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Signal processing／EEG Analysis／KANSEI Analysis／Mathematical Modeling

This laboratory focus on various signal processing and it's applications. The current main topics of our research are new AR/VR system with bio-signal (EEG, EMG, EOG, ECG, GSR, Body temp. Breath, Salivary amylase, NIRS, fMRI), brain computer interfaces, new medical approaches for dementia or depression using simple EEG device, and impression & situation analysis of animation images.

Theme

Neuro signal processing and mathematical modeling for KANSEI and sleep stage decision using EEG and heart rate

Major

System Identification, Signal processing for noise remove, and Biomedical signal processing

Common tech. : Mathematical MODELING by equation using the self-tuning Identification method

<today topics>

EEG Modeling while various KANSEI in high noise level situation (KANSEI modeling)

Sleep stage decision using the mathematical model (system identification)

$$\sigma_{WK}(\tau) = \frac{1}{1+e^{-(-2.84-1.32\cdot[RR(\tau)]+0.33\cdot[RR_{std}(\tau)]-0.20\cdot[VLF(\tau)]-0.09\cdot[LF(\tau)/HF(\tau)])}}$$

$$\sigma_{REM}(\tau) = \frac{1}{1+e^{-(-1.80-0.44\cdot[RR(\tau)]+0.27\cdot[RR_{std}(\tau)]+0.61\cdot[VLF(\tau)]+0.54\cdot[LF(\tau)/HF(\tau)])}}$$

$$\sigma_{N1}(\tau) = \frac{1}{1+e^{-(-2.68-0.15\cdot[RR(\tau)]+0.24\cdot[RR_{std}(\tau)]+0.15\cdot[VLF(\tau)]+0.25\cdot[LF(\tau)/HF(\tau)])}}$$

$$\sigma_{N2}(\tau) = \frac{1}{1+e^{-(0.21+0.86\cdot[RR(\tau)]-0.32\cdot[RR_{std}(\tau)]-0.19\cdot[VLF(\tau)]-0.11\cdot[LF(\tau)/HF(\tau)])}}$$

$$\sigma_{N3}(\tau) = \frac{1}{1+e^{-(-2.71+0.23\cdot[RR(\tau)]-0.53\cdot[RR_{std}(\tau)]-0.64\cdot[VLF(\tau)]-0.39\cdot[LF(\tau)/HF(\tau)])}}$$

Real-time KANSEI detection

Visualization of KANSEI

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