

Study about factors of accommodative stimuli in integral floating display

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Integral floating display is a type of autostereoscopic three-dimensional display, which is derived from an integral imaging system by means of introducing a floating lens [1]. The accommodative responses of the human eye induced from the integral imaging display are verified from several researches [2-3], likewise the integral floating display is regarded to provide a natural accommodative stimuli to the viewers. The factors of our interest about the depth expression characteristics of the integral floating display are the angular and the lateral resolutions. It is thought that the accommodative responses to the changing depth stimuli of a target are whether or not induced corresponding to the system design of integral floating display, especially by manipulating gap between the lens array and floating lens, which is called 'floating gap'. By controlling the floating gap, both angular and lateral resolutions of the system are changed.

The angular resolution of the integral floating system is regarded as the diverging angle of the rays which consist so called 'floated voxel'. When the voxel is introduced from the integral imaging system, and is floated beyond the floating lens, we call this as a floated voxel. When the diverging angle is small, several rays from the floated voxel will pass through the eye pupil, evoke the accommodative system. On the contrary, if the angle is large enough, then the sole ray from the floated voxel, which is a mere floated pixel in this case, comes into the eye pupil, the accommodation system will not be evoked thereby.

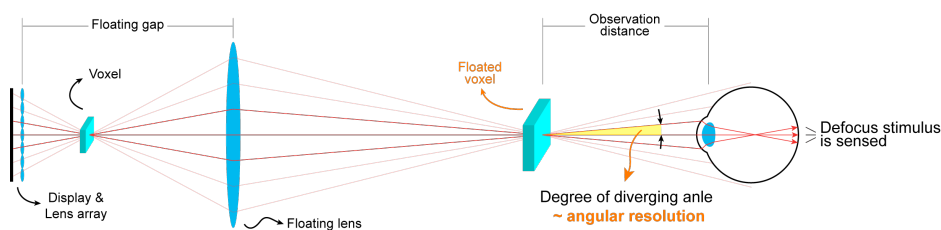


Fig. 1. Angular resolution in integral floating display

The lateral resolution of the integral floating display can be thought as the number of ray bundles contained in the designated size and position of floated target. With high lateral resolution integral floating display system, the target consists of several bundles of ray from each different sub-images. When the elemental image is changed and floated target position varies thereby, it is regarded that the defocus blur stimulus will be sensed on the retina, the accommodative response is followed naturally. On the other hand, in the case of the system with low lateral resolution, the floated target is a mere zoomed sub-image. In this case, even though the elemental image is changed to give a defocus stimulus, the accommodative response will not be induced, because what eye can observe is just a change of plane image, not integrated one.

In this sense, the several experiments are performed to analyse what kind of visual characteristics provided from the integral floating display will generate defocus blur and induce the natural accommodative response. If the floating gap is manipulated stepwise, the accommodative stimuli from the system will be changed, then the response will be or will not be induced to the given stimuli. By using the auto-refractometer, the variation of responses followed from the stimuli caused by different visual factors can be investigated. By means of that, the factors which induce accommodative response in integral floating display can be verified.

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