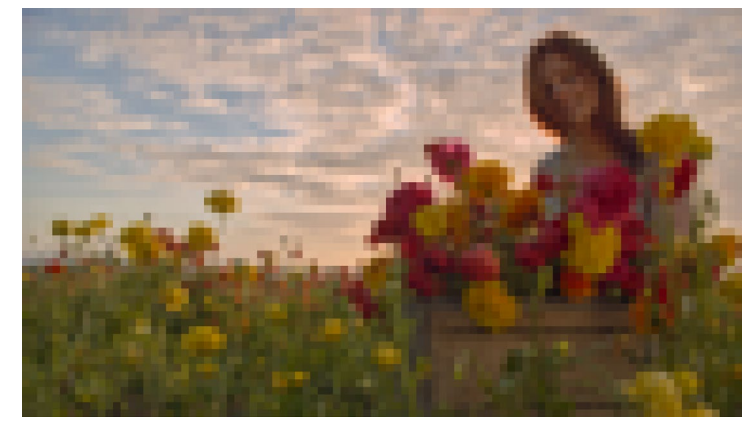


Motivation

AR/VR Headset Resolution is Hardware Constrained



AR/VR

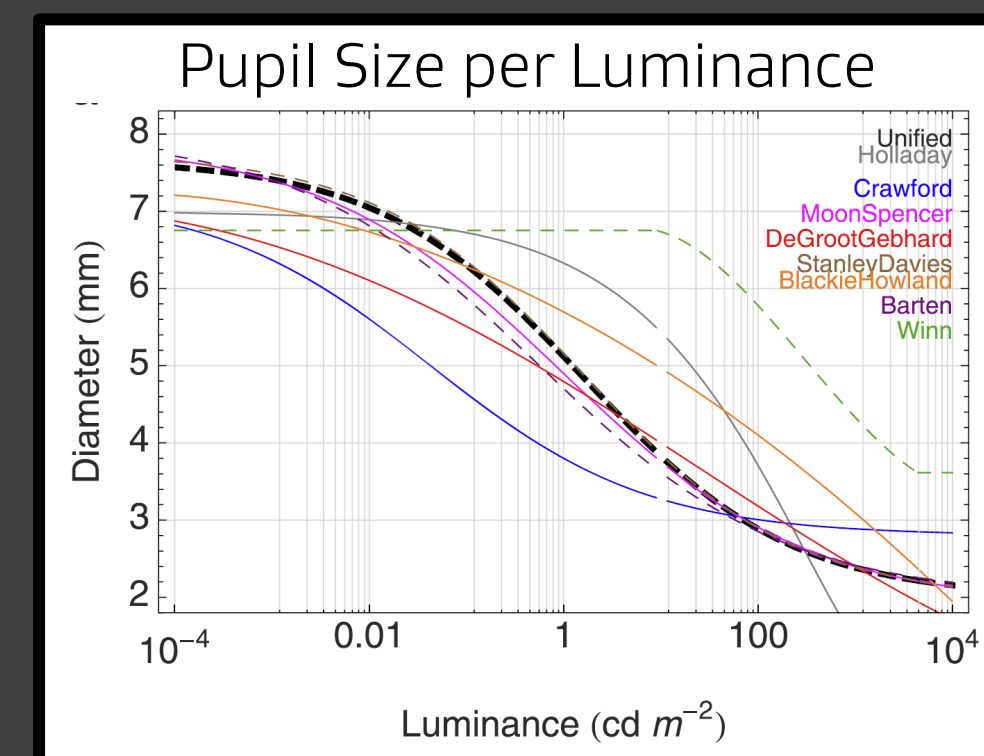
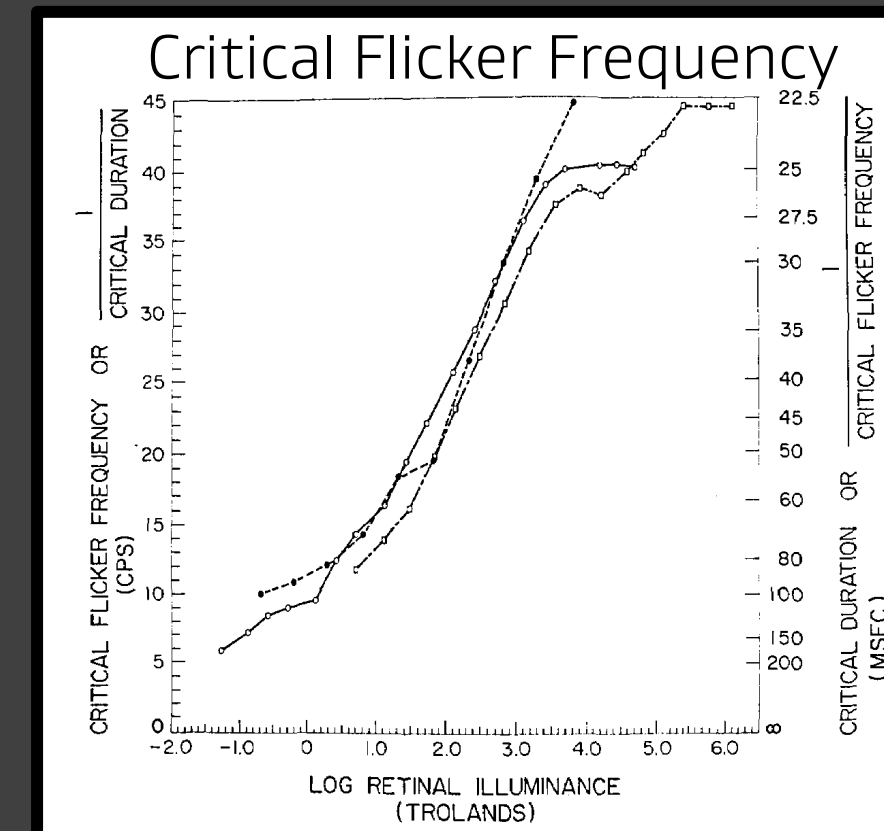


