Viewport Tile Selection Experiment:

Using Test Model for Immersive Video (TMIV)

Presenter: Soonbin Lee (soonbinlee@skku.edu)

Jong-Beom Jeong, Soonbin Lee, Sungbin Kim, Il-Woong Ryu, Dongmin Jang, Eun-Seok Ryu

Multimedia Computing Systems Lab. (MCSL)

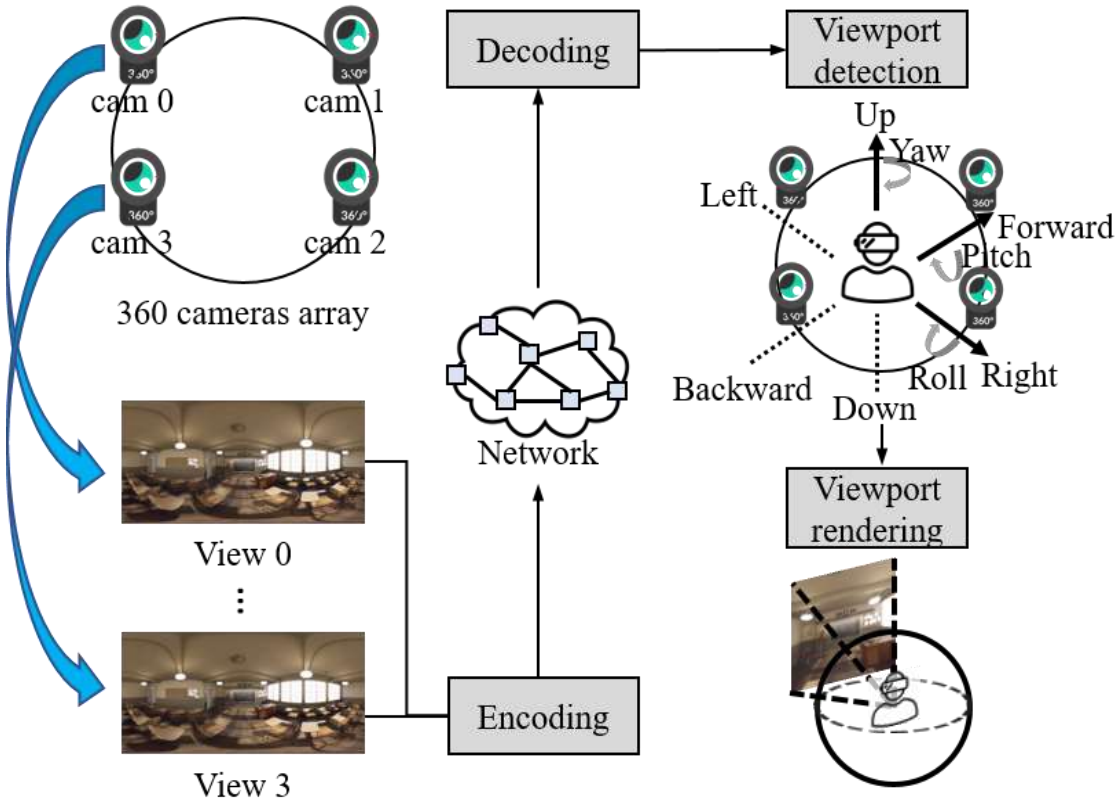
http://mcsl.skku.edu

Department of Computer Education

Sungkyunkwan University

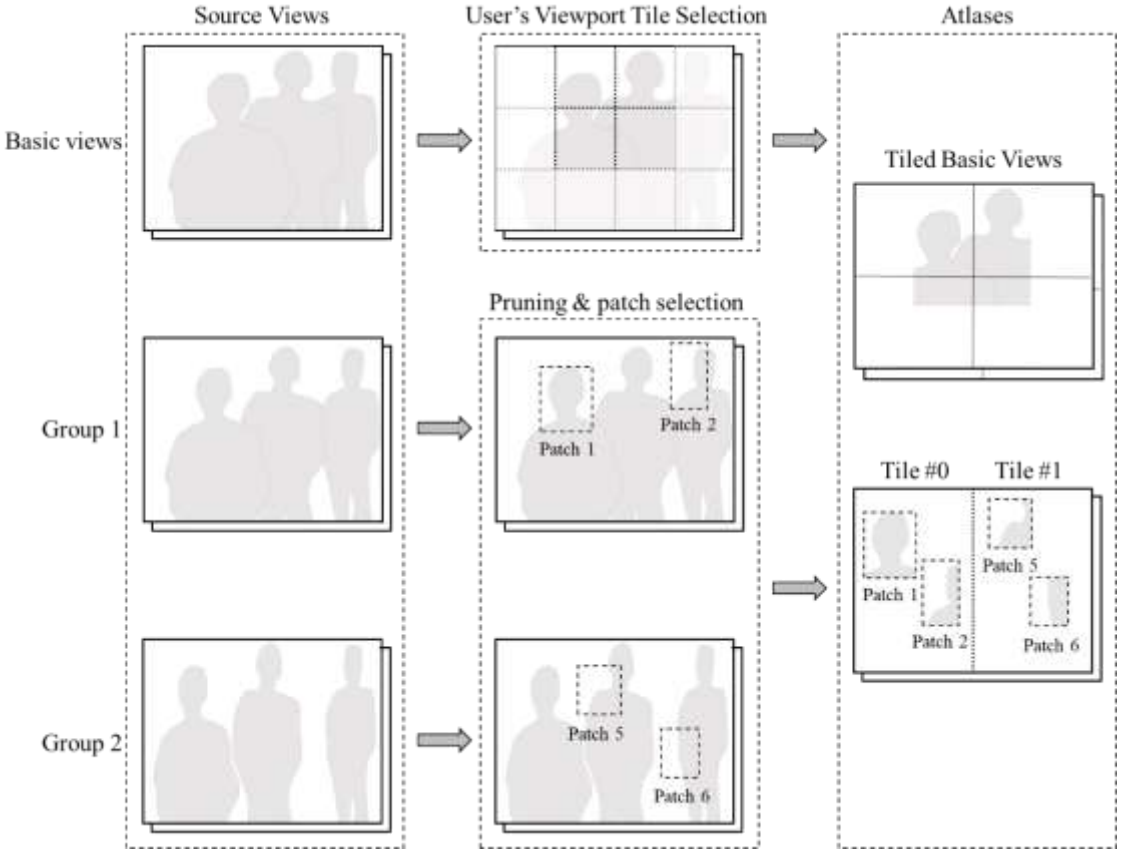
