

(SD2021-221) Automated deep correction of MRI phase-error

Tech ID: 32439 / UC Case 2021-Z08-1

BACKGROUND

Time-resolved 3D phase-contrast MRI with three-dimensional velocity encoding (4D Flow MRI) has become increasingly valuable for the evaluation of cardiovascular disease. While cardiothoracic and neurovascular applications have grown rapidly, a limiting factor for abdominal applications is the correction of magnetic eddy current-related background phase error, which can be more challenging to reliably correct in abdominopelvic regions due to complex vascular and soft tissue geometry. Phase-error correction is essential for both quantification of blood flow as well as for visualization.

TECHNOLOGY DESCRIPTION

Radiologists from UC San Diego developed a novel and reliable strategy for training a convolutional neural network (CNN) to learn to identify and estimate a 3D magnetic phase-error map from 4D Flow MRI data. With this strategy, the CNN does not require any input from a human operator or any algorithm to identify static soft tissue. This correction can then be smoothed, to fully correct magnetic phase-error while avoid spurious inaccuracies in the CNN inference. The researchers show that this improves measurement of blood flow with increased consistency and conservation of mass, comparable to what can be achieved with manual phase-error correction.

ADVANTAGES

Obviates human, manual correction of magnetic phase-error, which is prone to error.

STATE OF DEVELOPMENT

The invention automatically corrects background magnetic phase-error (also known as eddy-current related phase-error) in MRI images, which is critical for measurement of blood flow by 4D Flow MRI. This resolves a long-standing issue where human, manual soft tissue selection is currently required to perform this correction. We first illustrate this in abdominopelvic 4D Flow MRI exams, anticipating this will be the hardest to solve, but expect that it will work just as effectively in neurovascular and cardiothoracic and other applications of 4D Flow MRI.

INTELLECTUAL PROPERTY INFO

CONTACT

University of California, San Diego
Office of Innovation and
Commercialization
innovation@ucsd.edu
tel: 858.534.5815.



OTHER INFORMATION

KEYWORDS

4d flow, cardiovascular, MRI, phase error, eddy current

CATEGORIZED AS

- ▶ **Imaging**
 - ▶ Medical
- ▶ **Medical**
 - ▶ Diagnostics
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RELATED CASES

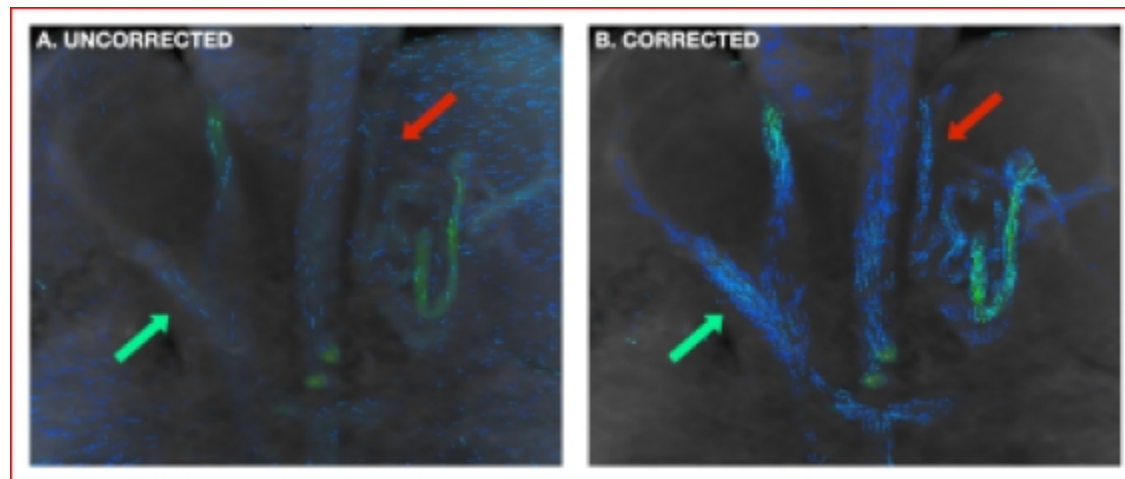
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UC San Diego is seeking partners to commercially develop this patent-pending technology. Currently, worldwide patent rights are available.

RELATED MATERIALS

USER DEFINED 2

Legend for Figure: Effect of background phase-error correction on flow visualization. In a patient with cirrhosis and severe portal hypertension, a coronal view of the abdomen shows portosystemic shunting through variceal vessels (red arrows) that are difficult to discern in (a) prior to correction, but clearly visualized in (b) following correction. Normal anatomy, including the main portal vein (green arrows), is also better visualized.



University of California, San Diego
Office of Innovation and Commercialization
9500 Gilman Drive, MC 0910, ,
La Jolla, CA 92093-0910

Tel: 858.534.5815
innovation@ucsd.edu
<https://innovation.ucsd.edu>
Fax: 858.534.7345

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