

Coherent Stylization for Stereoscopic Augmented Reality

Max Rensen

Supervisors: M. Weinmann, B. Usta

Responsible professor: E. Eisemann

1. Introduction

- The real world and a virtual scene are difficult to blend together in augmented reality.
- Image stylization can address this problem and improve immersion [1].



The same image unstylized (left) and with a cartoon stylization (right)

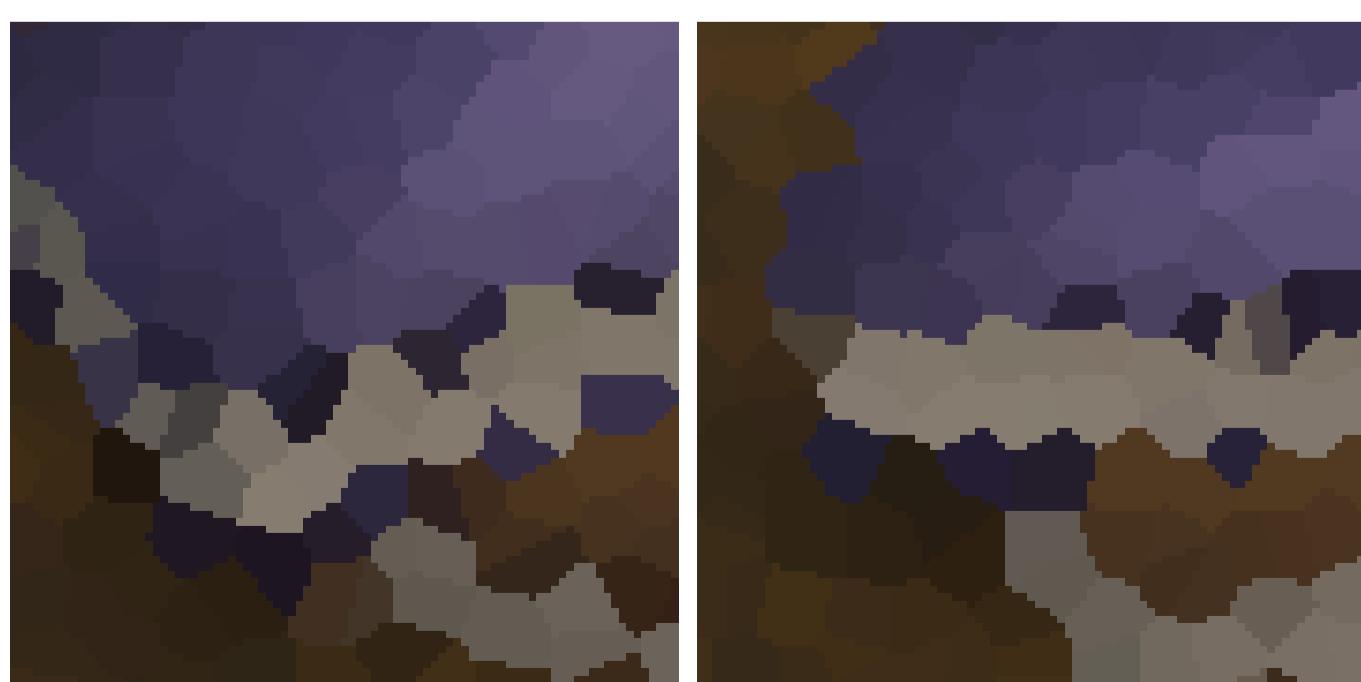
- Research Question:** How can visual and temporal coherence be improved when stylizing stereoscopic augmented reality?

2. Problem

- When applying image stylization to a video, subsequent frames might significantly vary, making the video incoherent.
- The same incoherence appears between two images in a stereoscopic setup.