3DoF+ Overview

- 3DoF+ Overview System
  - the MPEG defined 3DoF+ to support the user's head movements.
  - requires a high computing power and bandwidth



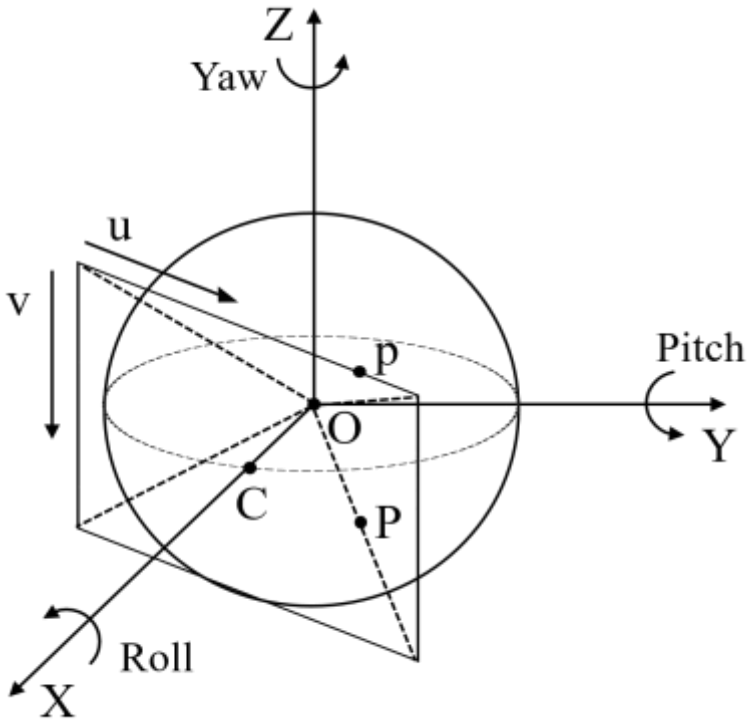
Viewport Streaming for 3DoF+

- Viewport Streaming for 3DoF+
  - When a user's head movement are transferred from the client, selects the tile sets that belong to the user's viewport and their bitstreams.



