Abstract

Background. The information displayed on a Head Mounted Display (HMD) can only be read by making eye movements, since head movements have no effect on the ocular image position. Aniseikonia (a common visual deficit) is expected to cause eye strain and limit the readability of large FoV binocular HMDs. As the FoV increases, the screen layout needs to optimize overall display readability by preventing clutter while taking common optometric conditions into account. Methods. We measured the ability to quickly determine the orientation of a target ⊤ (⊤ vs ⊥) surrounded by 4 randomly oriented (up, down, left, right) flanker T's as a function of target-flanker spacing and eccentricity, in conditions where the target had either the same or opposite opposite luminance polarity as the flankers. All 12 subjects scored normal on relevant optometric tests (stereopsis, visual acuity, Awaya aniseikonia test, phoria). An aniseikonic lens placed in front of one eye optically enlarged the image by 2½%, simulating a common optometric condition. The additional delay caused by the presence of the four flankers is adopted as the 'Crowding component' of the reaction time. Results. Compared to the Same polarity condition, Opposite polarity reduced the Crowding time by a factor of 2.3 ($p < 0.001$). The Crowding times can be described as an extension of Fitts' law. Unexpectedly, the mild aniseikonia condition doubled the Crowding time ($p < 0.001$) and caused the highest level of eye strain ($p < 0.001$). Conclusion. For all eccentricities and target-flanker spacings, the Crowding time more than halved in the opposite polarity condition, while it doubled due to the addition of just 2½% aniseikonia. Practical implications. Even users with mild aniseikonia are likely to experience problems while reading a large FOV HMD. 'Polarity decluttering' can significantly enhance symbology legibility.