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Research Article

Accommodative Haptics Study Based on Flexible Amplification Mechanism

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ABSTRACT

In this study, we take the effect of the anterior movement of the optic into account and propose a novel haptic based on lever-type and bridge-type flexible amplification mechanisms. Based on the consideration of the offset of the rotation center of the flexible hinge, we have deduced the formula for calculating the amplification ratio of the proposed four-stage amplifier. The geometric parameters and the material property parameters, in terms of the clinical measurement data of the human eye, are assumed to restrain the structural features and motion trajectories for the amplifier. As the ciliary muscle achieves the contraction limit, the output displacement and amplification ratio reach the highest and lowest values, separately, and gradually approach a stable range. The amplification ratio of formula calculation and FEA (Finite Element Analysis) are around 18.86 and 17.79, respectively, with the input displacement ranging from 0.115mm to 0.127mm. The error of the amplification ratio between theoretical method and FEA is less than 5%. The presented haptic acting as a four-stage displacement amplifier, enables an improved lens power of 3.80 diopters to obtain much more focus shift to achieve a better near visual performance for patients.

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