World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:17, No:12, 2023

Strabismus Detection Using Eye Alignment Stability

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Abstract : Strabismus refers to a misalignment of the eyes. Early detection and treatment of strabismus in childhood can prevent the development of permanent vision loss due to abnormal development of visual brain areas. Currently, many children with strabismus remain undiagnosed until school entry because current automated screening methods have limited success in the preschool age range. A method for strabismus detection using eye alignment stability (EAS) is proposed. This method starts with face detection, followed by facial landmark detection, eye region segmentation, eye gaze extraction, and eye alignment stability estimation. Binarization and morphological operations are performed for segmenting the pupil region from the eye. After finding the EAS, its absolute value is used to differentiate the strabismic eye from the non-strabismic eye. If the value of the eye alignment stability is greater than a particular threshold, then the eyes are misaligned, and if its value is less than the threshold, the eyes are aligned. The method was tested on 175 strabismic and non-strabismic images obtained from Kaggle and Google Photos. The strabismic eye is taken as a positive class, and the non-strabismic eye is taken as a negative class. The test produced a true positive rate of 100% and a false positive rate of 7.69%.

Keywords : strabismus, face detection, facial landmarks, eye segmentation, eye gaze, binarization
Conference Title : ICCVISP 2023 : International Conference on Computer Vision, Image and Signal Processing
Conference Location : London, United Kingdom
Conference Dates : December 11-12, 2023