HUMAN HEAD RECONSTRUCTION IN PAT USING EDGE DETECTION TECHNIQUE

[1]Sharmitha.M, [1]Supriya.R, [1]Muhammad Naeem Aakhil.V.P, [1]Fahad Mahamood, [2]D. Nithiya Priya

[1]UG students, [2]Assistant Professor,
Department of Biomedical engineering,
Rajiv Gandhi College of Engineering and Technology, Puducherry, INDIA.

Abstract: **Multispectral photoacoustic tomography (PAT) is capable of resolving tissue chromophore distribution by spectral un-mixing and absorption spectrum variations are identified from a sequence of photoacoustic images acquired at multiple illumination wavelengths. By this large dataset is created. In development reduced detectors were used. The process is challenging because of poor angular coverage. By the time of spectral unmixing imaging artefacts will be amplified by inaccurate reconstructions.in order to solve this problem we use interlaced sparse sampling PAT method.**

I.INTRODUCTION:

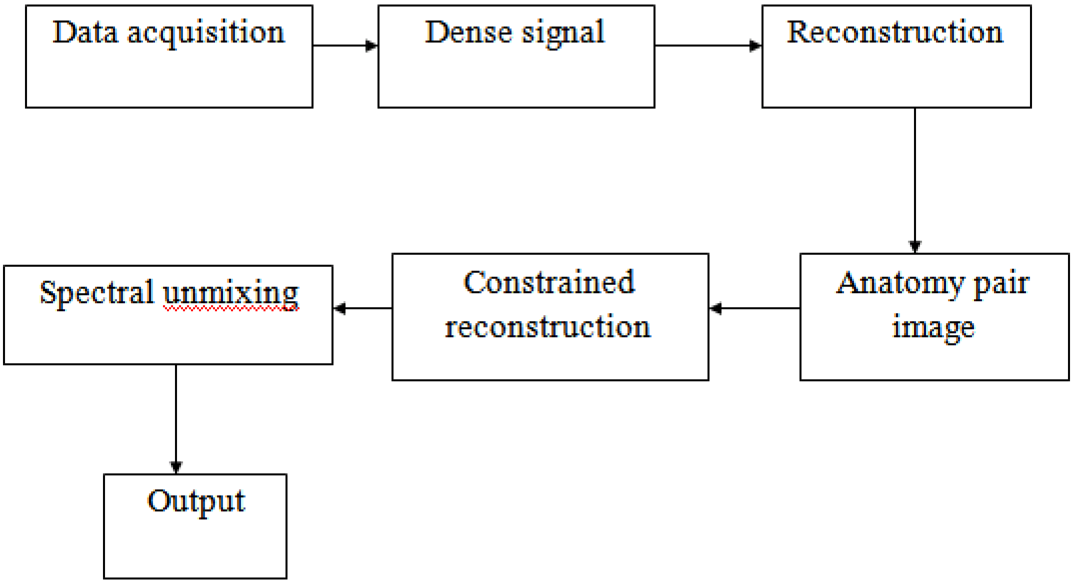
Multispectral photoacoustic tomography (PAT) is a hybrid imaging modality based on the detection of broadband ultrasound wave generated by the absorption of multispectral pulsed light in elastic media. By identifying the absorption spectrum variations in a sequence of photoacoustic images obtained at multiple excitation wavelengths, multispectral PAT is able to resolve the distribution of tissue chromophores and photo-absorbing agents and quantify their concentrations. Multispectral PAT has been shown capable of visualizing the neuronal activity of mammalian brain monitoring tumor progression diagnosing placental and foetal malfunction and evaluating vascular responses to therapeutic cancer drugs and so on.

II.RELATED WORK:

Multispectral PAT systems usually employ a transducer array consisting many detection elements for photoacoustic signal acquisition to ensure sufficient angular coverage. To perform multispectral measurement, a number of images should be acquired at different excitation wavelength. Therefore, multispectral PAT imaging inevitably generates a large amount of data, resulting in a high demand for data and signal acquisition synchronization. The reduction of transducer number lowers the complexity and cost of the imaging system since each element requires its exclusive preamplifier and signal acquisition channel. However, with fewer detectors, the angular coverage becomes sparse, making it difficult for high quality image reconstruction. As a compensation to this problem, novel image reconstruction algorithms have been developed, including the compressed sensing methods, the total-variation-based algorithm and more recently, deep learning approaches. These advanced algorithms greatly improved PAT image quality, but it is still challenging to retain detail structural information and avoid over-smoothing, especially when there is only a very small number of detectors are available. Moreover, inaccurate PAT image reconstruction results will further degrade the spectral un-mixing accuracy because spectral un-mixing is essentially solving an overdetermined linear system that is very sensitive to noise.

III.PROPOSED MODEL:

The following analysis is carried out based on circular detection geometry, in which a ring-shape transducer array is used. However, the ISS principle also works on linear detection geometry. Also, for simplicity, we focus on two-dimensional (cross-sectional) PAT imaging. Figure below illustrates the principle of the proposed interlaced sparse sampling strategy and its corresponding image reconstruction method. Endogenous absorbers oxyhemoglobin (HbO2) and de-oxyhemoglobin (Hb) are taken as the results of spectral un-mixing. As a comparison, the dense sampling (DS) scheme and the sparse sampling (SS) scheme are also shown. First, a sampling scheme is proposed to achieve full angle acquisition with limited amount of transducers. This not only creates an anatomy image to guide the image reconstruction, but also effectively reduces the data volume of the acquired photoacoustic signal, and in turn reduces the requirements of multi-channel signal acquisition and storage, resulting in simplified system hardware and lower cost. Also, the ISS-PAT method does not increase the total acquisition time for multispectral imaging, which is ultimately determined by the laser's wavelength tuning speed. Second, an image reconstruction algorithm guided by an anatomy prior obtained from the ISS scheme successfully recovers the missing angular information and achieves significant improvement of spectral un-mixing accuracy. This algorithm makes full use of the rich structural information of the prior image to enhance PAT image reconstruction, while at the same time leaves the image intensity unchanged, and thus ensures high spectral un-mixing ac



CONCLUSION

In this work, we proposed the interlaced sparse sampling strategy for multispectral photoacoustic tomography. The ISS-PAT method is based on a rotation-scanning imaging mechanism, which requires only a few transducers. Assisted with a specially designed image reconstruction algorithm, ISS-PAT achieved comparable performance to that using large number of transducers, while keeping the total image acquisition time unchanged.

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