Editorial

Special Issue on "Medical Imaging & Image Processing II"

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Medical Imaging is becoming an essential component in various fields of bio-medical research and clinical practice: Neuroscientists detect regional metabolic brain activity from positron emission tomography (PET), functional magnetic resonance imaging (MRI), and magnetic resonance spectrum imaging (MRSI) scans; biologists study cells and generate 3D confocal microscopy data sets; virologists generate 3D reconstructions of viruses from micrographs; and radiologists identify and quantify tumors from MRI and computed tomography (CT) scans.

On the other hand, Image Processing includes the analysis, enhancement, and display of biomedical images. Image reconstruction and modeling techniques allow instant processing of 2D signals to create 3D images. Image processing and analysis can be used to determine the diameter, volume, and vasculature of a tumor or organ, flow parameters of blood or other fluids, and microscopic changes that have yet to raise any otherwise discernible flags. Image classification techniques help to detect subjects suffered from particular diseases and to detect disease-related regions.

This Special Issue of Technologies comprises 4 selected papers about medical imaging and image processing. The first paper by Rashid et al. [1] investigated telemedicine, which is defined as the use of Information and Communication Technology (ICT) for clinical health care from a distance. The exchange of radiographic images and electronic patient health information/records (ePHI/R) for diagnostic purposes had the risk of confidentiality, ownership identity, and authenticity. In their paper, a data-hiding technique for ePHI/R was proposed. The color information in the cover image was used for key generation, and stego-images were produced with an ideal case. As a result, the whole stego-system was perfectly secure. This method included the features of watermarking and steganography techniques. Their method was applied to radiographic images. For the radiographic images, their method resembled watermarking, which was an ePHI/R data system. Experiments showed promising results for the application of their method to radiographic images in ePHI/R for both transmission and storage purposes.

The second paper by Boudjelal et al. [2] stated that positron emission tomography (PET) is an imaging technique that generates 3D detail of physiological processes at the cellular level. This technique requires a radioactive tracer, which decays and releases a positron that collides with an electron; consequently, annihilation photons are emitted, which can be measured. The purpose of PET is to use the measurement of photons to reconstruct the distribution of radioisotopes in the body. Currently, PET is undergoing a revamp, with advancements in data measurement instruments and the computing methods used to create the images. These computer methods are required to solve the inverse problem of "image reconstruction from projection". In this paper, the authors proposed a novel kernel-based regularization technique for maximum-likelihood expectation-maximization (κ-MLEM) to reconstruct the image. Compared to standard MLEM, their proposed algorithm was more robust

and was more effective in removing background noise, whilst preserving the edges and suppressing image artifacts, such as out-of-focus slice blur.

The third paper by Paley et al. [3] used a wireless accelerometer in conjunction with a dedicated 3T neonatal MRI system installed on a Neonatal Intensive Care Unit to measure in-plane rotation, which is a common problem with neonatal MRI. Rotational data were acquired in real-time from phantoms simultaneously with MR images, which showed that the wireless accelerometer could be used in close proximity to the MR system. No artifacts were observed on the MR images from the accelerometer or from the MR system on the accelerometer output. Initial attempts to correct the raw data using the measured rotational angles had been performed, but further work would be required to make a robust correction algorithm.

The final review paper authored by Kalavathi et al. [4] researched the brain, which is the most complex organ in the human body, and it is divided into two hemispheres—left and right. The left hemisphere is responsible for control of the right side of our body, whereas the right hemisphere is responsible for control of the left side of our body. Brain image segmentation from different neuroimaging modalities is one of the important parts of clinical diagnostic tools. Neuroimaging-based digital imagery generally contains noise, inhomogeneity, aliasing artifacts, and orientational deviations. Therefore, accurate segmentation of brain images is a very difficult task. However, the development of accurate segmentation of brain images is very important and crucial for a correct diagnosis of any brain related diseases. One of the fundamental segmentation tasks is to identify and segment inter-hemispheric fissure/mid-sagittal planes, which separate the two hemispheres of the brain. Moreover, the symmetric/asymmetric analyses of left and right hemispheres of brain structures are important for radiologists to analyze diseases such as Alzheimer's, autism, schizophrenia, lesions, and epilepsy. Therefore, in this paper, the authors analyzed the existing computational techniques used to find brain symmetric/asymmetric analysis in different neuroimaging techniques such as the magnetic resonance (MR), computed tomography (CT), positron emission tomography (PET), and single-photon emission computed tomography (SPECT), which were utilized for detecting various brain related disorders.

The four articles published in this Special Issue present some of the most important topics about medical imaging and image processing technologies and applications. However, these selected papers offer significant studies and promising methodologies. We expect their work to benefit your future research.

Conflicts of Interest: The authors declare no conflict of interest.

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