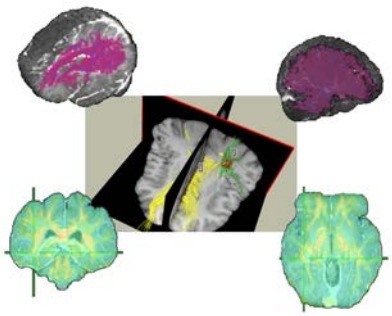
HOUSTON METHODIST INVENTION:

Enhanced Visualization of the Flow of White Matter in the Brain and Spinal Cord

Invention

The invention is a system and method for more accurate determination and 3-D visualization of the direction of white matter fiber bundles in the brain and spinal cord through processing of MRI images with a novel diffusion anisotropy method. This approach does not rely on the Eigenvector and Eigenvalues calculations employed by existing methods, so is faster and more robust than those methods.



Background

White matter fiber bundles are collections of myelin-coated axons that allow communication between the neural cell bodies found in gray matter. Diffusion tensor imaging (DTI) has been established as an imaging method to investigate white matter tracts in the brain and spinal cord. Traditionally, a construct called the "diffusion tensor matrix" is assembled from the original magnetic resonance images. Through a complex mathematical operation, the dominant direction that is similar to an average of all measurements (that is, the Eigenvector with the largest Eigenvalue) is identified. This direction is then interpreted as the orientation of the white matter fiber bundle.

Advantages

Unlike other methods of measuring white matter direction, such as research magnetic resonance pulse sequences that can only be employed outside the clinic, the invention uses the original clinical images. The invention allows for the construction of the diffusion tensor without determination of the Eigenvectors. Rather, the diffusion anisotropy is directly estimated from the magnetic resonance images. Moreover, our invention obtains a more accurate estimation of the direction of the white matter fiber bundles. This is because our algorithm does not determine a dominant direction but rather calculates an average of all measured diffusion directions, considering large and small contributions equally. An enhanced understanding of white matter flow will allow for the conduct of more specific research on the pattern of white matter degradation, and may provide a tool for pre-symptomatic diagnosis of neurological diseases, such as Parkinson's disease, Alzheimer's disease, amyotrophic lateral sclerosis, schizophrenia, and Fragile X syndrome.

For more information, contact the Office of Technology Transfer by e-mail at OTT@HoustonMethodist.org.

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