



Correcting for Movement due to Breathing Improves MRI Images of the Heart

Cardiac Magnetic Resonance Image (MRI) scanning lasts for several heart beats and as the heart moves with breathing, making high resolution images difficult to obtain. The algorithm developed enables respiratory motion to be automatically compensated for whilst the patient breathes normally, resulting in timesaving and clear MRI images.

To prevent blurring of the MRI image a patient is asked to hold their breath, but patients with heart problems may find it difficult to hold their breath for up to 20 heartbeats. If more than one breath-holding period is required to complete an image slice, the position at which the patient holds their breath is rarely identical.

A set of pre-measurements of movement during breathing ('navigators') are made and during the actual image capture are used to predict the displacement of the heart, enabling the image to be mathematically reconstructed to produce a clear image.

Benefits

- Clear cardiac MRI images during MRI scanning, whilst patients breathe normally
- Increases efficiency by reducing time taken to obtain a clear image

Market

- MRI equipment manufacturers
- MRI users, specialist imaging centres, hospitals, etc.

Technical Description

'Diaphragmatic Navigator Gating' is often used to limit the impact of respiratory motion, but it has an inherently low respiratory efficiency, which is further compromised by respiratory drift. 'Prospective Slice Following' becomes temporally more outdated as the segment duration increases and the slice following less accurate.

In this invention, the difference between the measured and estimated outputs (the error) is fed back constantly to correct the model, minimising divergence over time. Before the scan, the diaphragm motion is modelled as a sine wave with the frequency set to the patient's breathing rate. It has been tested on a phantom and healthy volunteers and it is being validated clinically on patients at present.

Keywords:
Cardiac MRI, MRI
Correction, Respiratory
Motion Correction

**Intellectual Property
Status:**
Britain: 2478403
South Africa: 2012/06353
USA: US-2012-
0319685-A1

**Technology Readiness
Level:**
4- Validated in a relevant
environment

Contact:
Dr. Revel Iyer,
Business Development
Manager,
Research Contracts &
IP Services,
University of Cape Town,

revel.iyer@uct.ac.za
www.rcips.uct.ac.za

The inventor is Ian Burger.