HVS

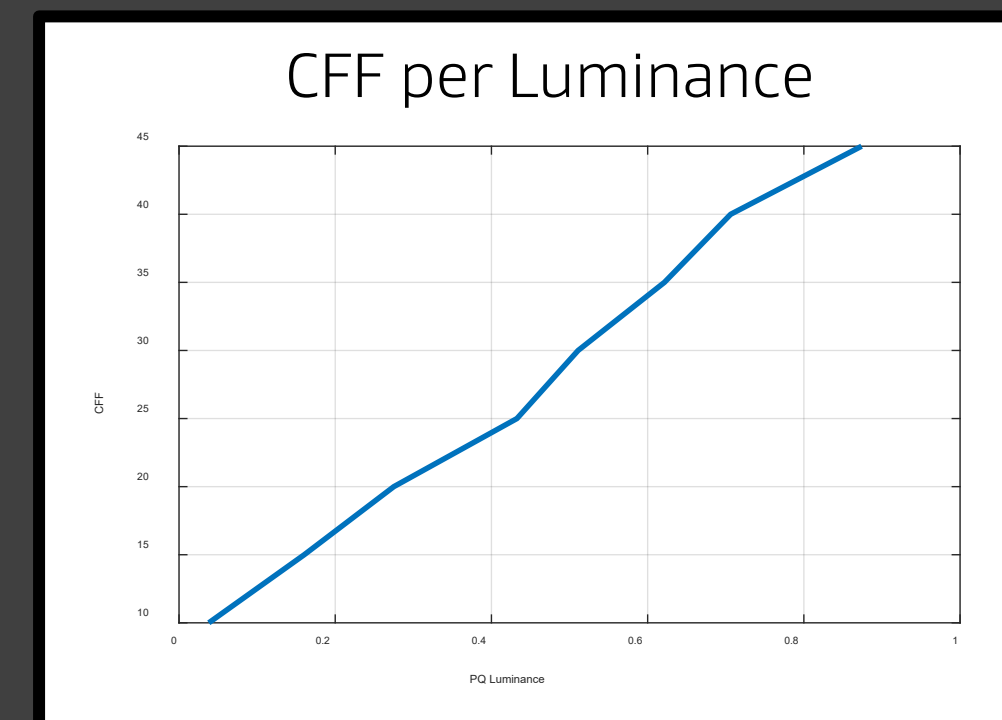
HVS Threshold = 60 cpd
VR Resolution = 5.5 cpd

Modeling Flicker

Prior work lists flicker as a issue, but does not try to solve it.



