 106 point scatterers. As there is no quantitative method to assess quality of a simulated ultrasound image compared to a measured one, visual inspection was used for evaluation.