

Editorial

Recent Advances in Molecular Imaging

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Molecular imaging is a newly emerging and rapidly developing biomedical imaging field in which the modern tools are being married to depict noninvasive *in vivo* cellular and molecular processes sensitively and specifically, such as monitoring multiple molecular events, cell trafficking and targeting. The goals of this field are to develop technologies and instruments for studying biological and medical processes as well as diagnosing and managing diseases better. Although rapid progress in the fundamentals and applications make molecular imaging become an important tool for biomedical research in recent years, many difficult problems and challenges remain. Discussing the problems and challenges in detail and illustrating recent progress and future direction, the special issue collects the high-quality, peer-reviewed, original research papers in the area of molecular imaging.

Novel molecular imaging theories and algorithms, new molecular probes, multimodality molecular imaging prototype systems and experiments, and final clinical applications are introduced mainly in this special issue. In molecular imaging theories and algorithms, genetic algorithm-based optimization tool is used to improve the accuracy of the diffusion model in strongly absorbing media by adjusting the optical parameters. Furthermore, a penalized linear and nonlinear combined conjugate gradient method, a fast pre-iteration algorithm based on the generalized inverse matrix, and a Monte-Carlo-based network method are also proposed for light source reconstruction in optical tomography. Considering the importance of molecular probes, synthesis and bioconjugation of gold nanoparticles as potential molecular probes for light-based imaging techniques are described in this special issue, and the nitroimidazole-based thioflavin-T derivatives as cerebral ischemia markers are evaluated *in vivo*.

In order to test the feasibility and effectiveness of imaging theories, algorithms and probes, molecular imaging prototype systems should be designed, constructed and employed for small animal or phantom imaging. Thus, multimodality fusion near-infrared optical tomography Systems with highly sensitive CCD camera and photomultiplier tube can be consulted respectively in this special issue. Furthermore, a novel confocal optical system design and a dual laser confocal scanner have been developed for molecular imaging applications of biochip. In clinical applications, the advantage of PET and CT integration in examination of lung tumors is analyzed. Moreover, several innovative processing methods of molecular image are also presented in this special issue. In conclusion, this special issue covers recent important advances in molecular imaging field.

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Special Issue on Applications of Time-Frequency Signal Processing in Wireless Communications and Bioengineering

Call for Papers

Time-frequency signal processing is a well-established area with applications ranging from bioengineering and wireless communications to earthquake engineering and machine monitoring. Signals in these applications are typically non-stationary and as such require joint time-frequency analysis. The objective of this special issue is to bring together theoretical results and application of time-frequency methodologies from investigators in the wireless communications and bioengineering disciplines.

While novel theoretical results and applications of time-frequency signal processing in wireless communications and biomedical systems will be preferred, applications in other areas will also be considered. Likewise, this issue will emphasize methodologies related to Priestley's evolutionary spectrum and the fractional Fourier transform, but other methodologies will also be considered.

The intended focus of this issue will be on presenting time-frequency signal processing applications to wireless communications and biomedical systems using evolutionary spectral techniques and fractional Fourier transform.

Topics of interest include, but are not limited to:

- Biomedical systems: EEG, ECG waveforms and heart sound, vibroarthrographic signals emitted by human knee joints, EEG signals, and various other biomedical waveforms analyzed by time-frequency techniques
- Wireless communications: time-frequency receivers, channel characterization, channel diversity, time-varying modulation schemes, and suppressing nonstationary interference as chirp jammers

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Special Issue on Microphone Array Speech Processing

Call for Papers

Significant knowledge about microphone arrays has been gained from years of intense research and product development. There have been numerous applications suggested, for example, from large arrays (on the order of >100 elements) for use in auditoriums to small arrays with only 2 or 3 elements for hearing aids and mobile telephones. Apart from that, array technology has been widely applied in the areas of speech recognition and more recently surveillance. Traditional techniques that have been used for microphone arrays include the fixed spatial filter as well as optimal and adaptive beamforming. These techniques model input or calibration signals as well as localization information for their design. Today contemporary techniques using blind signal separation (BSS) and time frequency masking techniques have attracted significant attraction. Those techniques are less reliant on array modeling and localization, but more on the statistical properties of speech signals such as sparseness, non-Gaussianity, nonstationarity, and so forth. The main advantage that multiple microphones add from a theoretical perspective is the spatial diversity, which is an effective tool to combat interference, reverberation, and noise when used according to the theoretical assumption. Combining spatial information with time-frequency information and perceptual cues will lead to innovative techniques and new methods, which will provide improved communication capabilities in challenging acoustic environments.

To further enhance current research and to promote new applications, this special issue aims to collect and present the latest research efforts in signal processing methods and algorithms for microphone arrays.

Topics of interest include, but are not limited to:

- Optimal and adaptive beamforming
- Blind signal extraction methods
- Multichannel dereverberation techniques
- Microphone array-assisted multichannel acoustic echo cancellation
- Spatial filtering techniques
- Sound source localization and tracking
- Psychoacoustically motivated procedures and algorithms such as perceptual cues, hearing thresholds, and spatial masking effects

- Distributed microphone networks
- Spherical array of microphones and Eigen/Modal beamforming

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Special Issue on Video Analysis for Human Behavior Understanding

Call for Papers

Video cameras are becoming increasingly ubiquitous and pervasive in our daily life. Along with the fast growing number of exchanged and archived videos, there is an urgent need for advanced video analysis techniques that can systematically interpret and understand the semantics of video contents, within the application domains of security surveillance, intelligent transportation, health/home care, video indexing/retrieving, video summarization/highlighting, and so on. Understanding human behaviors based on video analysis calls for even greater challenges due to very large variations of human bodies and their motion activities under all kinds of contexts such as different viewing perspectives, dressing colors, changing human poses, human-human occlusions, and body parts self-occlusions. To overcome these challenges, not only the traditional image processing, computer vision, pattern recognition, and machine learning techniques are required, but also advanced estimation theory and statistical inference, articulated 2D/3D human body modeling and synthesis, sophisticated database or rules for events/behaviors, and so on are critically desired.

The primary focus of this special issue will be on the advanced video analysis techniques for understanding human behaviors, starting from human object detection, segmentation and tracking, 2D/3D spatial and temporal features extraction, 2D/3D human body modeling and synthesis, event discovery and behavior learning, system performance evaluation, and potential applications of these techniques. The special issue is intended to become an international forum for researches to summarize the most recent developments and ideas in the field. The topics to be covered include, but are not limited to:

- Modern wireless communication system techniques such as multiantenna and multiaccess, spectrum sensing and cognitive radio, wireless ad hoc and sensor networks, cooperative signal processing, and information theory
- Human object detection and segmentation
- Tracking of human objects
- Tracking under multiple cameras
- Crowd estimation and crowd behavior analysis
- Occlusions and segmentation errors handling

- 2D/3D articulated human body modeling
- Modeling and learning of human behaviors
- Knowledge interpretations of human behaviors

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