An Enhanced Powerful Method for Signal Processing in Medical Imaging (MEG, MRI, etc.) and Other Scientific and Engineering Applications (SD2011-252)

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OTHER INFORMATION

KEYWORDS

MEG, multi-core beamformer, dual-core beamformer, MEG, EEG, MCBF, DCBF, diagnosis, imaging, MCBF, eDCBF, eMCBF

CATEGORIZED AS

- **Computer**
  - Software
- **Imaging**
  - Medical
  - Software
- **Medical**
  - Diagnostics
  - Imaging

RELATED CASES

2010-340-0, 2010-340-0

BACKGROUND

Magnetoencephalography (MEG) is a functional imaging modality that directly detects neuronal activity with a millisecond temporal resolution. UC San Diego researchers previously developed a multi-core beamformer (MCBF, see SD2010-340) approach that reconstructs common-mode source time-courses and their correlations networks from noisy MEG data, without requiring both *a priori* information and expensive and impractical computation. However, the performance of MCBF degrades at low correlations and cannot reconstruct individual source time-courses.

A detailed description for the related technology SD2010-340 can be found at http://invent.ucsd.edu/technology/cases/2010/SD2010-340.shtml.

TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed an enhanced multi-core beam former (eMCBF). The eMCBF detects the orientation (direction) of the signals and allows correlation and reconstruction of multiple interfering sources at the same time. Furthermore, the eMCBF can accurately obtain the individual source time-courses, whereas previous MCBF can only obtain the common mode among multiple source time-courses. Such improvement allows faithful reconstruction of the source temporal dynamics for individual neuronal sources.

APPLICATIONS

The added features and capabilities of the eMCBF greatly enhance its clinical utility in stroke, mild traumatic brain injury, and other brain-function related disorders and diseases. The ability to reconstruct source temporal dynamics for individual neuronal sources is especially important, for example, in the clinical diagnosis of epilepsy in which primary epilepsy source and propagations often co-exist in the data.

eMCBF can also be used to recover source information from any type of sensor array system, including radar; sonar; astronomical telescopes; magnetotelluric arrays for geologic exploration of water, oil, or minerals in the earth; optical and other electromagnetic arrays; and others.

ADVANTAGES

The eMCBF spatial filter is robust to a wide range of correlations, SNRs, source locations, and various source temporal dynamics. Using a three-core MCBF filter, UC San Diego researchers further demonstrate how additional sources of interference can be accounted for once source localization is performed.

STATE OF DEVELOPMENT

he eMCBF performs well for both computer simulations and real human MEG recordings and produces meaningful correlation estimations and accurate time courses.

RELATED MATERIALS

▶ Diwakar M, Tal O, Liu TT, Harrington DL, Srinivasan R, Muzzatti L, Song T, Theilmann RJ, Lee RR, Huang MX. Accurate Reconstruction of Temporal Correlation for Neuronal Sources Using the Enhanced Dual-core MEG Beamformer. Neuroimage. 2011 Mar 25. [Epub ahead of print]

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,883,812	02/06/2018	2010-340

RELATED TECHNOLOGIES

▶ A Novel and Powerful Method for Signal Processing in Medical Imaging (MEG, MRI, etc.) and Other Scientific and Engineering Applications

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