Background EEG Activity Simulation Using Autoregressive Models and Double Modulation

C Janeczko, H Lopes*, CEFET-PR, Curitiba, PR, Brazil

Poster Session: ***TU-FXH-119*** Poster Session: VII Signal Processing in Sensorial and Motor System and Others

Track: 23 Signal Processing

The background activity of the EEG for vigil and sleep can be considered as a stochastic stationary process for short time intervals (typically less than 10 sec). A convenient way of simulation of these signals is by means of passing a white noise by an autoregressive (AR) filter of order p. The filter coefficients are calculated using a real EEG segment. However this modeling is linear and produces signals that roughly resemble the real EEG. A non-linear simulation model is the double modulation of a sine wave, modulating the envelop and the slope of the wave. In this case, it is rather difficult to find both the modulating input. In this work we propose a novel model of EEG simulation using both autoregressive model and double modulation. In order to generate the modulating inputs, first it is extracted the instantaneous envelop and the instantaneous slop of a real EEG segment. These inputs are simulated using an AR filter and white noise and then the modulating inputs modulate the amplitude and frequency of a sine wave. The model were tested using background EEG from vigil (mostly beta rhythm) and sleep (mostly alpha rhythm) the several subjects. Simulated and real signals were visually compared both in time and frequency domain. This qualitative analysis revealed that the method here proposed can simulate signals very similar to real ones. Results suggest that the method is adequate for the simulation of rhythmic signals of the EEG.