Using this previous work, we can solve for the relationship between CFF and Luminance



New Technique

Sharp Rendering

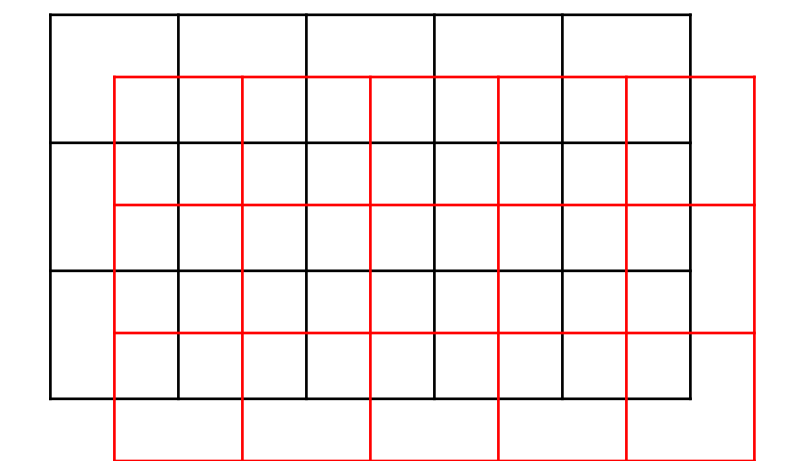


Blurred Rendering



Gradient Descent

$x = x - \beta A^T (Ax - b)$
b = temporally averaged low resolution
x = 4 low resolution images

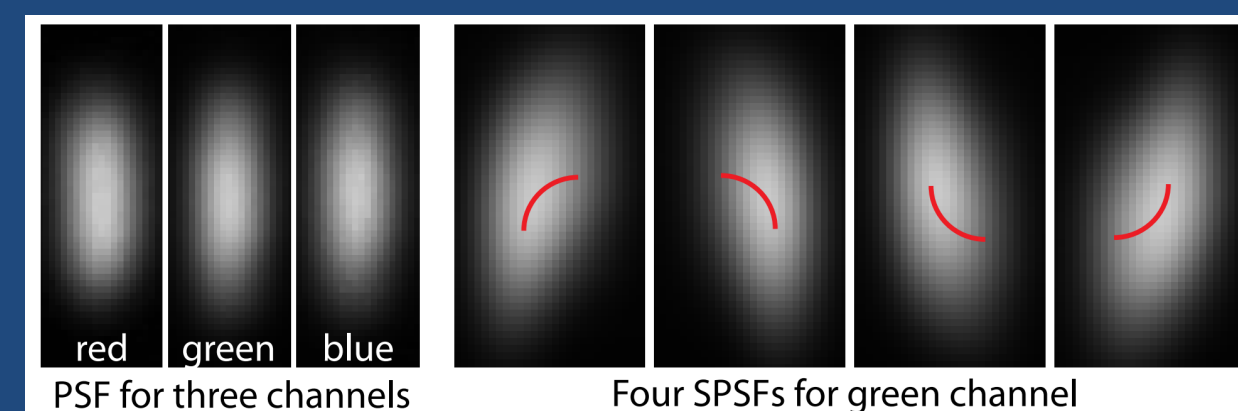
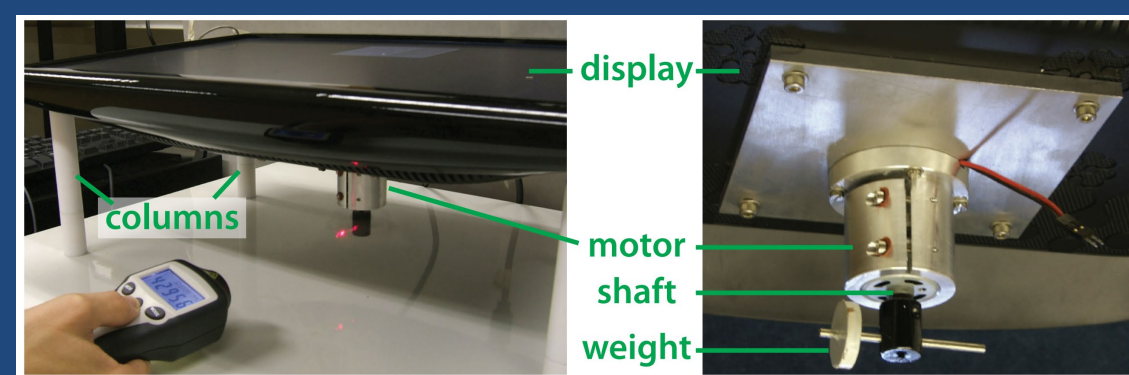


