

Title: Function for motion-artifact detection using wavelet analysis

Originality: This function coded based on the study by Sato et al.

Related paper: "Wavelet analysis for detecting body-movement artifacts in optical topography signals", *NeuroImage* 33 (2006) 580-587

In order to exclude measured data which containing motion artifact from signal analysis, this function set a flag when motion artifact were detected by calculations. The detail of the calculations for detection of motion artifact using wavelet analysis will be found in the related paper.

Detailed Situations in the related paper:

Subject: Nine healthy neonates (four males and five females, 4.33 days old (SD=1.80)

Experimental design: 25 rest periods and 24 stimulation periods one after the other (Total 14-15 min). The rest period were randomized between 20 and 30 s, and the stimulus periods were fixed at 10 s. In the stimulus periods, speech sounds were presented.

Measurement: OT system (modified version of model ETG-7000, Hitachi Medical Corporation, Japan) that can image a whole brain area with 72 measurement positions. The system simultaneously irradiates light at wavelengths of 690 and 830 nm through an optical fiber to one point. Optical fibers were fixed onto a probe cap, which was mounted at the head of the bed to enable it to be placed on the neonate's head without awakening him or her. The transmitted light was detected every 100 ms with an avalanche photodiode through an optical fiber located 30 mm from the incident position. Optical fibers were used for both irradiating and detecting the lights. The average power of each light source was 1.5 mW, and each source was modulated at a distinctive frequency (1–10 kHz) to enable separation by using a lock-in amplifier after detection.