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Fast spectrophotometry with compressive sensing DAVID STARLING, IAN STORER, Penn State University — Spectrophotometers and spectrometers have numerous applications in the physical sciences and engineering, resulting in a plethora of designs and requirements. A good spectrophotometer balances the need for high photometric precision, high spectral resolution, high durability and low cost. One way to address these design objectives is to take advantage of modern scanning and detection techniques. A common imaging method that has improved signal acquisition speed and sensitivity in limited signal scenarios is the single pixel camera. Such cameras utilize the sparsity of a signal to sample below the Nyquist rate via a process known as compressive sensing. Here, we show that a single pixel camera using compressive sensing algorithms and a digital micromirror device can replace the common scanning mechanisms found in virtually all spectrophotometers, providing a very low cost solution and improving data acquisition time. We evaluate this single pixel spectrophotometer by studying a variety of samples tested against commercial products. We conclude with an analysis of flame spectra and possible improvements for future designs.

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