Abstract

Current methods use blood oxygenation level-dependent contrast to indirectly detect neural activity but are inaccurate in their localization in space and time. Magnetic resonance imaging (MRI) has high space and time resolution, but it has not been shown to be feasible for detecting nerve signals. The action currents in nerves create their own magnetic field, which could potentially cause a large enough phase shift in the magnetic resonance signal to be detected. The possibility of direct imaging would benefit neuroscientists in their study of the human brain. In this thesis, COMSOL Multi physics is used to simulate the displacement of ions in a copper sulfate solution as a model for the displacement of water molecules around nerves. If the water molecules experience a sufficient Lorentz force, their shift can be measured using MRI. The simulations do not conform to the results expected from articles on the same topic, due to errors and wrong assumptions in the model.