Combining Wave Chaos and the Loschmidt Echo to Extend the Concept of Fidelity to Classical Waves[1] BINIYAM TADDESE, University of Maryland, College Park: Department of Electrical & Computer Engineering, JAMES HART, University of Maryland, College Park: Department of Physics, THOMAS ANTONSEN, EDWARD OTT, STEVEN ANLAGE, University of Maryland, College Park: Department of Physics, Department of Electrical & Computer Engineering — We propose and demonstrate a new remote sensor scheme by applying the wave mechanical concept of fidelity loss to classical waves. The sensor makes explicit use of time- reversal invariance and spatial reciprocity in a wave chaotic system to sensitively and remotely measure the presence of small perturbations to the system. The loss of fidelity is measured through a classical wave-analog of the Loschmidt echo by employing a single-channel time-reversal mirror to rebroadcast a probe signal into the perturbed system. We also introduce the use of exponential amplification of the probe signal to partially overcome the effects of propagation losses. It is demonstrated that exponential amplification can be used to vary the spatial range of sensitivity to perturbations, thereby actively modifying the range of operation of the sensor. Experimental results are presented for both electromagnetic and acoustic versions of the Loschmidt echo based sensor.

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