ANALYTICAL MODEL OF QUALITY TRANSITIONS IN THE HUMAN BRAIN

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Our study is based on the experimental data of magnetoentcephalography (MEG) recorded from human brain. These data were obtained in the Center for Neuromagnetism of New York University. We analyzed spontaneous brain activity from healthy control subjects and from patients suffering from Parkinson's disease. The data of patients are differed from that of control subject by presence of spike activity with sudden increasing of amplitude and changing of frequency.

We observed some interesting transitions between different patterns on these signals. To understand how the switching occurs between different patterns analytical model was proposed. This model describes the transition between two different temporal patterns. Pattern corresponding to normal activity from MEG signal has stochastic behavior and in the model is described by the noise generator. The behavior of another pattern is more simple and corresponds to pathological activity. In the model, it is described by the Van - der - Pol generator presented by system of differential equations of fourth order. This generator is often used for modeling of different disorders, when normal activity gives place to accurate quasi-harmonic oscillation.

To obtain more detail understanding of the behavior of dynamical system reconstruction of phase space was carried out by means of time delay and two types of attractors corresponding to different regimes on experimental data were obtained.

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