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CBC Talk on a Unifying Fractional Wave Equation for Compressional and Shear Waves - September 1, 2010

Professor Sverre Holm will give a talk based on an article from J. Acoust. Soc. Am. Volume 127, Issue 1, pp. 542-548 (January 2010), "A unifying fractional wave equation for compressional and shear waves", Wednesday September 1, at 10:15 in Bakrommet.

Total number of participants: 13
Total number of guests outside of CBC: 5
Number of different nationalities represented: 3
Total number of speakers: 1
Total number of talks: 1

A unifying fractional wave equation for compressional and shear waves

This study has been motivated by the observed difference in the range of the power-law attenuation exponent for compressional and shear waves. Usually compressional attenuation increases with frequency to a power between 1 and 2, while shear wave attenuation often is described with powers less than 1. Another motivation is the apparent lack of partial differential equations with desirable properties such as causality that describe such wave propagation. Starting with a constitutive equation which is a generalized Hooke's law with a loss term containing a fractional derivative, one can derive a causal fractional wave equation previously given by Caputo [Geophys J. R. Astron. Soc. 13, 529–539 (1967)] and Wismer [J. Acoust. Soc. Am. 120, 3493–3502 (2006)]. In the low (low-frequency) case, this equation has an attenuation with a power-law in the range from 1 to 2. This is consistent with, e.g., attenuation in tissue. In the often neglected high (high-frequency) case, it describes attenuation with a power-law between 0 and 1, consistent with what is observed in, e.g., dynamic elastography. Thus a unifying wave equation derived properly from constitutive equations can describe both cases.

In addition an intuitive/mathematical introduction to fractional derivatives and their properties will be given.

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Popular description in Norwegian:
"Bedre diagnose ved bedre derivasjon "

For more information about the speaker, please visit the web page of   Professor Sverre Holm , Department of Informatics, University of Oslo.

What	Talk
When	Sep 01, 2010 from 10:15 AM to 11:00 AM
Where	Bakrommet @ Simula
Contact Name	Hans Petter Langtangen
Attendees	Andreas Austeng Anna Blechingberg Aron Wahlberg Fabrice Prieur Glenn Lines Hans Petter Langtangen Jo Inge Buskenes Karen Støverud Kent-André Mardal Marie Rognes Ola Skavhaug Peter Näsholm Sverre Holm
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