ETHzürich   ●∴● skope

# HIGH-PRECISION BRAIN SCANS WITH THE NEURO-CAM

Problem – Challenge

MRI – magnetic resonance imaging – is a widespread diagnostic tool. The MRI scan yields a 3D image of the body, allowing to diagnose disease in its structure and function. During an MRI scan, radiofrequency waves probe the tissue, while the patient is lying in a strong magnetic field that is slightly modulated to encode the signal. In practice the accuracy of MR image datasets is affected by spatiotemporal perturbations of these dynamic magnetic fields applied for encoding. As a result, relatively robust yet slow imaging techniques are being used instead of the ones offering best contrast-to-noise results. With this conservative approach some of the image errors are reduced, yet not removed, while limiting the scans in resolution and speed.

Solution

The NeuroCam by Skope is an MRI coil array for imaging the brain. Different from conventional coils, the NeuroCam is equipped with magnetic field sensors that measure the actual magnetic field dynamics present during the scan. This information on the slight imperfection of the encoding can be used to correct the image at the signal processing stage, where the acquired radiofrequency signals are turned into images. As a consequence, images can be acquired fast while their accuracy is preserved, eventually enabling more powerful automated image analysis tools to support diagnostics.

One of the challenges is the operation of the magnetic field sensors with the required accuracy in nanotesla in a magnetic background field of several tesla and fluctuations on the order of tens of millitesla. Several measures are needed to achieve this like blocking sheath wave currents on cables, which are used in the NeuroCam.
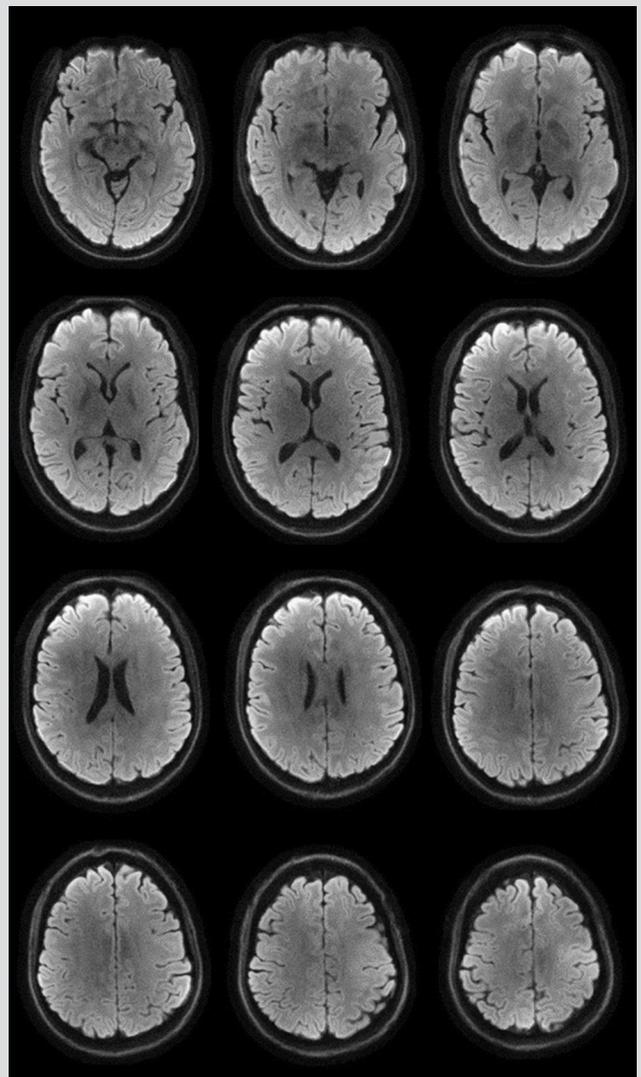
Top figure: NeuroCam by Scope
Bottom figure: Series of ultafast diffusion images acquired with the NeuroCam