EI2024 Highlights Session

Engineering Reality of Virtual Reality

Real-time Stereoscopic Image-parallel Path tracing

Erwan Leria, Markku Mäkitalo, Pekka Jääskeläinen
Tampere University

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Wed. January 24 / 4:10 PM / Grand Peninsula E

Introduction

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Real-time Stereoscopic Image-parallel Path tracing
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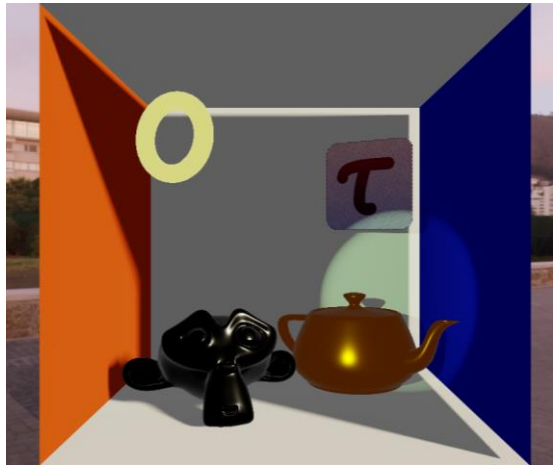
1

Path tracing

Rasterization



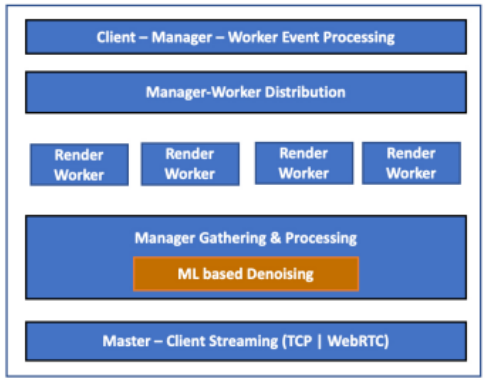
2

We set the motion to photon (end to end) latency to be between **11-20 ms**
Based on the **Critical Flicker Frequency** range: **50-90 Hz**

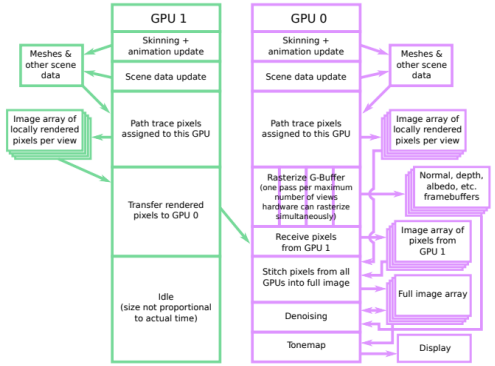
3

Single Node multi-GPU pipelines:

