

A method for scanner noise cancellation and detection of verbal responses during an fMRI experiment is presented. In recent fMRI experiments overt responses have been used to monitor the subject's response and the timing used in the statistical analysis.. Due to the presence of scanner noise, the subject's speech can be difficult to understand. Data were collected on a 3T scanner during EPI acquisition. A template of the scanner noise is created during the period of scanning that is used to allow the signal to reach equilibrium. For each TR intervals, correlation of the template is used to optimize the subtraction by a shift of +/- 5 pixels. A median filter (1x5) is used to remove spurious noise spikes resulting from an incomplete subtraction. Finally, a threshold is applied defined as 2 standard deviations above the baseline, to identify the verbal responses. The time position of each verbal response is obtained with respect to an initial setting.

The result is an audio stream that is nearly free of scanner noise with a reduction in noise by 15 dB. The subject's voice is detectable. A spreadsheet of verbal response onsets is also created for use during analysis to improve the statistical model. Future implementation is aimed at having a real-time version to monitor the subject during any form of imaging to provide additional levels of safety. The experimental data is sampled at a rate of 25000 samples/second. Figure 1, shows pictures of scanner signals, before and after the processing of an event related trial. Figure 2, shows the scanner signal before processing in one TR segment. Figure 3 shows the power spectrum plot of the audio signals, before and after processing. The result shows that it is possible to reduce the scanner noise by 15 db using this technique.