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Title: 3DV EE1 Results on the Café Sequence
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1. Introduction

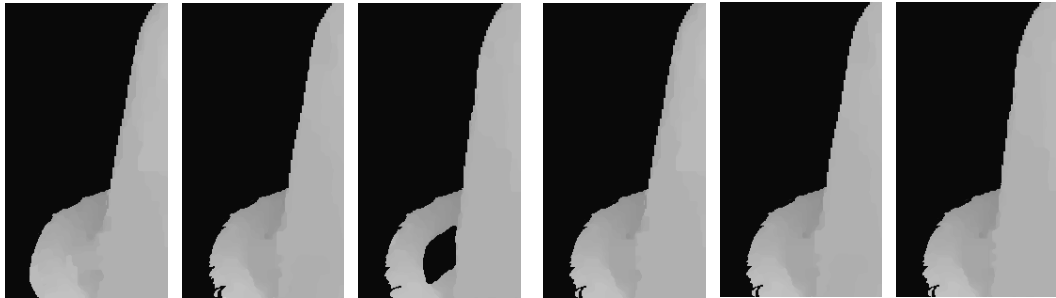
This document reports experimental results of the depth estimation on 'Cafe' sequence in response to EE1 of 3D video coding [1]. We obtained depth sequences by the following operations; depth estimation using DERS 5.0 assisted by semi-automatic data, bilateral depth filtering, manual refinements. Then, we synthesized virtual views using VSRS 3.5 alpha with the common hole-filling method. We confirmed that experimental results have improved subjective quality of the virtual views.

2. Results of Depth Estimation

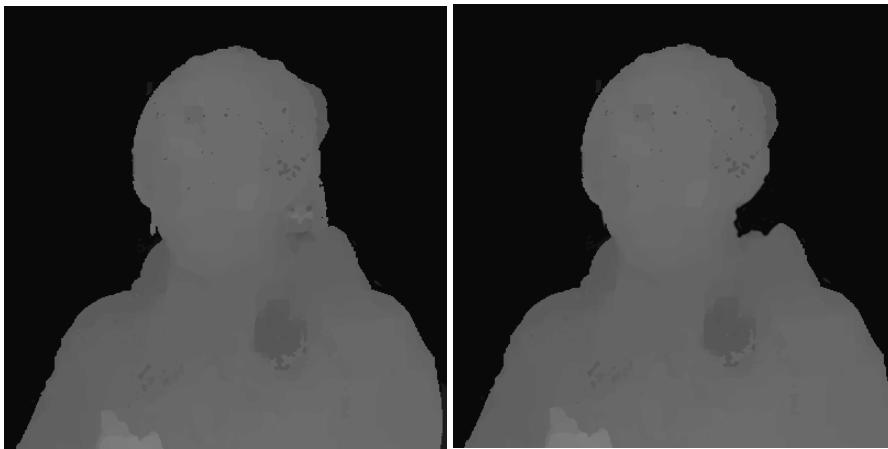
In the last MPEG meeting, we had presented the refined depth videos and synthesized views [2]; however, those data still generated visual artifacts, especially, flickering artifacts along object boundaries. As a result, the evaluation result of the Café sequence was 'slight artifacts'. In order to solve the problem, we refined the depth data manually and exploited the view synthesis by using VSRS 3.5 alpha including the common hole-filling method.

2.1. Depth Sequence Refinement

In order to remove erroneous depth values, we refined depth sequences manually using painting tools. In particular, we refined depth data near the foremost man and woman and the static object, such as the foremost chair. We modified them from 50th frame to 199th frame for three viewpoints. Figure 1 shows results of manual depth refinement. Three left figures show the previous results and three right figures are the refined new results. As shown in Fig. 1, erroneous depth values are significantly reduced.



(a) Temporally consistent depth sequence



(b) Refined depth map: 191st frame for viewpoint 2
Fig. 1. Manually refined depth data

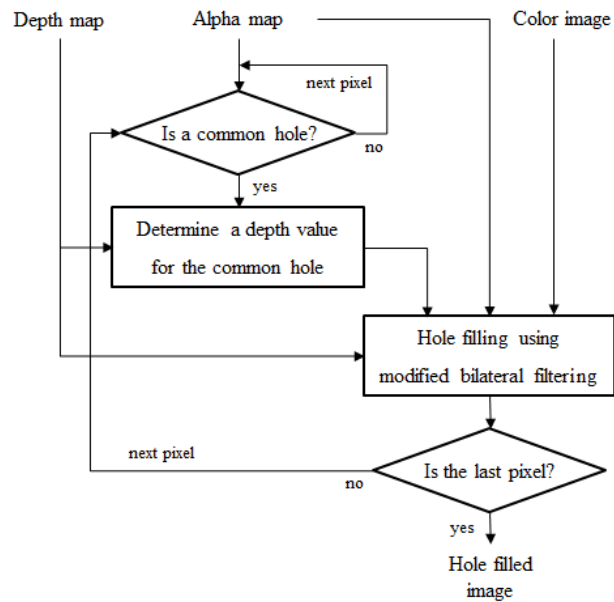


Fig. 2. Block diagram of common hole-filling method

2.2. View Synthesis using Common Hole-filling Method

We performed the view synthesis operation for the 3rd view using two color and depth videos for the 2nd and 4th viewpoint. Then, we compared the original view to the synthesized view in terms of PSNR. In this experiment, we exploited both the boundary noise removal method and the common hole-filling method that was included in VSRS 3.5 alpha [3]. Figure 2 shows the block diagram of the common hole-filling method.