Decide Between Blurred or Sharp Pixel by Pixel

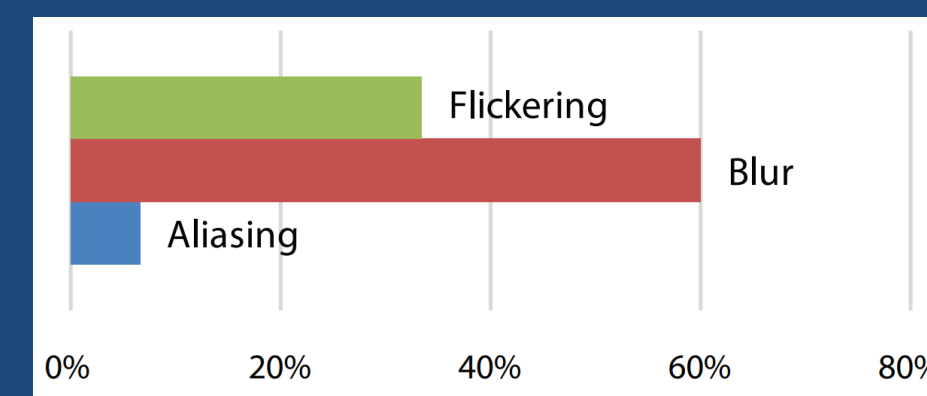
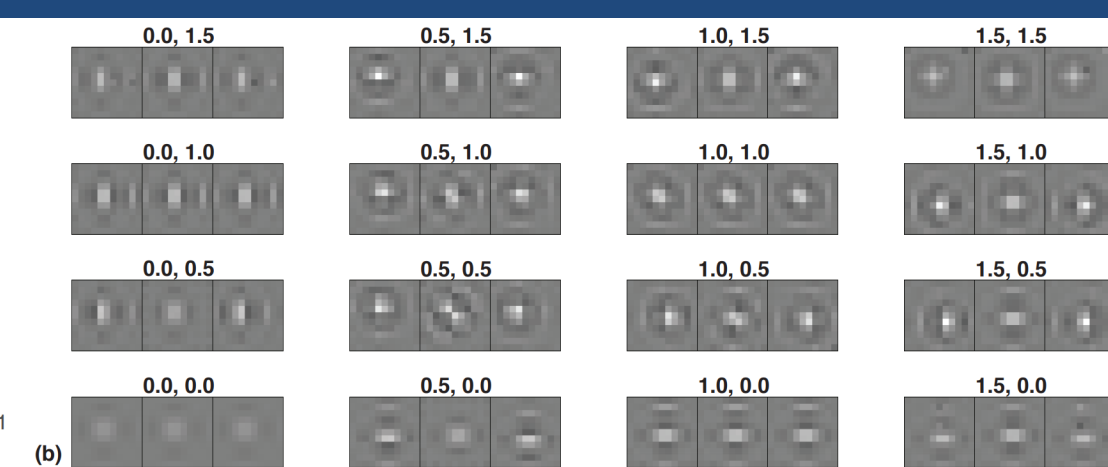
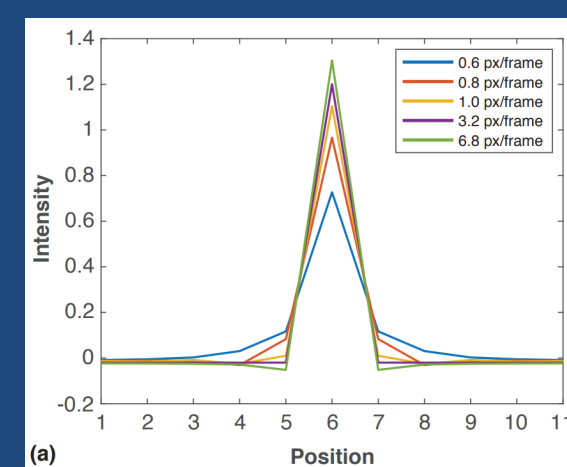
$\alpha = (50 * L_{PQ} + 8.2) / 45$
 $x = \alpha * s + (1 - \alpha) * b$
s = sharp rendering
b = blurred rendering

Related Work

Resolution Enhancement by Vibrating Displays [1]



Apparent Resolution Enhancement for Head Mounted Displays [2]