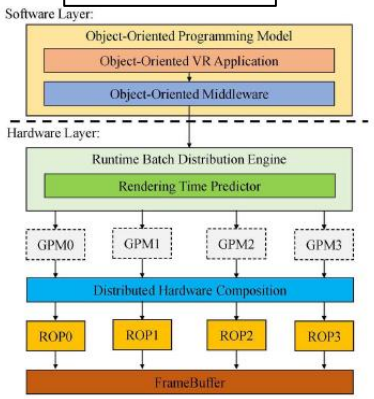
Meta RL Cycles



Tauray



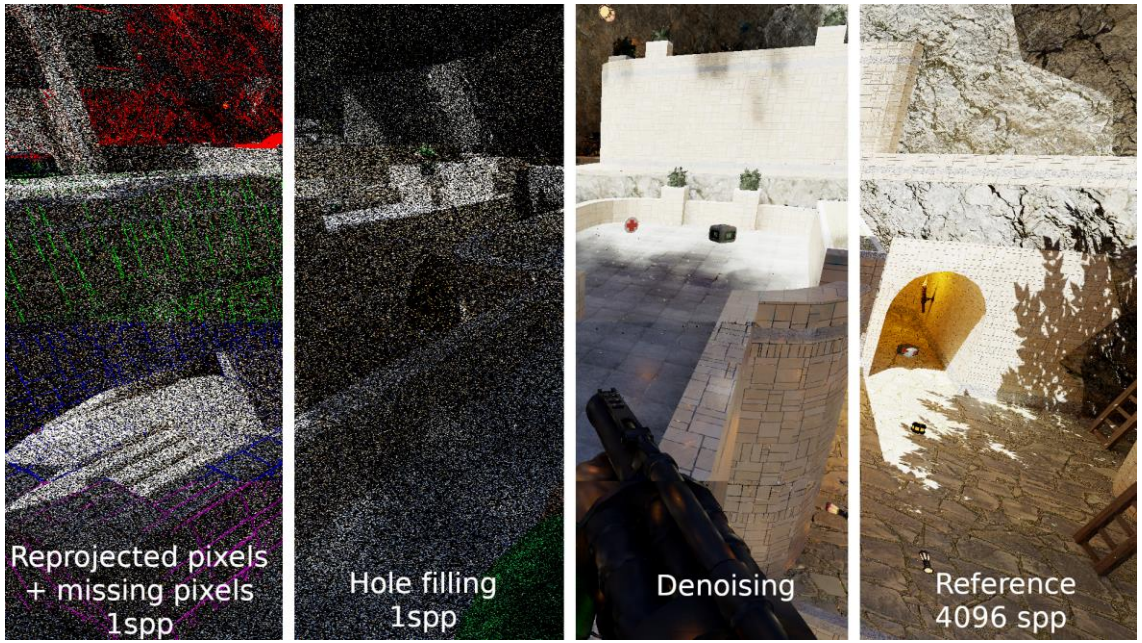
OOVR

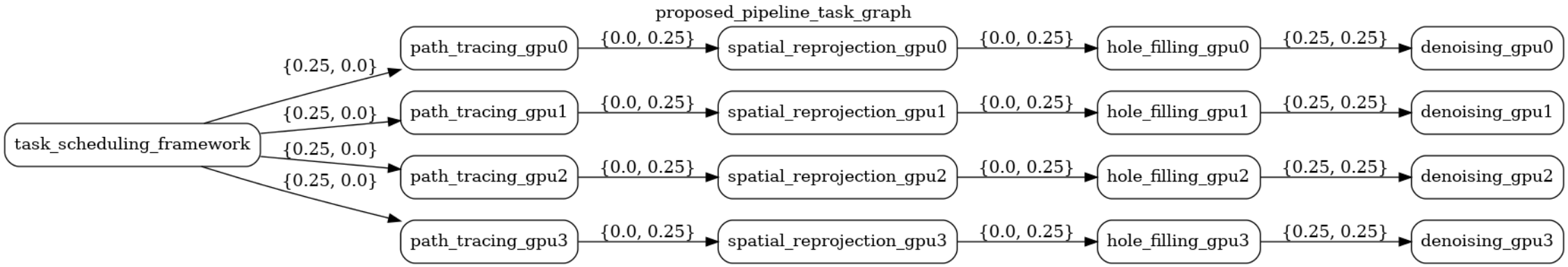


/!\ Restrained parallelization

Stereoscopic Image-parallel pipeline

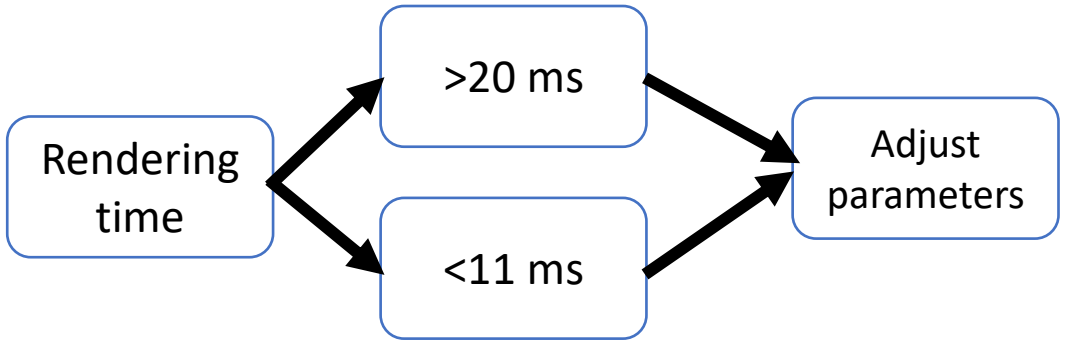
(Image of the right eye)

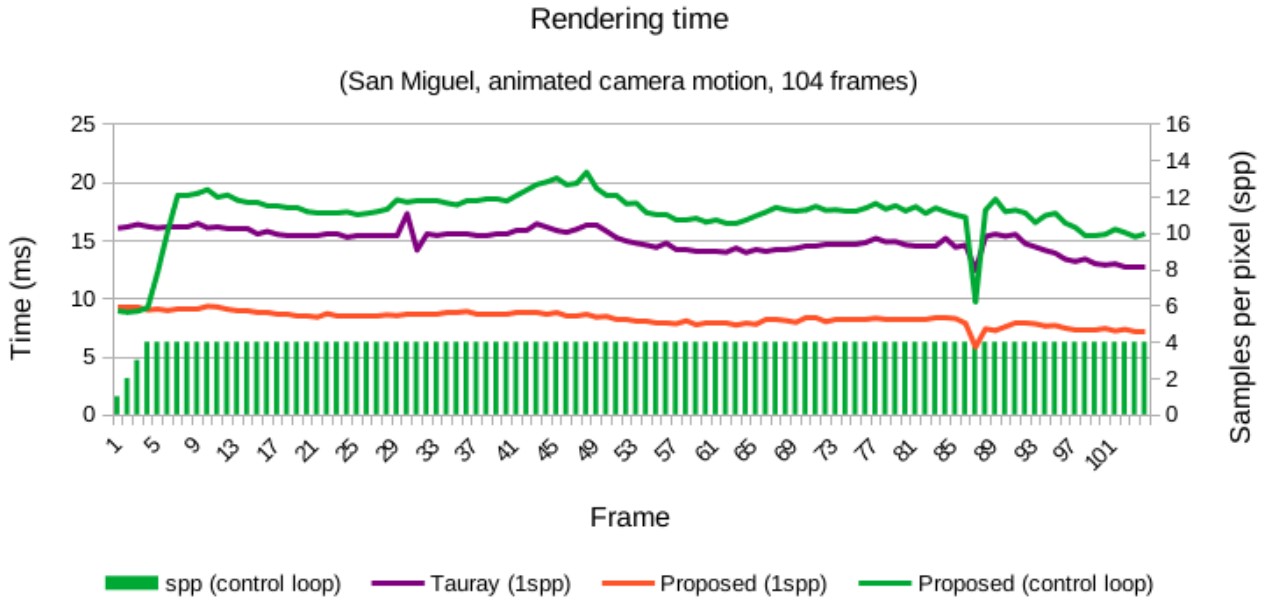




Quality-performance control loop

- Adapts the renderer to the scene variability
- Keeps the rendering frequency in the CFF range 11-20ms





Results / Conclusions

Proposed Pipeline

- Maximizes **data locality** along horizontal axis in the image
- Parallelizes spatial reprojection, hole-filling and denoising across multiple GPUs
- Handles **workload dependency** through workload ratios per GPU per stage per view
- Keeps the rendering frequency within and/or above the 50-90 Hz target range
- Tunes the quality with respect to the rendering frequency

Performance

- For the 3 test scenes: **x2.25** speedup for ~100 frames against Tauray
- For the main stages for the San Miguel scene: **x2.75 to x4.2** speedup against Tauray

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Thank You!

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