3D Representation of the Real Object on the 360-Degree Integral-Floating Display using a Fixed Depth Camera

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A 360-degree integral-floating display (IFD) is a distinguished method to display the full-parallax three-dimensional (3D) image within the unlimited omnidirectional viewing zone. Few advances such as vertical viewing angle and viewing quality for the 360-degree IFD have been presented; however the methods provided only for computer-generated virtual 3D objects. Depth camera-based simplified integral imaging pickup method is an effective method to generate the elemental images by use of depth information of the real object.

In this paper, a novel 360-degree IFD system that displays the 3D representation of the real object in 360-degree. A fixed depth camera acquires the depth information of the object for each corresponding viewpoint and generates the point clouds according to the acquired depth information. An iteration closest point (ICP) algorithm with rigid transform is used to synthesize the point clouds as single synthetic point cloud which includes depth information of the object. Here, ICP algorithm calculates the rotation and translation matrix for each point cloud and combine the point clouds that translating the commonly iterated points of the initial point clouds into each other. The elemental image arrays are generated from the newly generated synthetic point cloud model and a 3D image for the entire synthetic point cloud model is displayed through the 360-degree IFD. Authors hope that the proposed system can be an effective way to display the 360-degree 3D representation for the real object. Schematic configuration of the proposed system is illustrated in Fig. 1.

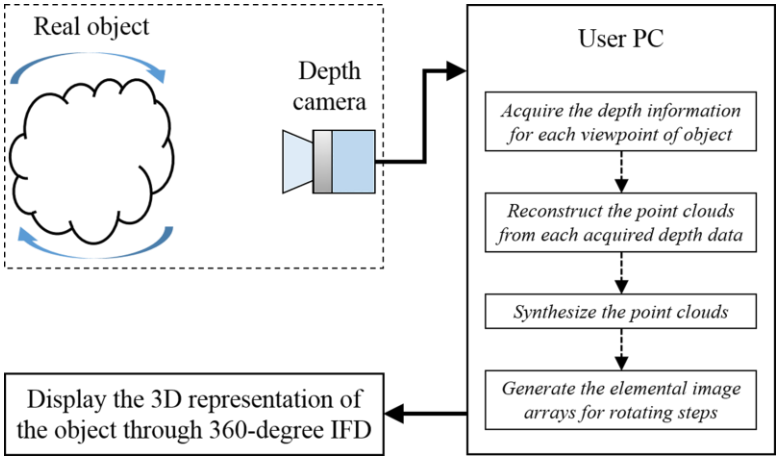

Fig. 1. A schematic configuration of the novel 360-degree system

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References

1. M.-U. Erdenebat, K.-C. Kwon, E. Dashdavaa, Y.-L. Piao, K.-H. Yoo, G. Baasantseren, Y. Kim, and N. Kim, *J. Opt. Soc. Korea*, 18, 706 (2014).
2. G. Li, K.-C. Kwon, G.-H. Shin, J.-S. Jeong, K.-H. Yoo, and N. Kim, *J. Opt. Soc. Korea*, 16, 381 (2012).
3. P.J. Besl and N.D. McKay, *IEEE Transactions: Pattern Analysis & Machine Intelligence*, vol. 14, p. 239 (1992).