Mosaic stylization between two frames



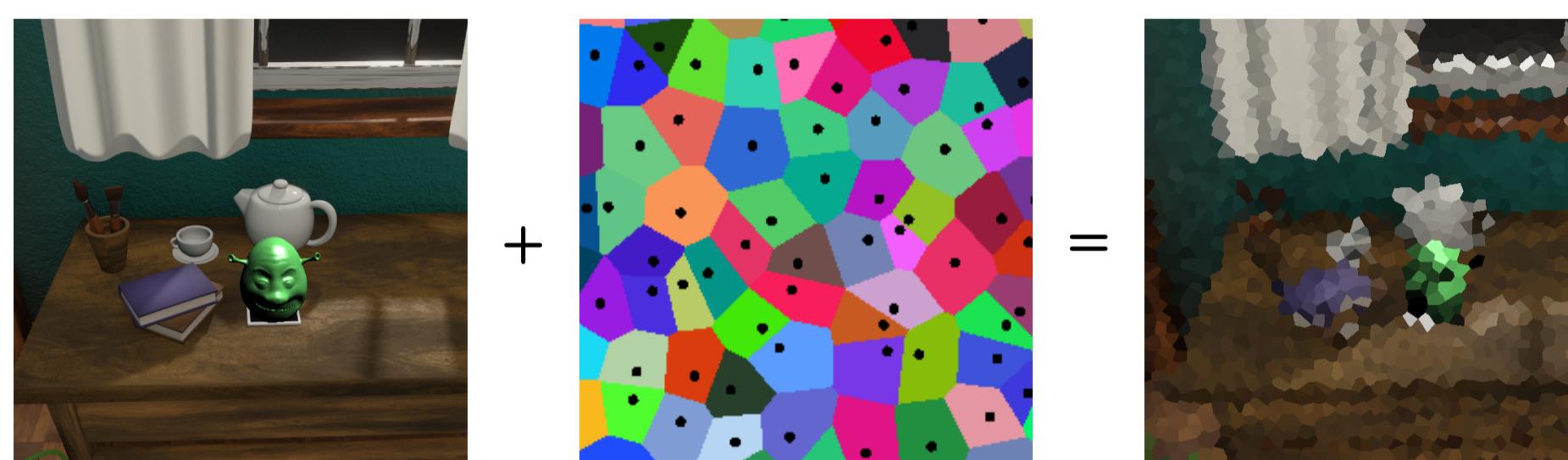
There is a clear difference in mosaic tile positioning

3. Solution

Novel method for stereo video stylization, making use of stereo information and AR marker tracking to estimate the world coordinate and track it across frames.

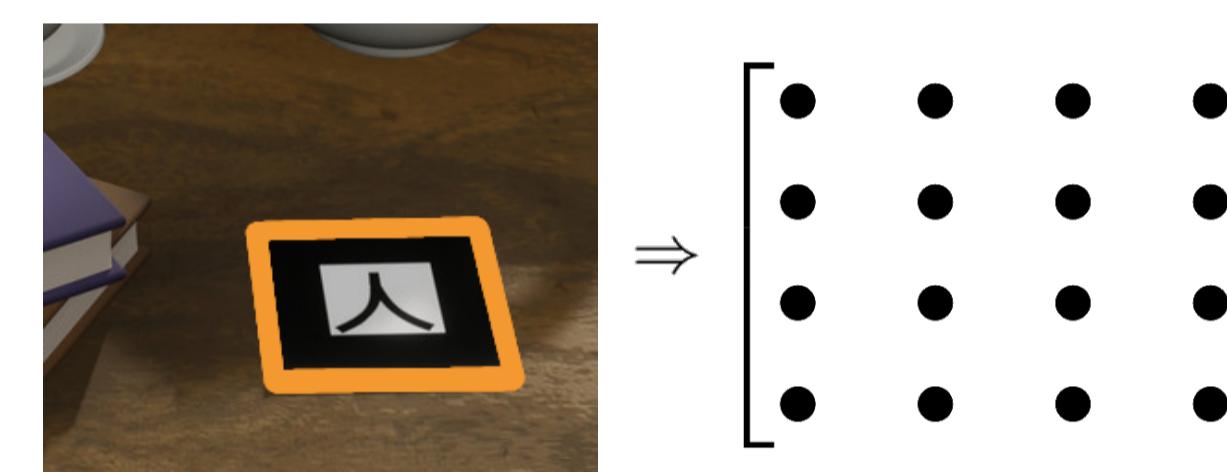
Initialization:

Construct initial mosaic pattern.

