DASH FOR 3D NETWORKED VIRTUAL ENVIRONMENT

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GOAL: REPRESENT STATIC 3D CONTENT IN DASH FORMAT

	Period	Adaptation Set	Representation	Segment
Video	Start time and duration of content (e.g., chapters, ads)	Different media content (video, audio, subtitles)	One representation per video quality	Segmented into fixed duration
3D	N/A	One per geometry cell, one per texture	Multiple resolutions for textures	Segmented into fixed number of faces

SCENE PARTITIONING FOR VIEW-DEPENDENT STREAMING

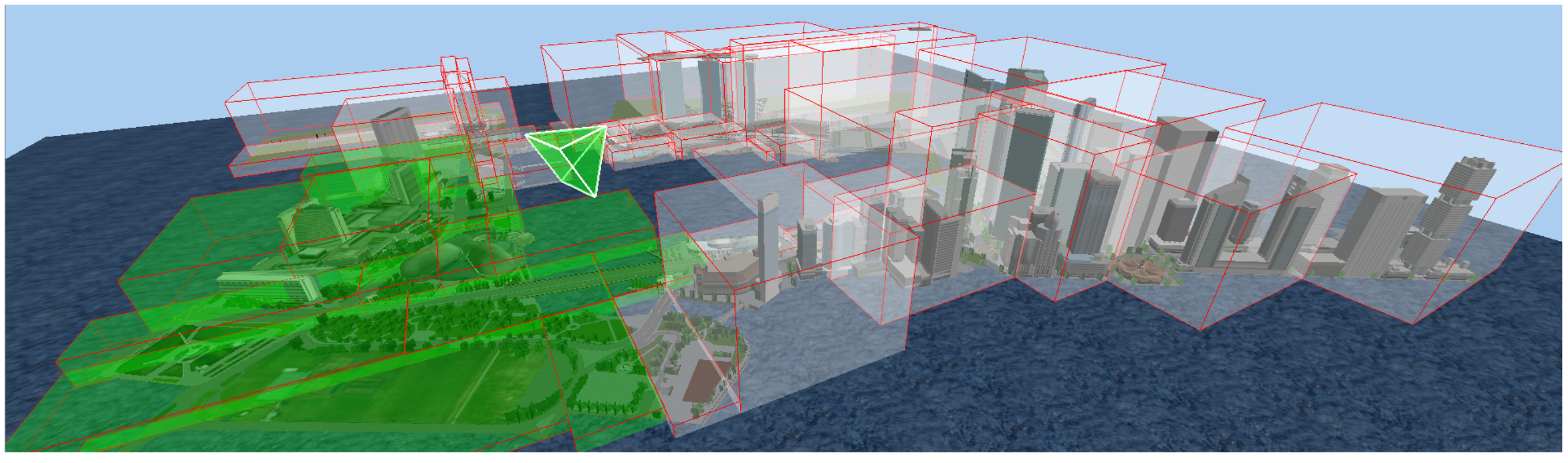
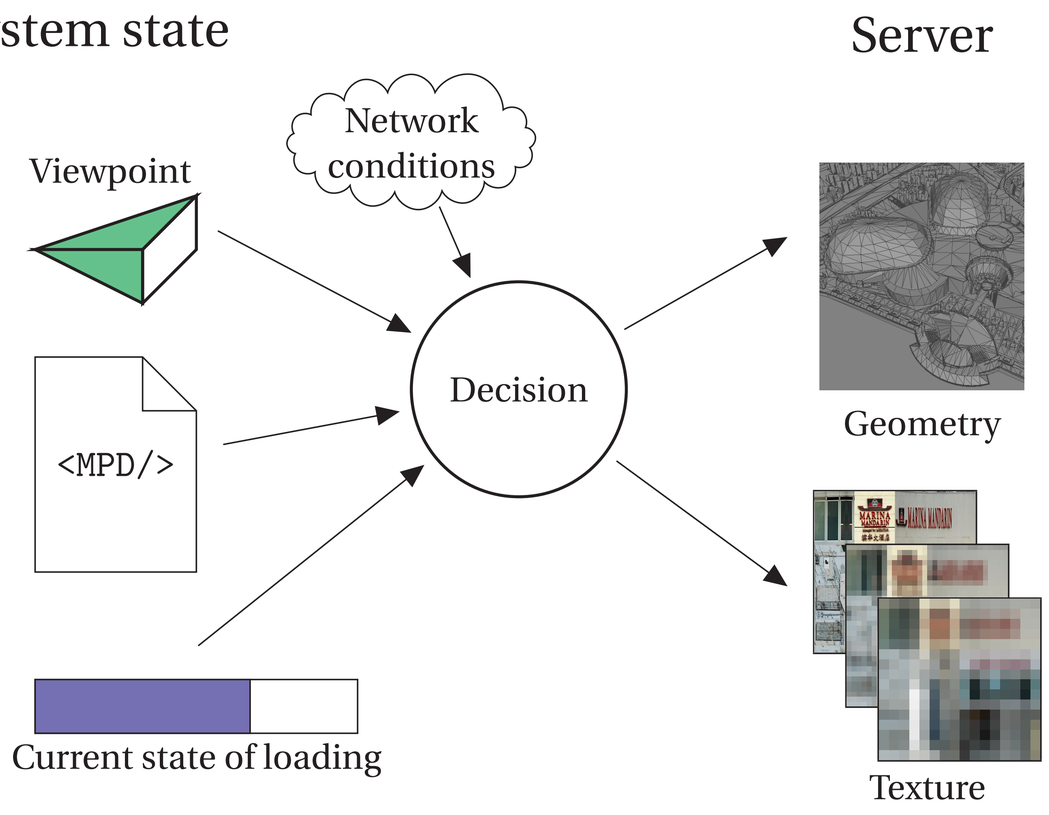


