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Precision Displacement Measurement Using Shearing Interferometer RAJU KC, JAXON LEE, EDWARD FLAGG, West Virginia University — The emission spectra from some fluorescent sources, like semiconductor quantum dots, consists of closely spaced peaks, which are difficult to resolve with a conventional grating spectrometer. One way to solve this problem is to use a scanning Fabry-Perot interferometer (FPI), which acts as a narrow bandwidth tunable spectral filter, to increase the measurement resolution. This technique requires a precise control of the distance between the two FPI mirrors with a precision of 1 nm. Direct optical measurement of the mirror separation would provide the best feedback, but at the cost of an expensive tunable laser. Here we propose a less expensive way to achieve the required precision by connecting the FPI cavity to a shearing interferometer whose mirror separation can be measured using an interference pattern created by a relatively inexpensive single-frequency laser. The interferogram can be recorded with a photodiode array connected to an Arduino microcontroller, which can also provide the feedback signal and is affordable to any lab.

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