岩手県立大学
ソフトウェア情報学部
Faculty of Software and Information Science

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MEDIRE: Computer-aided Medical Diagnosis and Rehabilitation Systems

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Research Interests

- Human Computer Interaction
- Behavior Analysis
- Eye Tracking
- Virtual Reality
- 3D Spherical Display

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MEDIRE Special Track :: Summary

Computer-aided diagnosis has been used to assist clinicians in performing complex clinical tasks. Enhanced sensors and data analysis are expected to improve the accuracy of diagnosis in many cases. The development of computer vision has facilitated the estimation of body posture and gaze direction, enabling these estimation results to be used for rehabilitation and understanding of visual recognition information. In this special track, three studies were presented that involved estimating the 3D posture of a partial body from a single image and applying it to an application to detect deterioration in sitting posture, automatic eye calibration for eye trackers based on eye-frontalization, and 3D eye characteristics in mixed reality (MR) environments.

MEDIRE Special Track :: Topics of Interests

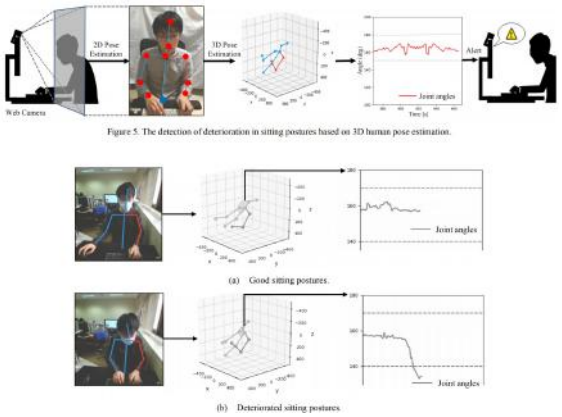
- Eye tracking
- Visual field test
- Human pose estimation
- Wearable sensors for physical rehabilitation, etc.

Summary of Contributions 1/3

Title 3D Human Pose Estimation of a Partial Body from a Single Image and Its Application in the Detection of Deterioration in Sitting Postures

Authors Oky Dicky Ardiansyah Prima and Kazuki Hosogoe

- This study experimentally constructed a neural network model for 3D human pose estimation based on a single image and evaluated the difference in accuracy of the pose estimated by the model constructed for the partial joints of the body and the whole-body joints. Results were confirmed with Human3.6M data and with data created independently with the Intel RealSense Depth Camera D435.
- The upper body model was then used to detect deterioration in sitting posture from images acquired from a web camera. The deterioration of posture was detected by the change in the angles of the nose, neck, and pelvis.



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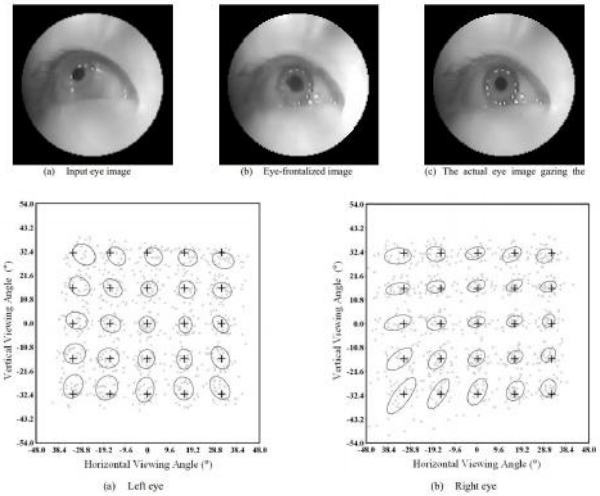
Summary of Contributions 2/3

Title Gaze Calibration of Eye Trackers for Head-Mounted Displays Using Eye-Frontalization Process

Authors Katsuyoshi Hotta, Oky Dicky Ardiansyah Prima, and Takashi Imabuchi

- This paper proposed a new gaze calibration method that can compensate the accuracy of gaze measurement for changes in the position of the Virtual Reality Head-Mounted Displays (VR-HMD) relative to the face.
- The proposed method consists of eye-frontalization and single-point calibration. The accuracy of Point of Regard (PoR) measured 5.07 ± 3.30° for the left eye and 5.50 ± 3.25° for the right eye.



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Summary of Contributions 3/3

Title 3D Gaze Characteristics in Mixed-Reality Environment

Authors Kenta Kato and Oky Dicky Ardiansyah Prima

- This paper proposed a See-Through Head-Mounted Display (ST-HMD) to analyze the impact of MR environments on 3D gaze measurements.
- The results showed that there was no significant difference in 3D gaze measurements conducted in the rooms with and without depth cues. In the experiment of tracking the gaze of a visual target moving from back to front, the scanpath of the 3D gaze was found to follow the trajectory of the target's movement.

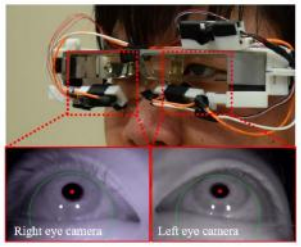


Figure 1. Our 3D eye tracker used in this study.

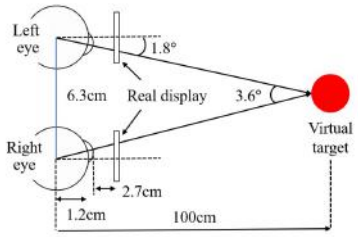
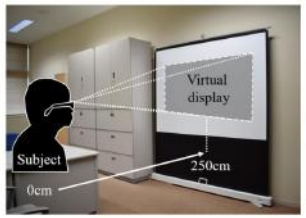


Figure 2. The relationship between both eyes and the virtual

(a) A room with depth cues.



(b) A room without depth cues.

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Conclusion & Future Perspective

- The special track “MEDIRE: Computer-aided Medical Diagnosis and Rehabilitation Systems” introduced research case studies on analyzing body and eye movements. Based on these studies, there was an opportunity to discuss research topics related to computer-aided diagnosis and rehabilitation environments, as well as issues and solutions for each topic.
- At the upcoming MEDIRE, we would like to invite case studies of eye trackers and discuss a wide range of topics related to the analysis and application of eye movement information in the field of rehabilitation.