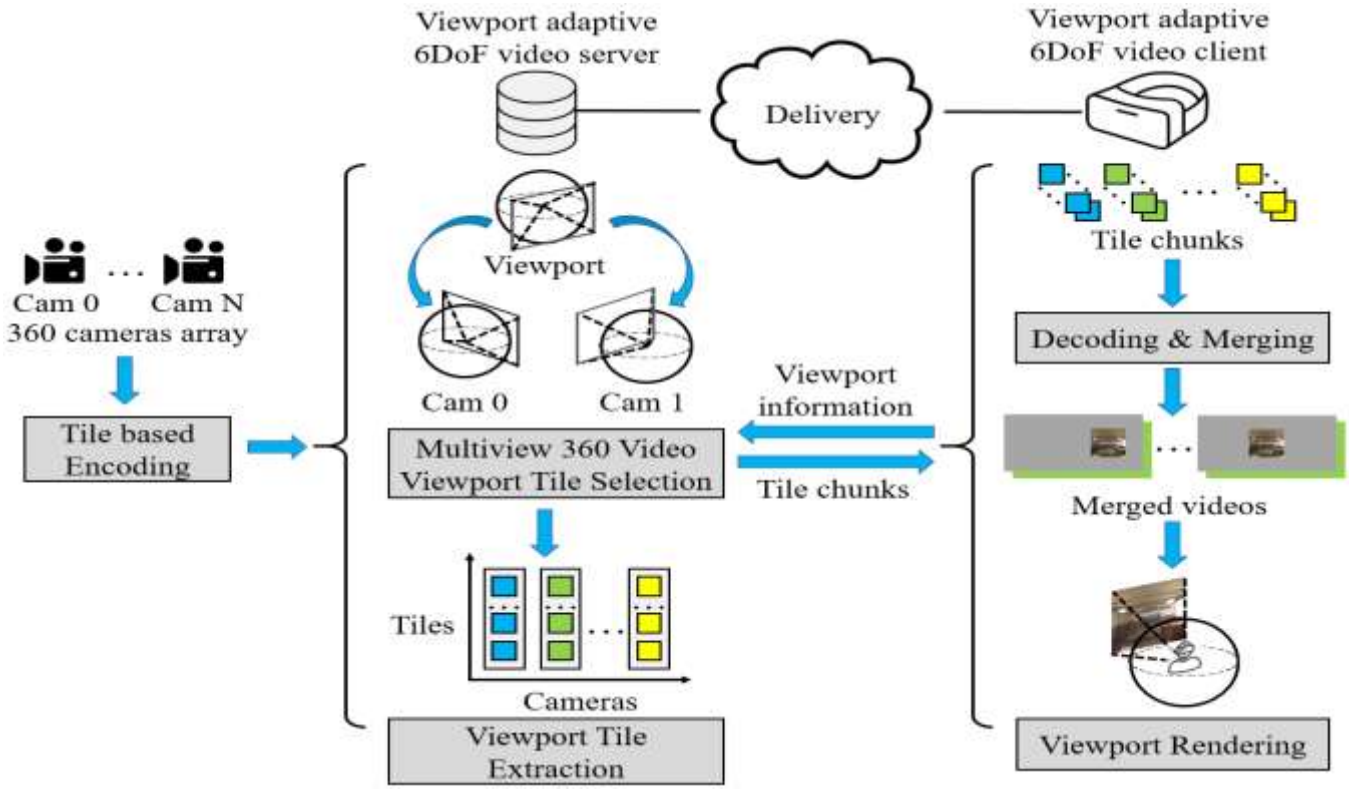
OMAF(Omnidirectional MediA Format)

- OMAF Coordinate System
  - Global coordinate system is defined in OMAF, OMAF is part 2 of MPEG-I
  - Viewport tile decision method for a single 360 video, which is compatible with OMAF



Viewport Tile Selection (VTS)

- Viewport Tile Selection (VTS)
  - Single-pass encoding/rendering with MCTS-encoder and modified TMIV
  - Saving bandwidth with selective tile-based streaming
  - Fewer decoder instance



Experimental Results

IEEE 3079

- Experimental results for CTC
  - We conducted experiment with CTC defined in MPEG
  - Every evaluation frames is 97

