A Novel Computer-Generated Hologram (CGH) Achieved Scheme Generated from Point Cloud by Using a Lens Array

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Abstract : We proposed a novel computer-generated hologram (CGH) achieved scheme, wherein the CGH is generated from a point cloud which is transformed by a mapping relationship of a series of elemental images captured from a real three-dimensional (3D) object by using a lens array. This scheme is composed of three procedures: mapping from elemental images to point cloud, hologram generation, and hologram display. A mapping method is figured out to achieve a virtual volume date (point cloud) from a series of elemental images. This mapping method consists of two steps. Firstly, the coordinate (x, y) pairs and its appearing number are calculated from the series of sub-images, which are generated from the elemental images. Secondly, a series of corresponding coordinates (x, y, z) are calculated from the elemental images. Then a hologram is generated from the volume data that is calculated by the previous two steps. Eventually, a spatial light modulator (SLM) and a green laser beam are utilized to display this hologram and reconstruct the original 3D object. In this paper, in order to show a more auto stereoscopic display of a real 3D object, we successfully obtained the actual depth data of every discrete point of the real 3D object, and overcame the inherent drawbacks of the depth camera by obtaining point cloud from the elemental images.

Keywords : elemental image, point cloud, computer-generated hologram (CGH), autostereoscopic display

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