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Dynamic plenoptic perception with adaptive mirror

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Abstract content
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Plenoptic cameras enable one to take a single shot of a scene and have the focal plane decided upon later, by rendering the custom registered image in a post-processing step[1][2]. This approach takes a fuller advantage of the optics, as the name implies, capturing multiple light fields of a single scene. A given plane can be selected for optimal focus, and naturally all planes within its depth of field; but, by tweaking the rendering algorithm, also multiple distant planes can be presented simultaneously in focus. It works for static images and demands some post computation either on-board or in a PC. We, therefore, wondered whether videos, i.e. a sequence of static frames, could also exhibit such a feature.

We aim to present the plenoptic concept applied to dynamic imaging by means of an adaptive mirror coupled to an ordinary camera system. The outcome of our first tests seems to be quite promising when the mirror is driven at an appropriate duty cycle and amplitude, adjusted to the transfer function of the human retina. There is a myriad of applications that can deploy this concept, ranging from displays to microscopy. In this paper we intend to exploit the experimental setup, the obtained results and the constraints that must be observed for a successful dynamic plenoptic effect.

[1] NG, R. 2005. Fourier slice photography, ACM Trans. Graph., 735-744.

[2] GEORGIEV, T., LUMSDAINE, A. 2010. Focused Plenoptic Camera and Rendering, Journal of Electronic Imaging, Volume 19, Issue 2.

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