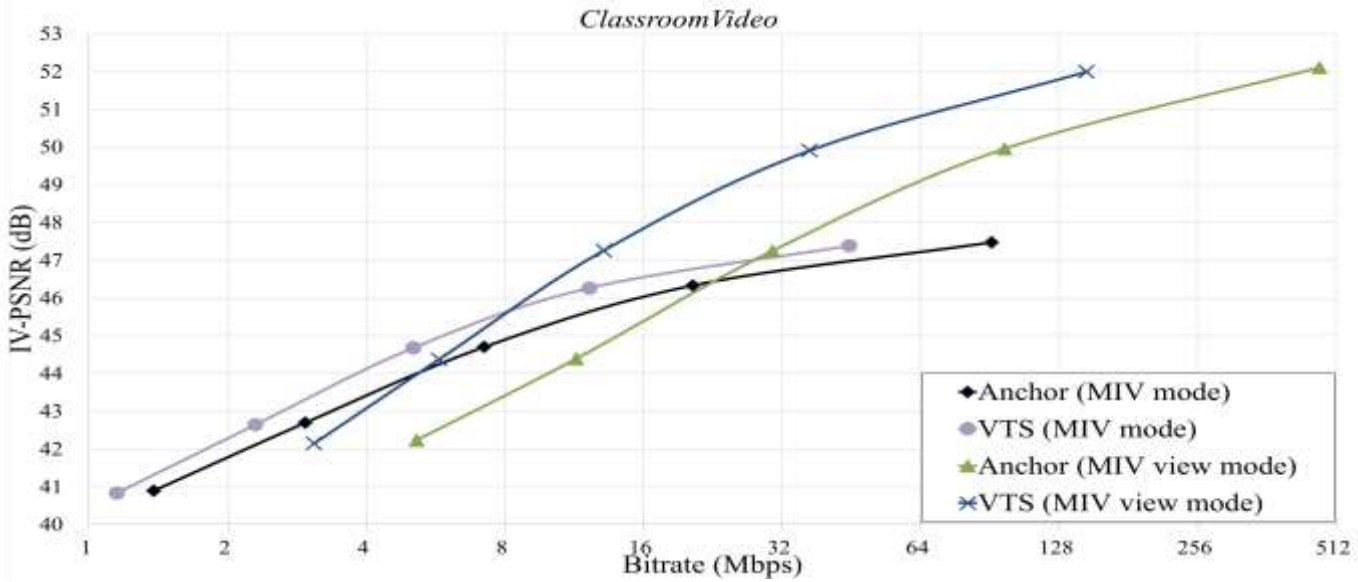
Sequence	Class	Resolution	View FoV	Global FoV	No. of views	Evaluation frames	
						Start frame	No. of frames
ClassroomVideo	CG1-A	4096 × 2048	360 × 180	360 × 180	15	23	97
TechnicolorMuesum	CG1-B	2048 × 2048	180 × 180	360 × 180	24	100	97
TechnicolorHijack	CG1-C	4096 × 4096	180 × 180	180 × 180	10	0	97
NokaChess	CG1-N	2048 × 2048	180 × 180	360 × 180	10	60	97

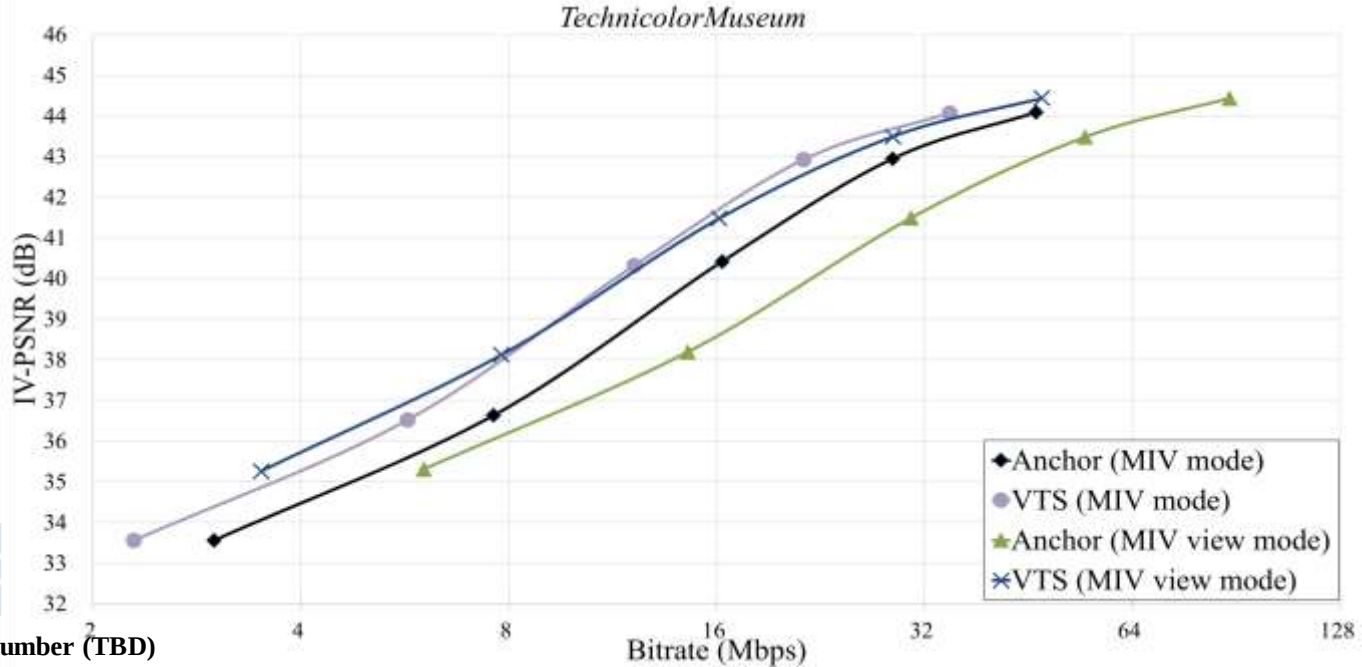
Experimental Results

- Experimental results for CTC
  - For the objective evaluation, PSNR and IV-PSNR* is used.
  - VTS method showed the better results on BD-rate and number of decoders.

