GUI for MRI-Compatible Neural Stimulator and Recorder

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ABSTRACT

Functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) are useful tools to analyze brain activities given active stimulation. However, the electromagnetic noise from the MRI distorts the brain signal recording and damages the subject with excessive heat generated on the electrodes attached to the skin. MRI-compatible recording and stimulation systems previously developed at LIBI lab were capable of removing the electromagnetic noise during the imaging process. Previously, the hardware systems had required the integrative software that could control both circuits simultaneously and enable users to easily change recording and stimulation parameters. Graphical user interface (GUI) programmed with computer language informed the user to setup safe recording and stimulating parameters and controlled microcontrollers on the MRI-compatible recorder and stimulator. With the stable data transmission, the GUI could send 2 bytes of command and data to a microcontroller on the MRI-compatible stimulation circuit to setup stimulation parameters, inform user of the safety limit, and change desired parameters. Also, the GUI could receive 8-bit resolute recorded data from a microcontroller on the recording circuit and visualize the recorded data from the serial port on the plotting area on the GUI. Therefore, the GUI was successfully integrated into the LIBILAB system to improve safely and provide fast control over the MRI-compatible hardware systems. Furthermore, the GUI will be developed to automatically detect irregular brain response to any change in stimulation parameters and record data with higher resolution.

KEYWORDS

Graphical User Interface, MRI, EEG, Neural Stimulation, Bioinstrumentation