

High speed modelling of waves with the finite element method

Peter Huthwaite

Imperial College London, London, UK

The flexibility of the finite element method makes it well suited to the general solution of a variety of ultrasound simulation problems across NDE. The ability to mesh local complexities is very powerful, and the method has been used for areas including guided wave simulations, bulk waves and phased arrays, through materials from metals to composites to plastics, with a variety of different structures. To realise the potential of FE for these applications, we have developed Pogo (www.pogo.software), which runs on graphics cards to maximise the speed while maintaining its flexibility. This talk will discuss some of the techniques that Pogo uses to do this, and what some of the key implications are. It will then discuss some example applications, focusing on waves in complex media, including travelling in large-grained materials, guided waves travelling beneath rough corrosion patches and waves reflecting from rough surfaces.