Navigation of an Electric Wheelchair Using EMG, EOG and EEG

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Background

Electric Wheelchair (EWC)

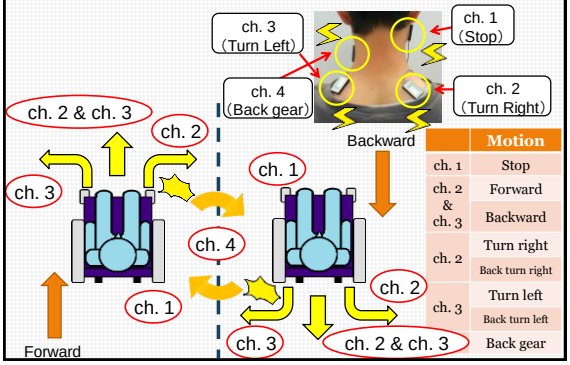
Usually,
Joy-stick is used to navigate EWC.
Joy-stick is manipulated by user's hand.

However, person who had his/her arms amputated by the accident, patients who have spinal cord injury and ALS patients are unable to control the joy-stick by their hand.

Objective of this study

Develop a navigation method of EWC by use of user's biological signals, such as electromyogram (EMG), electrooculogram (EOG) and electroencephalogram (EEG) has been studied.

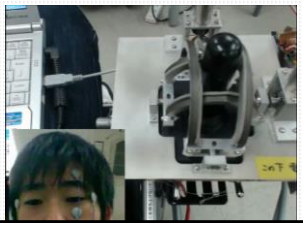
Electric wheelchair controlled by SEMG



	Motion
ch. 1	Stop
ch. 2 & ch. 3	Forward
	Backward
ch. 2	Turn right
	Back turn right
ch. 3	Turn left
	Back turn left
ch. 2 & ch. 3	Back gear

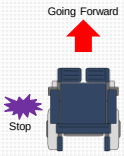
Electric wheelchair controlled by EOG

- Stop : One time of blink
- Turning Right : Two times of consecutive blinks + Right
- Turning Left : Two times of consecutive blinks + Left
- Forward : Two times of consecutive blinks + Up
- Backward : Two times of consecutive blinks + Down



Electric wheelchair controlled by EEG and SEMG

"Going Forward" and "Stop" only, so far.



Going Forward
Concentrated state

Stop
Clench

Conclusions

- This study presented some examples of the navigation method of the electric wheelchair using electromyogram (EMG), electrooculogram (EOG) and electroencephalogram (EEG).
- Generally, analysis becomes complicated at the order of EMG, EOG, and EEG, and with this order, it becomes difficult to distinguish an intention correctly.
- However, the measurement technology of the bio-signals is improving day by day. On the basis of Brain-Machine Interface (BMI), utilization of the electric wheelchair which can be navigated only by performing motor imagery is expected in near future.