Abstract

The technique of functional magnetic resonance imaging is rapidly moving from one of technical interest to wide clinical application. However, there are a number of questions regarding the method that need resolution. Some of these are investigated in this thesis.

High resolution fMRI is demonstrated at 3.0 T, using an interleaved echo planar imaging technique to keep image distortion low. The optimum echo time to use in fMRI experiments is investigated using a multiple gradient echo sequence to obtain six images, each with a different echo time, from a single free induction decay. The same data are used to construct T_2^* maps during functional stimulation. Various techniques for correcting the N/2 ghost are tested for use in fMRI experiments, and a method for removing the image artefact caused by external r.f. interference in a non-linearly sampled matrix is presented.

The steps in the analysis of fMRI data are detailed, and two new non-directed analysis techniques, particularly for data from single events, as opposed to epoch based paradigms, are proposed. The theory behind software that has been written for fMRI data analysis is also given.

Finally, some of the results from an fMRI study into the initiation of movement are presented, illustrating the power of single event experiments in the separation of cognitive processes.

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