Title:	A single-lens universal interferometer: Towards a class of frugal optical devices
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Abstract:	The application of precision interferometers is generally restricted to expensive and smooth high-quality surfaces. Here, we offer a route to ultimate miniaturization of interferometers by integrating a beam splitter, reference mirror, and light collector into a single optical element, an interference lens (iLens), which produces stable high-contrast fringes from the in situ surface of paper, wood, plastic, rubber, unpolished metal, human skin, etc. A self-referencing real-time precision of a sub-20 picometer (~λ/30 000) is demonstrated with simple intensity detection under ambient conditions. The principle of iLens interferometry has been exploited to build a variety of compact devices, such as a paper-based optical picobalance, having 1000 times higher sensitivity and speed, when compared with a high-end seven-digit electronic balance. Furthermore, we used cloth, paper, and polymer films to readily construct broadband acoustic sensors possessing matched or higher sensitivity when compared with piezo and electromagnetic sensors. Our work opens the path for affordable yet ultraprecise frugal photonic devices and universal microinterferometers for imaging.
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