

ACOUSTICS2008/3263 Green's function estimation in speckle using the FDORT method

Jean-Luc Robert^a and Mathias Fink^b

^aPhilips Research, 345 Scarborough Road, Briarcliff Manor, NY 10510, USA

^bLaboratoire Ondes et Acoustique, ESPCI, Université Paris 7, CNRS, 10 rue Vauquelin, 75005 Paris, France

The FDORT method (French acronym for Decomposition Of the Time Reversal Operator using Focused beams) is a Time Reversal based method that can detect point-scatterers in a heterogeneous medium and extract their Green's function. It is particularly useful when focusing in a heterogeneous medium. In this presentation, the theory of the FDORT method is generalized to random media (speckle), and it is shown that it is possible to extract Green's functions from speckle signal using this method. Therefore it is possible to achieve a good focusing even if no point scatterers are present. Moreover, a link is made between FDORT and the Van Cittert Zernike theorem. We deduce from this interpretation that the normalized first eigenvalue of the Focused Time Reversal Operator is a well-known focusing criterion. The concept of an equivalent virtual object is introduced, that allows the random problem to be replaced by an equivalent deterministic problem and leads to an intuitive understanding of FDORT in speckle. Applications to aberration correction are presented. The reduction of the variance of the Green's function estimate is discussed.