Figure 1: A subdivided 3D scene with a viewport, with regions delimited with red edges. In white, the regions that are outside the field of view of the camera; in green, the regions inside the field of view of the camera

DASH CLIENT DECISION MAKING



DECISION COMPUTATION

Geometry segment utility

$$\mathscr{U}\left(s^G, v(t_i)\right) = \frac{\mathscr{A}_{3D}\left(s^G\right)}{\mathscr{D}\left(v(t_i), AS^G\right)^2}$$

A geometry segment is more important if:
- the segment contains large faces
- the camera is close to the segment

Texture segment utility

$$\mathscr{U}\left(s^T, v(t_i)\right) = \mathrm{psnr}\left(s^T\right) \sum_{k \in K} \frac{\mathscr{A}_{3D}\left(s_k^G \cap \Delta(T, t_i)\right)}{\mathscr{A}_{3D}\left(s_k^G\right)} \mathscr{U}\left(s_k^G, v(t_i)\right)$$

A texture segment is more important if:
- it is high resolution
- it is often used in important geometry segments

Greedy policy

$$\underset{s \in \mathscr{S}_G \cup \mathscr{S}_T}{\operatorname{argmax}} \frac{\mathscr{U}\left(s, \hat{v}(t_{i+1}(s))\right)}{t_{i+1}(s) - t_i}$$

Get next most useful segment

Predictive policy

$$\underset{s \in \mathscr{S}_G \cup \mathscr{S}_T}{\operatorname{argmax}} \int_{t_{i+1}(s)}^{t_i + \chi} \mathscr{U}(s, \hat{v}(t_i))\, dt$$