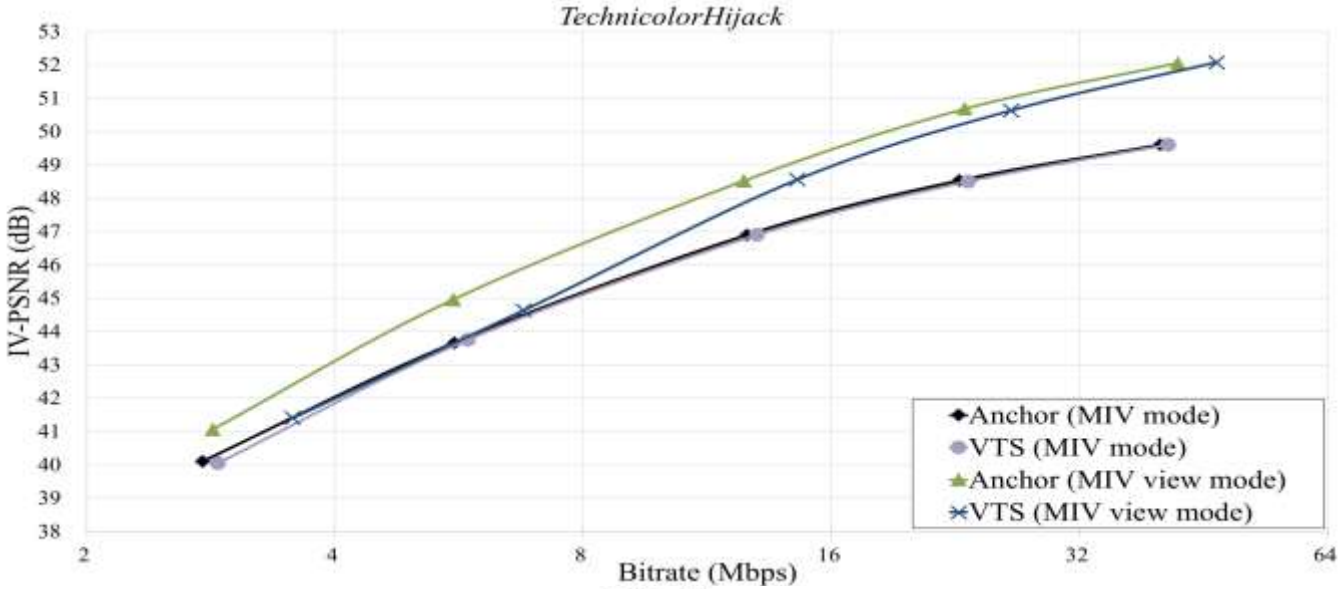
Sequence	Class	No. of decoders required	High BD-rate Y-PSNR(%)	Low BD-rate Y-PSNR(%)	High BD-rate IV-PSNR(%)	Low BD-rate IV-PSNR(%)
ClassroomVideo	CG1-A	4	-23.5	-21.3	-31.1	-24.8
TechnicolorMuesum	CG1-B	8	-24.9	-24.1	-24.1	-23.5
TechnicolorHijack	CG1-C	6	2.8	3.5	2.8	2.7
NokaChess	CG1-N	8	-7.3	-4.4	-8.1	-5.0
Average	-	**6.5**	**-13.2**	**-11.6**	**-15.1**	**-12.7**

