Dynamic Field of View in a Tomographic Light Field Display

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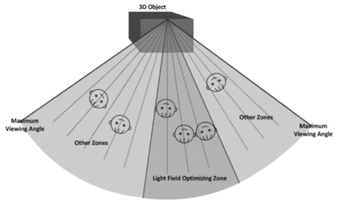
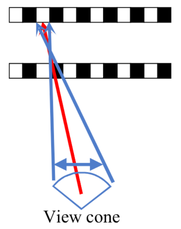
Motivation

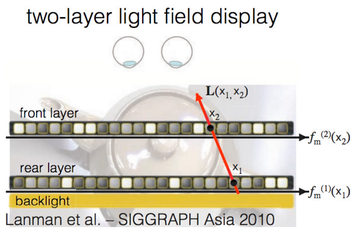
Unlike traditional 2D displays, light field displays provide binocular depth cues such as high-resolution motion parallax, occlusion, translucency, and specularity. In particular attenuation-based light field displays provide an inexpensive means by which to produce these unencumbering effects.

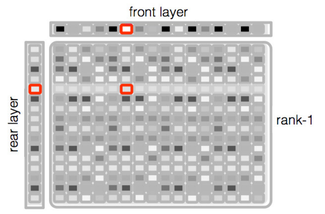
These displays however are limited by a small field of view and unecessary computation on the periphery. We look at ways to extend this FoV using a camera and optimize rendering on the GPU.

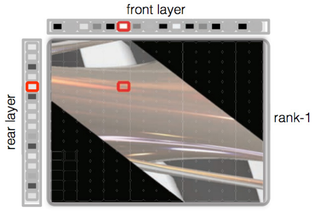
Methods











Algorithm SART - Generic

variables P, b, x, w, v, lb, ub

$x = \text{zeros}();$
$w = 1 \;/\; (P1);$
$v = 1 \;/\; (P^T 1);$

for all iterations k
  $x = x + v \circ (P^T(w \circ (b - Px)));$
  $x = \text{clamp}(x, [lb\ ub]);$
end

Related Work

1 Layered 3D. Wetzstein et al. 2011
2 Real-time Image Generation for Compressive Light Field Displays Wetzstein et al. 2013
3 Wide field of view compressive light field display using a multilayer architecture and tracked viewers. Wetzstein et al. 2014

Conclusions

We achieve a large effective field of view despite a small static field of view. The key to this improvement is the intelligent rendering of the light-field given a viewer's position.

We also demonstrate the effectiveness of SART in generating dynamic real-time scenes (20 fps on an Nvidia Pascal GPU).

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