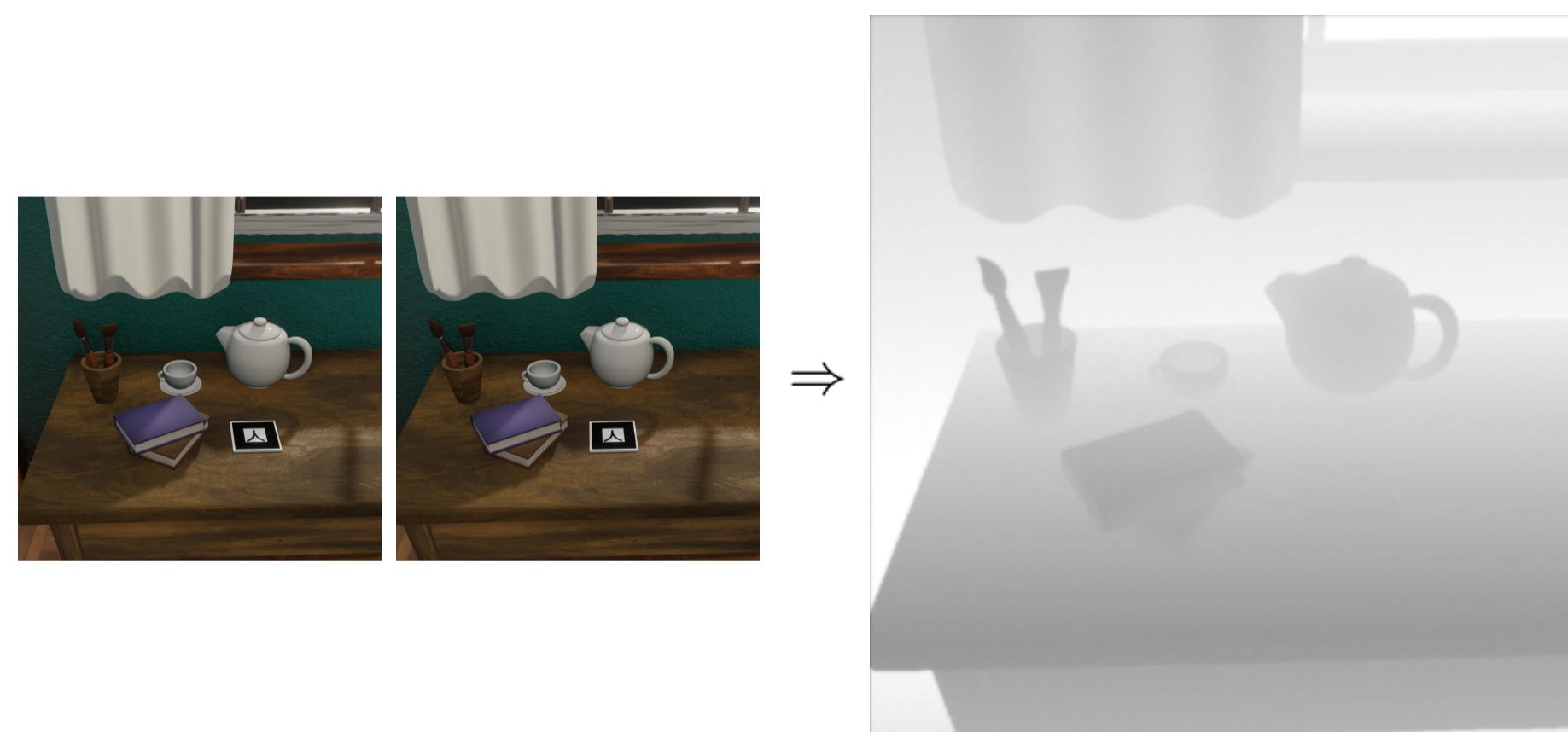


Continuous Process:

