MEMS based directional sound sensor with electronic readout\textsuperscript{1}

MICHAEL TOUSE, STEPHEN HARRISON, JEFFREY CATTERLIN, JOSE SINIBALDI, GAMANI KARUNASIRI, Naval Postgraduate School — Despite a spatial separation of only 0.5 mm between its two ears, the \textit{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 mm x 2 mm of 10\textmu m silicon-on-insulator, 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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