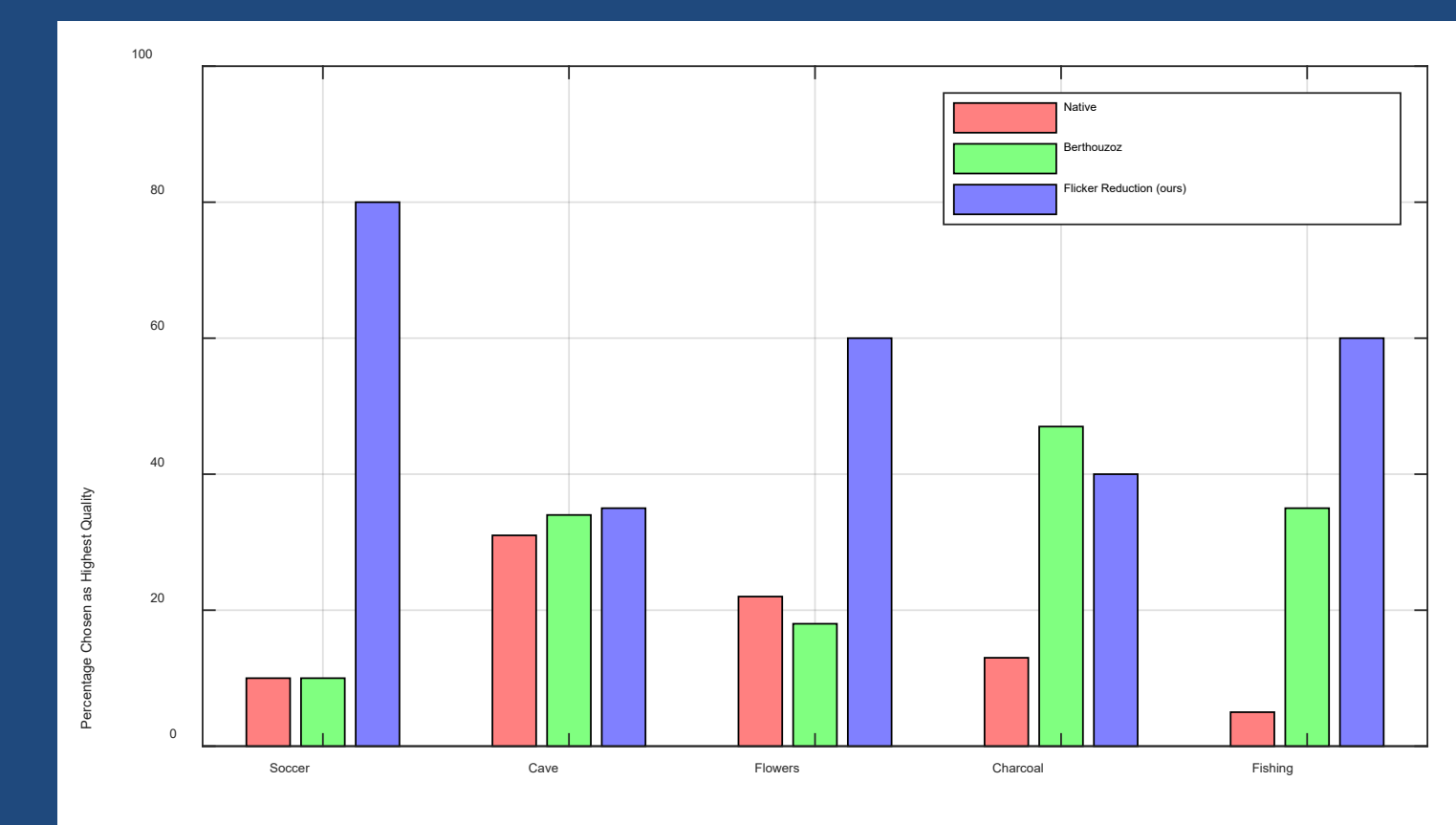


Experimental Results

Variations were played sequentially and observers were asked to choose the one with the highest quality



Flicker reduction was most important for bright sections with high detail



References

- [1] Berthouzoz, F., and Fattal, R. 2011. Resolution Enhancement by Vibrating Displays. ACM.
- [2] Lee, H., Didyk, P. 2018. Real-time Apparent resolution Enhancement for Head-mounted Displays. ACM.
- [3] Matin, I. 1966. Critical Duration, the Differential Luminance threshold, Critical Flicker Frequency, and Visual Adaptation: A theoretical Treatment. Journal of The Optical Society of America.
- [4] Watson, A., Yellott, J. 2012. A Unified Formula for Light-Adapted Pupil Size. Journal of Vision.