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EEG SOURCE LOCALIZATION OF THE HUMAN BRAIN IN THE SPACE MICROGRAVITY ENVIRONMENT

Abstract

This paper discusses the EEG (Electroencephalography) source localization in the microgravity environment in the space. In the space environment, onboard a space station, human body (particularly brain neurons) acts differently. Both induced and evoked neuronal responses are generated in brain cortex either by internal or external stimuli. For the generation of the evoked responses, external stimuli such as physical movement, auditory or visual exercises can be performed on healthy astronauts in the space. Any abnormality or thinking or conceptual process causes the induced mural responses in the brain. Microgravity itself or other actions performed in the microgravity environment can also produce both evoked and induced neural responses. The study includes simulations of brain behavior in microgravity conditions. Brain neural activities generate the electrical potential in the cortex region depending upon the stimuli provided. Forward problem and inverse problems are applied for measuring the electrical potentials scalp of human head and sources localization of the neural activities respectively by using EEG neuroimaging technique. The result is interpreted and explained by the statistical parametric mapping (SPM). This research reveals that brain neural activities caused by either internal or external stimuli generated in the microgravity environment in the space are different than that generated on the earth. These neural variations or changes are found in term of the amplitudes of the signals and frequencies of the dipoles generated and their source localization in the cortex is performed. The results will be helpful in the planning of future space mission, space travels and campaigns.