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Single Voxel MR Spectroscopy of Human Brain with Automatic Voxel Positioning

IP Status: US Patent Issued; **Application #:** 10,641,854

Fast, Automated Voxel Placement

An algorithm and software package for automatic voxel positioning in single voxel magnetic resonance spectroscopy (MRS) improves consistency of tissue coverage between subjects. The software tool quickly identifies the voxel of interest (VOI) in a given scan across a range of patients using an algorithm that maps a VOI from an atlas to a subject's MR scan data using a nonlinear/non-rigid transformation/mapping. The VOI is defined on an atlas registered to the T1 weighted images of the subject using a fast nonlinear registration algorithm during the scanning session. The algorithm calculates a rectangular voxel based on the deformed VOI mask transferred from the atlas to the T1 weighted images of the subject, and transfers the VOI position and dimensions to the scanner. Graphics processing unit (GPU) based parallel computation accomplishes this within seconds during the scanning session, and the user can decide to either accept or override the automated prescription.

Voxel Consistency

Single voxel spectroscopy, while available on clinical MR scanners, has suffered from limited clinical usage. One of the biggest challenges for achieving consistent results of single voxel MRS is selecting the voxel of interest (VOI), essentially a 3D pixel, in the correct location. At present, VOI identification is performed manually by the operator or technician performing the scan, a practice that limits comparability between patients and scans as well as hinders insurance coverage of MRS imaging. Software that identifies the VOI within a single patient does not currently allow comparable VOIs to be identified between patients, so no methods exist to improve VOI consistency both between and within subjects for single voxel MRS, and no tools guarantee that any particular brain structure is consistently aligned across subjects. This new tool and algorithm apply to any VOI. The protocol requires an expert (e.g., a spectroscopist or neuroradiologist) to select the VOI on the atlas only once and ensures within- and between-subject VOI consistency. Better positioning allows much improved diagnostic capabilities (neurological conditions, cancer, etc.), which could lead to greater adoption of spectroscopy in a clinical setting. Furthermore, using this software de-skills the VOI selection task for MR technicians.

BENEFITS AND FEATURES:

- Automatic identification of VOI
- Improved comparability of scans between patients
- Ensures within- and between-subject VOI consistency
- Improved diagnostic capabilities
- Reduces human error; de-skills task for technicians
- May increase insurance coverage of MRS

APPLICATIONS:

Technology ID

20170123-20180038

Category

Express License
Engineering & Physical Sciences/MRI & Spectroscopy
Life Sciences/Diagnostics & Imaging
Life Sciences/Human Health
Life Sciences/MRI & Spectroscopy
Life Sciences/Research Tools
Software & IT/Algorithms
Agriculture & Veterinary/Veterinary Medicine

View online

- Clinical MRS applications
- Multisite clinical trials where MRS is an outcome measure
- Major MR scanner manufacturers
- Brain imaging

Phase of Development - Prototype development

Researchers

Gulin Oz, PhD
Professor, Radiology
External Link (www.cmrr.umn.edu)
Christophe Lenglet, PhD
Associate Professor, Radiology
External Link (www.radiology.umn.edu)
Young Woo Park
Postdoc, CMRR

References

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