

Joint Bilateral Filter for Warped Depth Data in Real Time

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SUMMARY

In this paper, we propose a real-time depth acquisition method for a targeted viewpoint. We apply 3D warping to a low-resolution depth image and interpolate via joint bilateral up-sampling [1]. For fast execution, GPU parallel programming is used. The results show sufficient depth images generated in real-time.

I. INTRODUCTION

The 3D video system uses color and depth data to render the scene at the receiver. Color and depth data should be acquired at the capturing stage; then these data are encoded and transmitted. The receiver decodes and synthesizes images for display. In this paper, we focus on the capturing stage, particularly the generation of depth images.

Color and depth cameras can be used simultaneously to capture the 3D scene. Yet, due to physical limitation of the camera setup, the viewpoints cannot be exactly the same. Thus, 3D warping can be used by means of camera parameters [2].

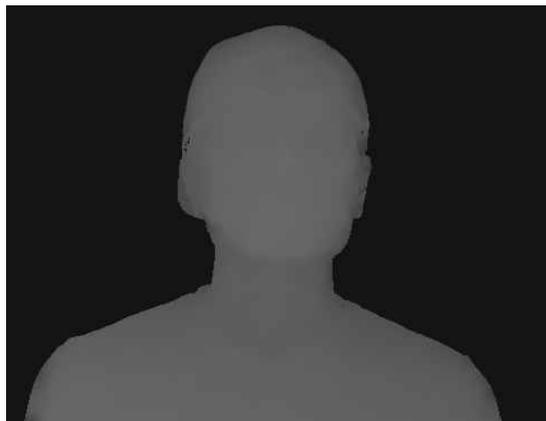


Figure 1. Depth image result

II. Proposed Method

The proposed method applies 3D warping to a low-resolution depth image in order to match the positions of color and depth data. Warped depth image. Consecutively, we apply JBF using GPU

parallel programming for interpolation. Finally, the depth image is acquired at the targeted viewpoint in real-time. Figure 1 shows the generated depth image.

III. Experimental Results

We tested JBF in both CPU and GPU implementations. Table 1 shows the comparison of running time. On average, the GPU implementation was 4804 times faster than the CPU implementation.

Table 1. Running time comparison between CPU and GPU implementations

GPU (ms)	CPU (ms)	(× faster)
13.57	64374	4743
13.65	65976	4833
13.78	65897	4782
13.60	65175	4792
13.73	66849	4868

IV. Conclusion

In this paper, we presented a depth generation method used for targeted viewpoints. We perform 3D warping to a low-resolution depth image and subsequently interpolate the data using joint bilateral up-sampling. From the experimental results, we confirm that sufficient quality depth images are generated at targeted viewpoints in real-time.

V. Acknowledgement

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