Get most useful segment over the next χ s

EXPERIMENTAL RESULTS

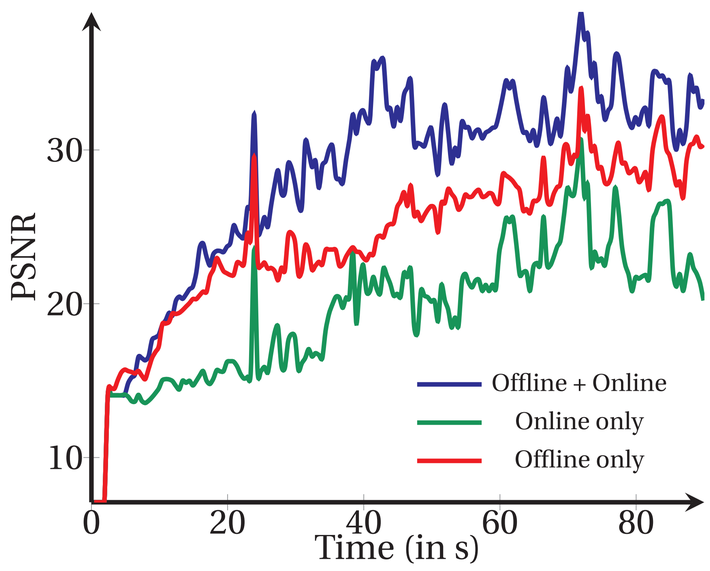


Figure 2: Segment utility

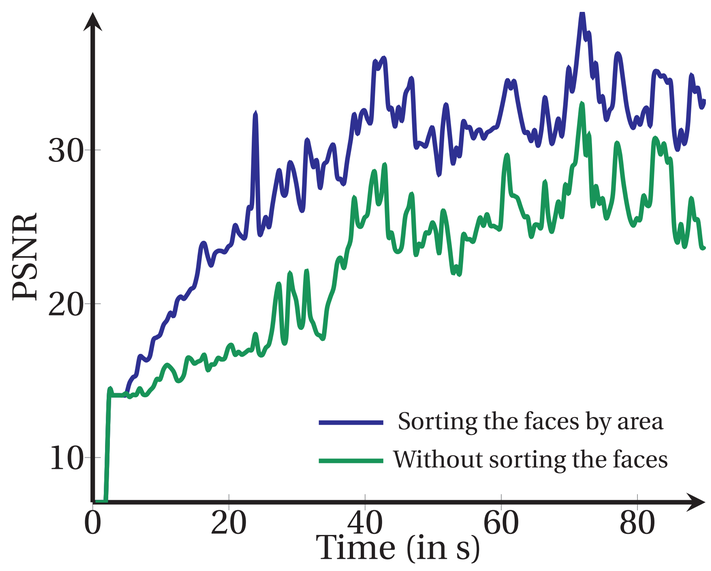


Figure 3: Face sorting

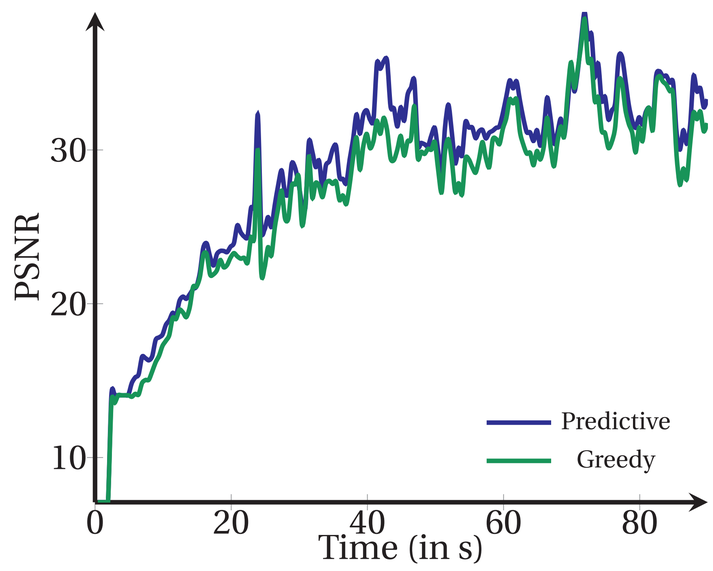


Figure 4: Streaming policy

REFERENCES

[1] Zampoglou, M. et Al. 2016. Adaptive streaming of complex Web 3D scenes based on the MPEG-DASH standard. Multimedia Tools and Applications

[2] Niamut, O. A., et Al. 2016. MPEG DASH SRD. In Proceedings of the 7th International Conference on Multimedia Systems - MMSys '16 (pp. 1âĂŞ8). New York, USA.