



An Improved Phase-Contrast MRI Technique

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SUMMARY

UCLA researchers in the Department of Radiological Sciences have developed a phase-contrast MRI acquisition technique called Hybrid One- and Two-sided Flow Encoding Only (HOTFEO).

BACKGROUND

4D flow phase-contrast MRI (PC-MRI) is clinically used to visualize and quantify blood flow and velocity. Temporal resolution and temporal footprint determine the accuracy in velocity measurements, which is important for diagnosing clinical diseases such as carotid artery stenosis. The PC-MRI technique acquires one flow-compensated (FC) and three-directional flow-encoded echoes (FC/3FE) to update one cardiac phase, which often limits the temporal resolution and footprint. Phase contrast MRI techniques can optimize the temporal resolution and footprint, but at increased acquisition times.

INNOVATION

UCLA researchers have developed an improved phase-contrast MRI acquisition technique, called Hybrid One- and Two-sided Flow Encoding Only (HOTFEO). The acquisition strategy uses a velocity direction constraint to provide more accurate blood flow and velocity measurements. The technique can also optimize temporal resolution and temporal footprint for PC-MRI without increasing total acquisition time. HOTFEO is an image-based reconstruction technique; therefore, other fast MRI techniques, such as parallel imaging, may be combined to achieve even higher acceleration rates.

APPLICATIONS

- Phase-contrast MRI
- Fast MRI techniques (parallel imaging MRI)

ADVANTAGES

- Increases temporal resolution and footprint
- No increase in acquisition time
- Combine with other fast MRI techniques to achieve higher acceleration rates

PATENT STATUS

Country	Type	Number	Dated	Case
Germany	Issued Patent	60 2016 070 362.9	03/23/2022	2016-050
European Patent Office	Issued Patent	3340875	03/23/2022	2016-050
France	Issued Patent	3340875	03/23/2022	2016-050
United Kingdom	Issued Patent	3340875	03/23/2022	2016-050
Netherlands (Holland)	Issued Patent	3340875	03/23/2022	2016-050
United States Of America	Issued Patent	10,743,785	08/18/2020	2016-050

RELATED MATERIALS

- Wang, D., Shao, J., Ennis, D.B., and Hu, P., Phase-contrast MRI with hybrid one and two-sided flow-encoding and velocity spectrum separation, Magnetic Resonance in Medicine, 2017.

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INVENTORS

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OTHER INFORMATION

KEYWORDS

Phase contrast MRI, 4D-flow, temporal modulation, velocity direction constraint, hybrid one- and two-sided flow encoding only, velocity encoding, flow rate, flow quantification, temporal resolution, temporal footprint

CATEGORIZED AS

- Imaging
 - Medical
- Medical
 - Disease: Cancer
 - Disease: Cardiovascular and Circulatory System
 - Imaging

RELATED CASES

2016-050-0

► [Wang, D., Shao, J., Ennis, D.B., and Hu, P., Hybrid One-and Two-sided Flow-Encodings Only \(HOTFEO\) to accelerate 4D flow MRI, Journal of Cardiovascular Magnetic Resonance, 2016.](#)

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- [High Spatial and Temporal Resolution Dynamic Contrast-Enhanced Magnetic Resonance Imaging](#)
- [An Accelerated Phase-Contrast MRI Technique](#)
- [A Novel MR Angiography Technique](#)
- [Improved Cardiac Late Gadolinium Enhancement MRI for Patients with Cardiac Devices](#)

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