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MEMS based directional sound sensor with electronic readout¹ TOUSE, STEPHEN HARRISON, JEFFREY CATTERLIN, JOSE MICHAEL SINIBALDI, GAMANI KARUNASIRI, Naval Postgraduate School — Despite a spatial separation of only 0.5 mm between its two ears, the Ormia ochracea fly is able to accurately determine the direction of a sound source due to a flexible structure which mechanically couples the fly's two tympana. The coupled system responds to acoustic excitation with a combination of fundamental modes that amplify the interaural pressure differences in both amplitude and phase. Theoretical background, finite-element modeling, and experimental results are presented from a MEMS device which was designed and produced to mimic the fly's hearing system, providing directionally dependent response with nanometer scale amplitudes in the 3-5 kHz range. The device, which is approximately $1 \text{ mm x } 2 \text{ mm of } 10 \mu m$ silicon-oninsulator, uses out-of-plane interdigitated comb-finger capacitors for transduction of the response signal instead of the complicated optical schemes that are sometimes used.

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