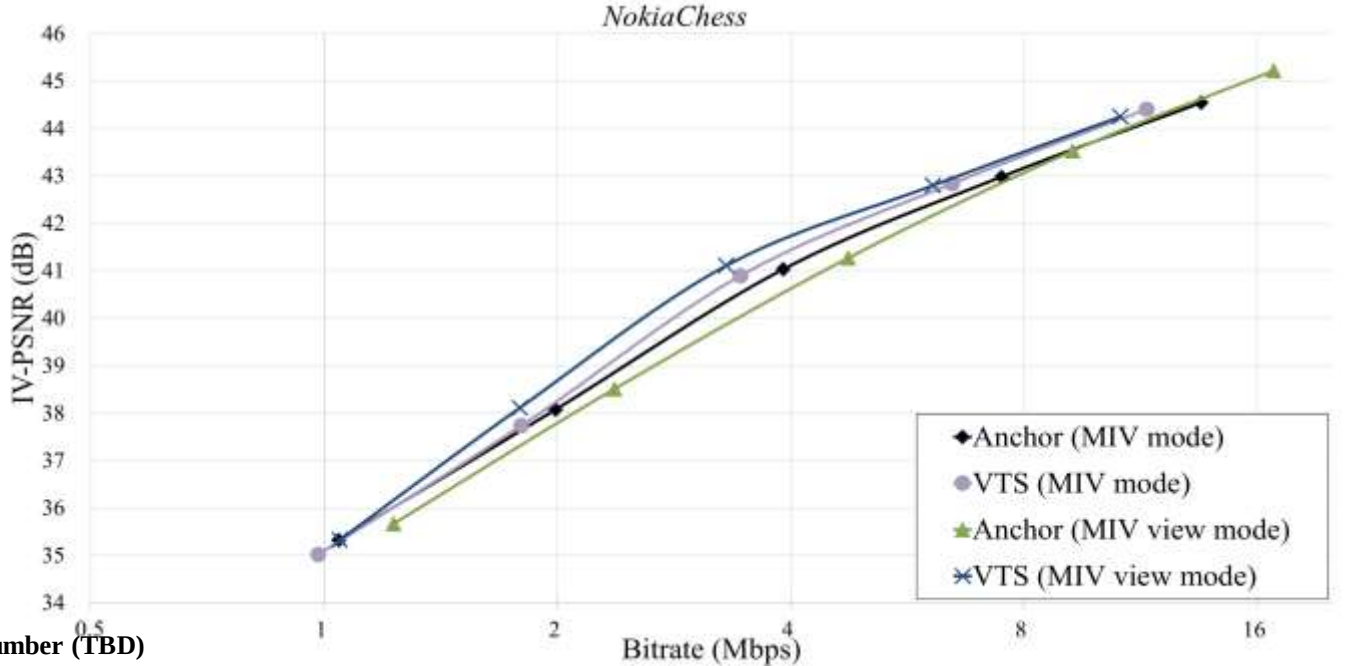
Experimental Results (-Cont'd)





Experimental Results (-Cont'd)

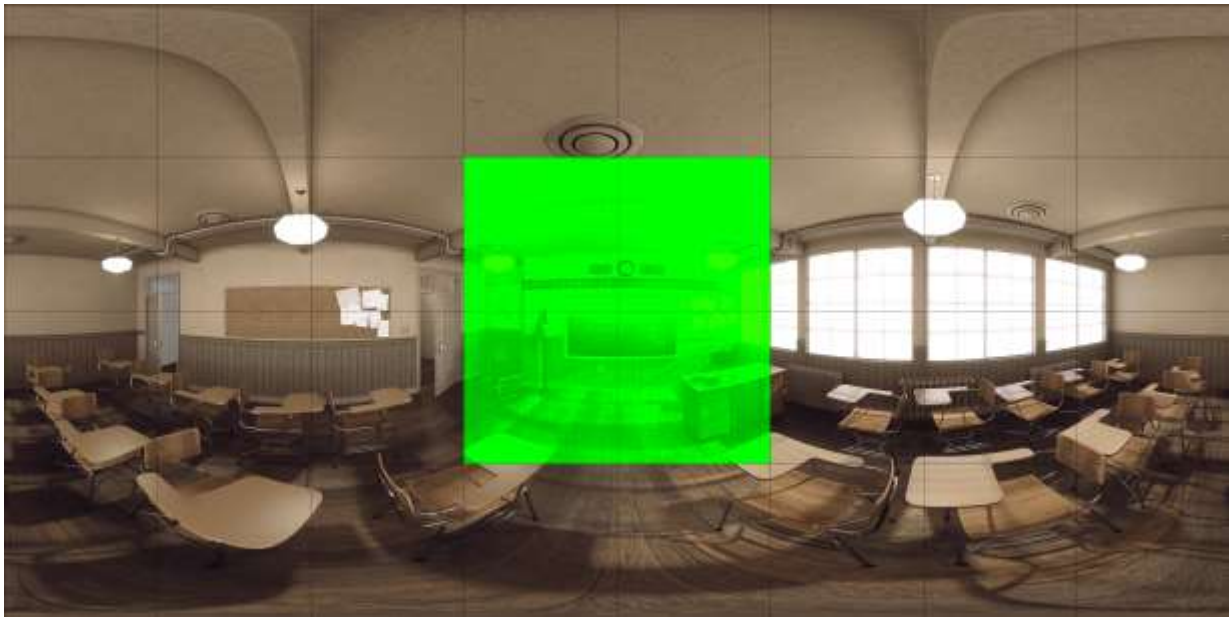




Appendix (-Cont'd)

