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Research Fields Bio-signals, Signal Processing, Robot control, Interface Development

Keywords EOG, EMG, Welfare Robot, Gaze direction ,Gaze Estimation

Research Outline

Research title: Development of Robot Operation Method using Electrooculography(EOG) and Electromyography(EMG) Measurement

- Background

A non-physical interaction has been an interest in the control method in recent years. The conventional control methods that rely on hand and leg manipulation are incapable of being used for those who are physically disabled. Physically disabled people such as Amyotrophic lateral sclerosis(ALS) patients are paralyzed from neck to toe. They are constrained to do interaction by using their eye, mouth, or head movement. Thus, bio-signals from the eye (EOG) and mouth (EMG) as the interaction alternative is proposed.

- Objective

To develop EOG and EMG control methods for robot operation. The robot is a part of the welfare application for physically disabled people.

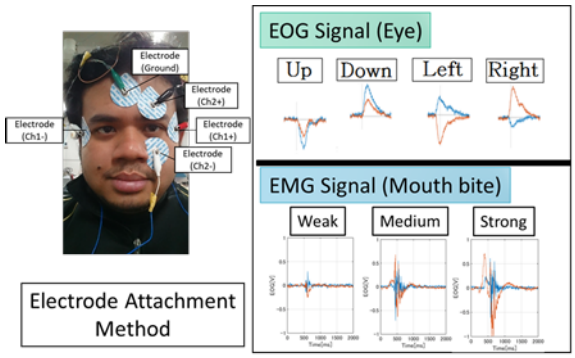

Figure 1: Measurement method and analysis

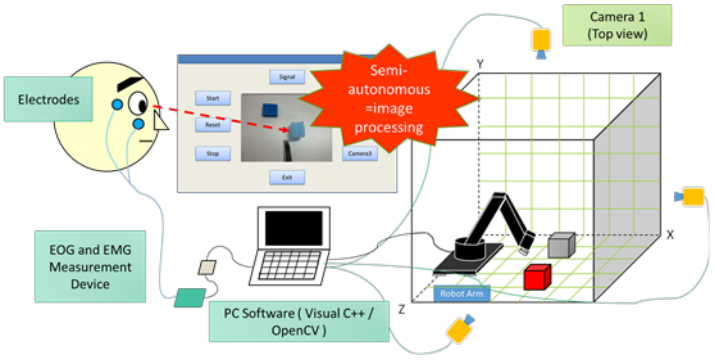

Figure 2: Robot operation system

- Research Achievements

1. Enhanced the EOG and EMG signal stability by proposing a custom-made mask for the electrode attachment method
2. Improvement of EOG gaze estimation accuracy by developing a calibration method based on affine transformation.
3. Investigation on robot control performance between two distinctive EOG gaze methods; the eye gaze direction and gaze estimation.

- Future Research

1. Evaluation of EOG mask performance on gaze estimation.
2. To implement deep learning object recognition method to enhance the EOG gaze estimation and robot's autonomous capability.
3. Investigation on EOG for eye depth perception.