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## Ultrasound imaging from reflection data

*Wednesday, November 1, 2017 9:50 AM (20 minutes)*

When only reflection data are available, imaging with the wave equation is much more difficult than in the presence of transmission measurements. This is because reflection data are spectrally incomplete due to the fact that frequencies close to zero can not be used.

In the talk we describe the mathematical problem and suggest a numerical method of data completion that generates the missing low frequency data by a purely mathematical procedure.

### (2) Material and Methods

Our results are based on numerical simulations using data generated by the acoustic wave equation. We model acoustic mammography by using a flat 2D transducer array.

### (3) Results

We demonstrate by numerical simulations using a breast phantom patterned after the Salt Lake City phantom that good pictures can be obtained with exactly the theoretically possible spatial resolution. We describe several computing techniques such as plane wave stacking and source encoding to speed up the computations. Our reconstruction algorithm is a nonlinear version of the well known ART algorithm of CT, which instead of line integrals works directly with the wave equation.

### (4) Discussion and Conclusion

Our presentation is purely theoretical. It is restricted to 2D and does not discuss practical aspects such as connecting materials. However it demonstrates that reasonable pictures can be obtained in spite of the spectral incompleteness of the reflection data.

**Author:** NATTERER, Frank (University of Münster)

**Presenter:** NATTERER, Frank (University of Münster)

**Session Classification:** Session 1: Imaging and inversion I

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