- CG1-A, position at v0, (x, y, z, yaw, pitch, roll) = (0, 0, 0, 0, 0, 0)
- Pose trace Ap02, (x, y, z, yaw, pitch, roll) = (0,0,0,1.85E-05,-2.99E-06,3.20E-05)

viewport

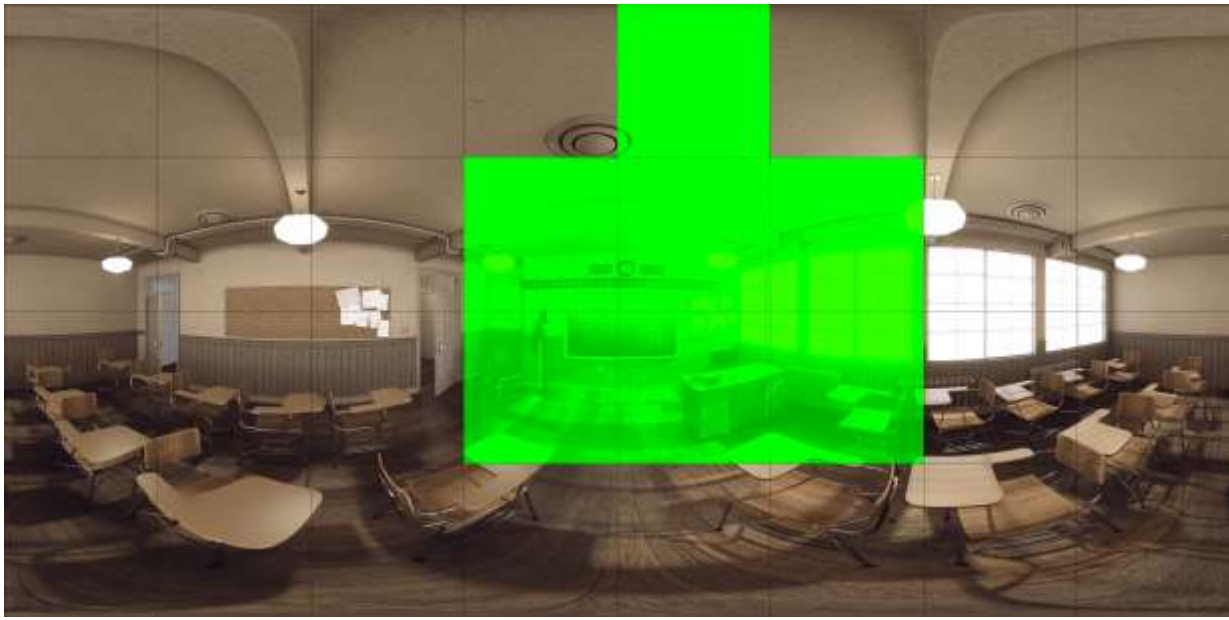


v0

Appendix (-Cont'd)

- CG1-A, position at v0, (x, y, z, yaw, pitch, roll) = (0, 0, 0, 0, 0, 0)
- Pose trace Ap01, (x, y, z, yaw, pitch, roll) = (0.205,0.09,0,-20,-5,0)

