Joint Depth of Field and Disparity Manipulation

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In our project we will seek to explore ways of enhancing the subjective experience in virtual reality by implementing 1) gaze-contingent depth of field and 2) disparity manipulation into the stereoscopic comfort zone. Improvements have been reported from using the two approaches independently; in our project we will seek to examine the effect of combining them.

We will begin by synthetically rendering views of a scene to generate a combined focal and disparity stack. This has the form of a matrix, where each element corresponds to a view, the rows correspond to a fixed disparity, and the columns correspond to a fixed focal stack. We will then attempt to either guide the user's gaze with on-screen markers, or track their gaze using an eye tracker. In both cases we will dynamically adjust the depth of field and disparity by choosing the appropriate views from our synthetically generated matrix of views.

We aim to implement this project in Unity and potentially use "Tobii EyeX" eye tracker. Depending on our progress in this synthetic environment, we will then consider implementing the same techniques for light field images and/or real time rendering in a 3d virtual environment (as in a game). Our decision to include a head mounted display will depend on whether or not we can incorporate the eye-tracker into our project (since good eye-trackers for head mounted displays are difficult to obtain). We will be in a better position to make this assessment once we have generated our synthetic views.

Time permitting we will try and conduct a small-scale user study to assess subjective appeal of this method.

References:
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