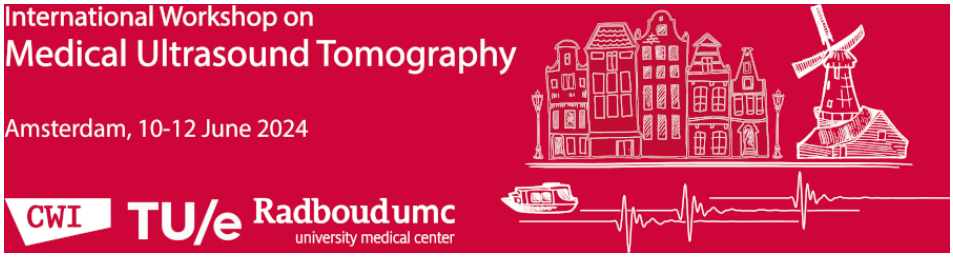


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# Numerical methods for weakly nonlinear ray tracing approximations in HIFU

*Wednesday, June 12, 2024 11:20 AM (20 minutes)*

Focused ultrasound is used in a therapeutic treatment (HIFU) and uses ultrasound waves to non-invasively destroy malignant cells inside the human body. The technique works by sending a high-energy beam of ultrasound into the tissue using a focused transducer. Numerically modelling HIFU presents a problem due to nonlinear effects leading to the formation of harmonics of the source frequency. Each harmonic requires a finer grid to resolve, rapidly increasing computational complexity.
In prior work we unified two ray tracing methods using weakly nonlinear ray theory. The first has the ray equations identical to those from linear ray theory while the amplitude equation is a nonlinear transformation of the Burgers' equation. In the second method, the Eikonal and transport equations are coupled which results in ray trajectories which depend on the amplitude. This presentation explores numerical comparisons of the two methods with the pseudo-spectral solution of the Westervelt equation.

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