Rotation of Oscillating Waves in Electroencephalograms

Ermentrout, G. Bard; Doamekpor, Frederick
Department of Mathematics
University of Pittsburgh

The neurons of the brain communicate by electrical signals known as action potentials. For signals to propagate, separate parts of large neural networks must fire in different patterns. This results in waves that oscillate over the surface of the brain. Electroencephalograms can capture these electrical oscillations, and rotations of these oscillations are often observed. Modeling the movement of these oscillating waves would be useful in better understanding information processing. The best model for this network is one in which there are n oscillating points on a sphere. For a simpler model, XPPAut was first used to model the dodecahedron, a solid which places 20 points equidistant on a sphere's surface, with each point coupled to its neighbors. Oscillators tend to synchronous movement, where each oscillator in the network ultimately mimics every other oscillator. Our model determines when the oscillators move synchronously and when they move non-synchronously on a sphere's surface.