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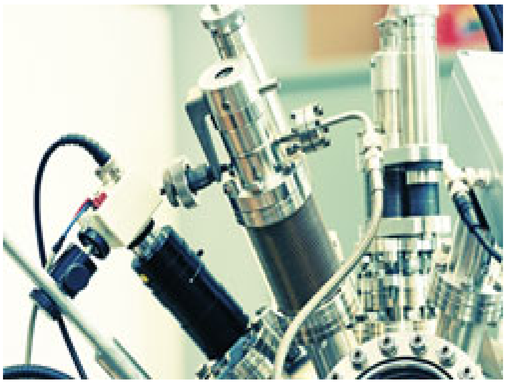
Blind Source Separation and Applications

Results in Brief

Analysing biomedical signals via advanced algorithms

The BLISS project studied and improved advanced signal processing techniques before applying them in biomedical signal analysis.

DIGITAL ECONOMY



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Under the auspices of the BLISS project the theoretical, algorithmic and application aspects of important signal analysis techniques were extensively explored. The so-called blind source separation (BSS) allows separation of a signal set from a mixture of signals without requiring information about their nature. Another computational method for signal separation is the independent component analysis (ICA) that provides the additive subcomponents of a multivariate signal.

More specifically, the project work focused on developing theory and algorithms for linear and non-linear ICA, as well as for separation of non-independent signals. Theoretical work and developed algorithms found useful applications in the analysis of biomedical signals and acoustic mixtures. Biomedical applications included detection and elimination of artefacts, validation of ICA decomposition and identification of relevant sources. In addition, preliminary results were also collected concerning functional magnetic resonance imaging (fMRI), analysis and foetal electrocardiogram (ECG) extraction.

Application of the promising ICA method in the analysis of electro- and magneto-encephalograms (EEG and MEG respectively) and fMRI has a considerable impact on human brain mapping research. Concentrating on neuroscience, researchers were able to analyse brain responses to external stimuli using both MEG and fMRI mapping modalities. Other applications involved the analysis of the heamodynamic response of the brain to auditory stimuli using fMRI. Structural MRI technique was also employed for brain tissue segmentation and classification. For further information click at: http://www.lis.inpg.fr/pages_perso/bliss/

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BLISS

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Project website

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