Supplementary Material: A Log-Rectilinear Transformation for Foveated 360-degree Video Streaming

David Li *Student Member, IEEE*, Ruofei Du *Member, IEEE*,
Adharsh Babu, Camelia D. Brumar, and Amitabh Varshney *Fellow, IEEE*

SUPPLEMENTARY MATERIAL:

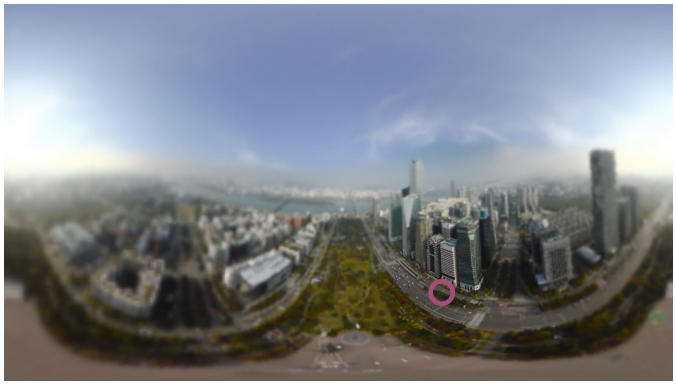
In this supplementary material for Li *et al.* [1], we briefly discuss mipmapping as an alternative to summed-area tables. More supplementary material is available at `https://augmentariumlab.github.io/foveated-360-video/`.

Mipmapping

An alternative to using summed-area tables would be to use mipmapped video frames which can be combined with any sampling method. Mipmaps can be pre-computed similar to multi-resolution methods to avoid the run-time computational overhead of computing summed area tables. However, mipmapping only allows averaging of fixed predetermined rectangles compared to summed area tables which allow averaging over rectangles of arbitrary size and location. In our testing, we found that mipmapping reduces aliasing but does not reduce flickering as large changes can occur when sampling crosses over pixel boundaries of the mipmapped video frames. A qualitative example of log-polar foveation with and without mipmapping is shown in Fig. 1.

Manuscript received xx xxx. 201x; accepted xx xxx. 201x. Date of Publication xx xxx. 201x; date of current version xx xxx. 201x. For information on obtaining reprints of this article, please send e-mail to: reprints@ieee.org. Digital Object Identifier: xx.xxxx/TVCG.201x.xxxxxxx

(a) Without Mipmapping



(b) With Mipmapping

Fig. 1: A qualitative example of a log-polar foveated ERP frame with and without mipmapping. Mipmapping is able to reduce aliasing as shown here but not flickering as the user' gaze changes.

REFERENCES

[1] D. Li, R. Du, A. Babu, C. D. Brumar, and A. Varshney. A log-rectilinear transformation for foveated 360-degree video streaming. *IEEE Transactions on Visualization and Computer Graphics*, 27(5):2638–2647, 2021. doi: 10.1109/TVCG.2021.3067762