viewport

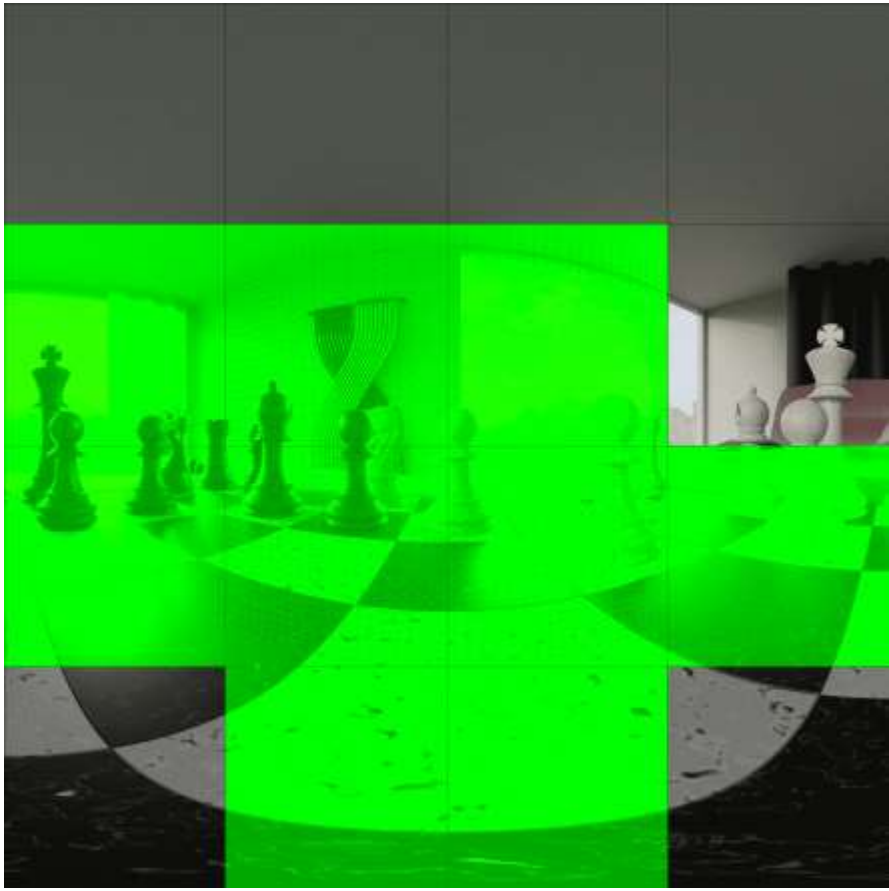


v0

Appendix (-Cont'd)

- CG1-N, position at v1, (x, y, z, yaw, pitch, roll) = (-0.20000000298023224, -0.5, 1.0, -0.0, -0.0, 0.0)
- Pose trace Np01, (x, y, z, yaw, pitch, roll) = (0.25,0.0,0.0,5.08888476044965E-14,-2.4148358874568E-06,2.4148358874568E-06)

viewport

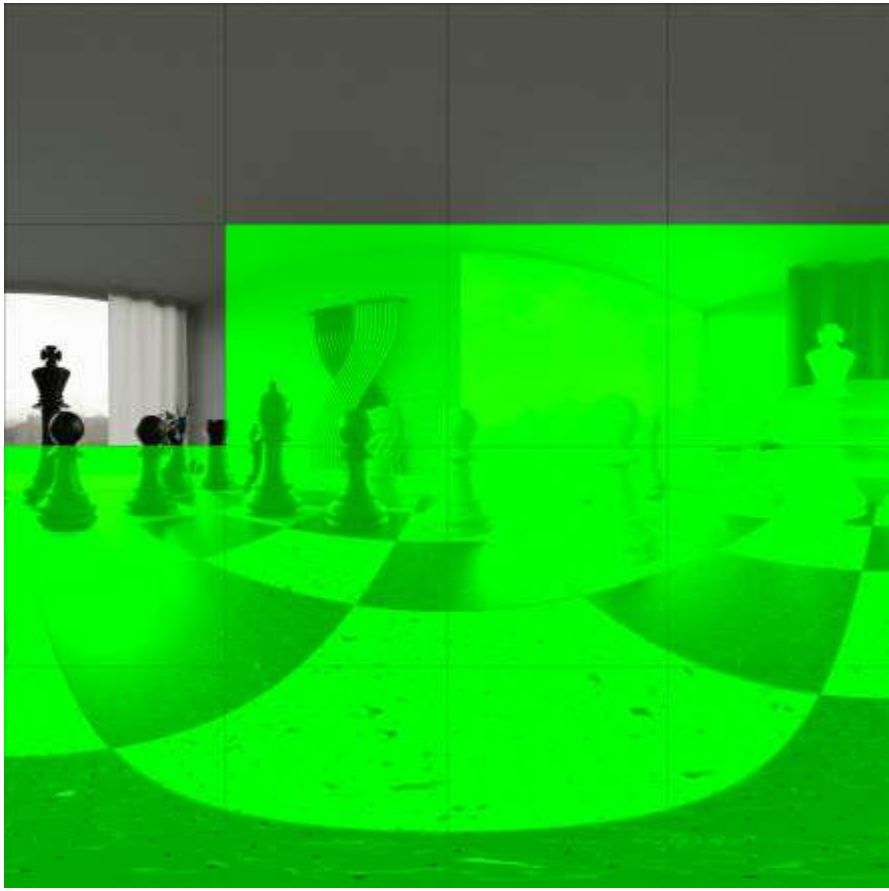


v1

Appendix (-Cont'd)

- CG1-N, position at v1, (x, y, z, yaw, pitch, roll) = (-0.20000000298023224, -0.5, 1.0, -0.0, -0.0, 0.0)
- Pose trace Np02, (x, y, z, yaw, pitch, roll) = (-0.25,0.0,0.0,-20.200002725009400, 29.99999741973150, -8.79232615657642E-09)

viewport



v1