1. Track camera view matrix from AR marker.

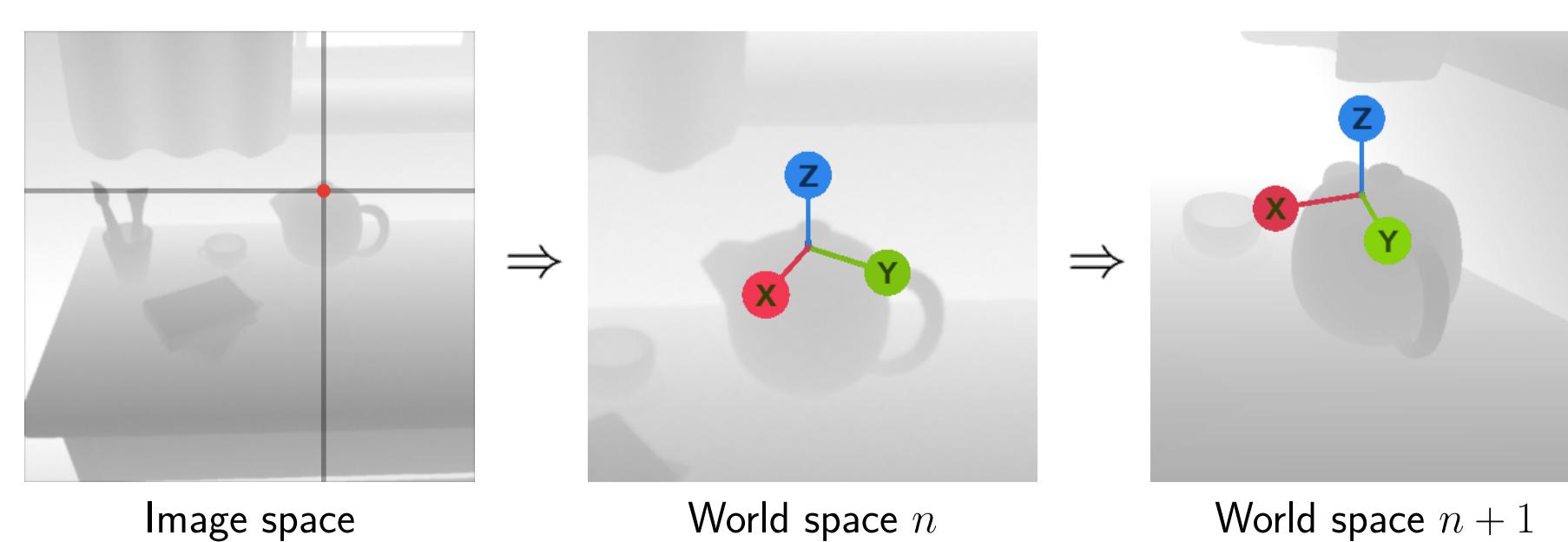


2. Estimate depth map from stereo images.



3. Use depth map to convert coordinates from image space to world space.

4. Track the world space coordinate across frames.



5. Redistribute mosaic tiles.

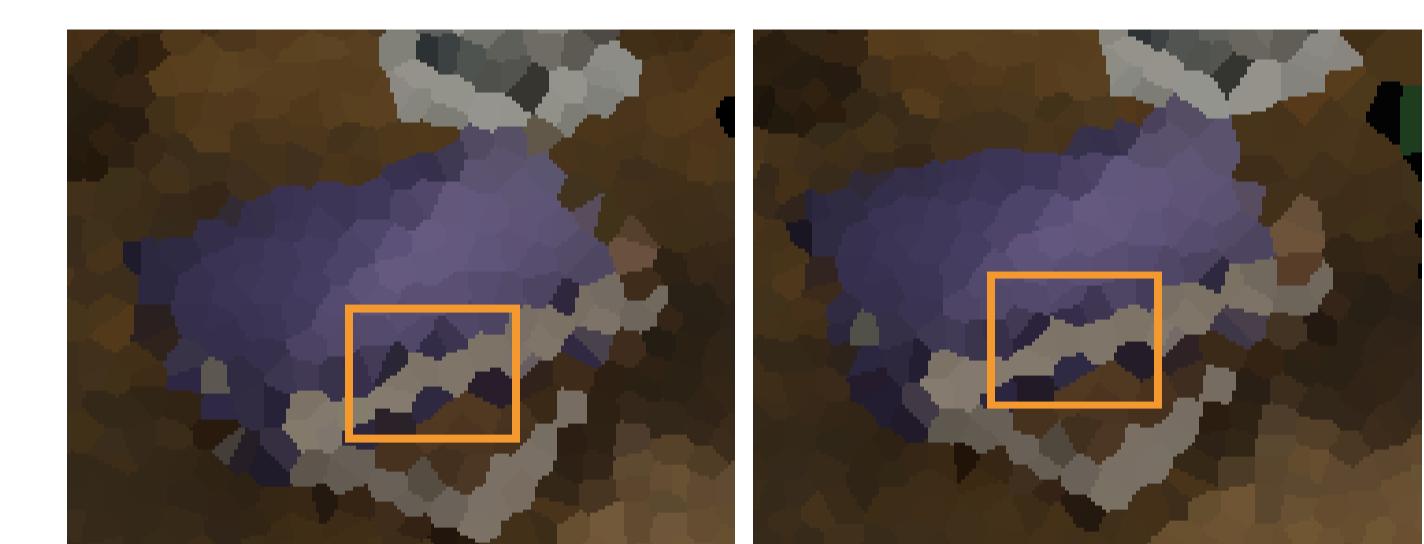


4. Results & Conclusion

Qualitative results demonstrating improved temporal coherence.



Two mosaic frames without coherence adjustments.



Two mosaic frames with our method applied.

Quantitative results demonstrating statistically significant improvement in temporal and visual coherence (room: 63.6% and 47.6%, market: 70.1% and 18.1%).

Scene	Method	Temporal	Visual
Room	Baseline	16234	16103
	Our method	9922	10991
Market	Baseline	22336	17828
	Our method	13127	15093

Table 1. Average of the total world position pixel difference between frames and images, demonstrating temporal and visual coherence.

References

- [1] J. Fischer, D. Bartz, and W. Straßer. "Stylized augmented reality for improved immersion". In: *IEEE Proceedings. VR 2005. Virtual Reality*, 2005. 2005, pp. 195–202. DOI: 10.1109/VR.2005.1492774.