Imaging and displays technology

Integral imaging system for capture and display of 3D content

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Creating 3D content has been the goal of many researchers in the academia and industry as well as artists for many years (e.g. in Cinema, TV and performing arts). There has been a trend in cinema in producing films with 3D enriched content such the latest adventure film “Avatar”. Currently stereo imaging is the technology being used to capture 3D-film. This requires complex multiple camera configurations for clever image registration and focusing to obtain multiple perspective views of the scene. However, it is known that stereo imaging cause eye-strain and headaches in some people.

The above facts have motivated researchers to seek alternative means for capturing true 3D content. Two of the most recognised being holography and Integral Imaging. Due to the interfering of coherent light fields required to record holograms, their use is still limited and mostly confined to research laboratories. Integral Imaging in its simplest form consists of a lens array mated to a photographic film or digital sensor with each lens capturing perspective views of the scene. The light field in this case does not need to be coherent and ‘holoscopic’ colour images can be obtained with full parallax. A project funded by the EU-FP7 ICT-4-1.5 – Networked Media and 3D Internet, entitled “3D Live Immerse Video-Audio Interactive Multimedia” (3D VIVANT) offers a number of advances in the integral imaging technology for capture, representation, processing and display of 3D content. In this paper, recent advances made by the authors with respect to the Integral imaging technology from the point of view of optical systems for capture and display of 3D content are presented.

An assessment of the temporal integrity of a high speed rotating mirror camera

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A mainstay modality for the purpose of capturing full frame image sequences of dynamic events that occur over microsecond timescales, rotating-mirror framing cameras were first conceptualised in the late 1930's. Based on the 'Miller principle', after CD Miller who initially developed the optical design concept, the first practical incarnations were realised during the Manhattan Project, where their focus was to study the detonation of the secondary explosives in the first nuclear device. The core concept of the Miller principle provides an instrument capable of generating a succession of static images relayed by a rotating mirror, so that, provided the target scene is framed at a sufficiently high rate, the short time taken to expose the imaging frame in effect captures the scene without temporal blurring. Some of our recent work has however discovered that even when imaging [apparently] within the Miller principle’s optical regime, a subtle temporal aberration can be present that may lead to significant misinterpretation of data. Here we will highlight several examples illustrating such distortion, and follow on to describe how the anomaly can be detected and characterised in a straightforward manner. Furthermore, we present proposals to take advantage of this effect for assessing system performance and more interestingly for operating in an enhanced imaging mode suitable for observing events requiring framing rates in the elevated MHz range.