Figure 3 shows the rendering quality of the synthesized images. The average value of the previous depth data reported in the last meeting was 33.13 dB and the average value of the refined depth data is 33.15 dB. We noticed that PSNR values were slightly increased and the rendering quality was also improved significantly.

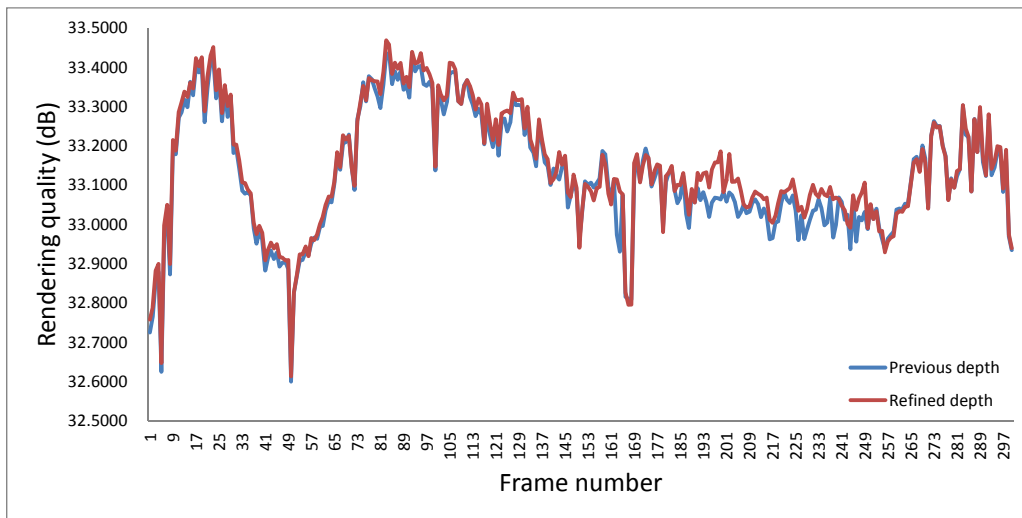


Fig. 3. Rendering quality of the synthesized images

The final depth map and the synthesized image for the viewpoint 3 are shown in Fig. 4. From the results, we observed that the refined depth sequences and the modified view synthesis method generated good quality of synthesized views.

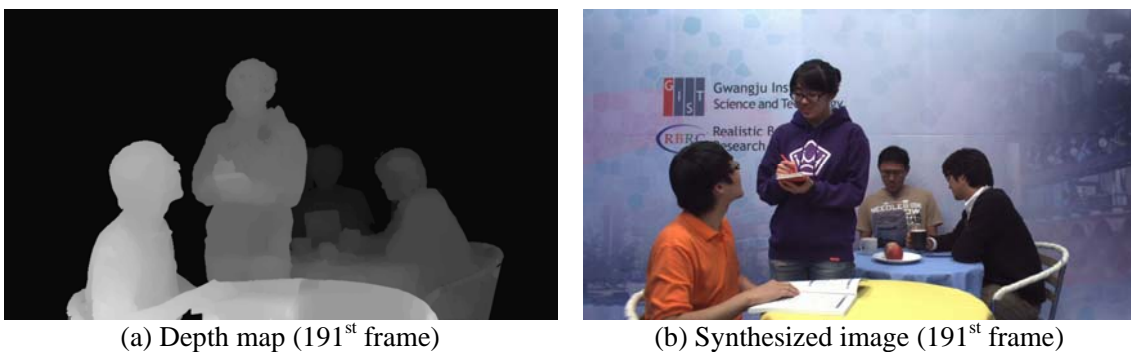


Fig. 4. Results of intermediate view synthesis

3. Conclusion

In this document, we have reported the depth map estimation and view synthesis results for the 'Cafe' sequence. In conclusion of this EE1 result, we have confirmed that the depth sequences guaranteed good quality in terms of the average PSNR values of the synthesized views and subjective quality. In this meeting, we can demonstrate our experimental results in the viewing session.

4. Acknowledgements

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5. References

- [1] ISO/IEC JTC1/SC29/WG11 "Description of Exploration Experiments in 3D Video Coding," N11831, Jan. 2011.
- [2] ISO/IEC JTC1/SC29/WG11, "3DV EE1 Results on Café," M19277, Jan. 2011.
- [3] ISO/IEC JTC1/SC29/WG11, "Results of View Synthesis using Modified Hole Filling Methods," m19281, Jan. 2011.