ASSESSING CHANGES IN THE FMRI VISUAL FIELD MAP AFTER SURGERY FOR EPILEPSY

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The visual field map is produced by mapping the active voxels of the visual cortex to a circular disk that corresponds to the retina. Activation of the voxels is determined by matching the fMRI time series to a time series based on a complex visual stimulus composed of rotating sectors and annuli while the subject is being imaged. Typically this identifies 200 to 500 points on the visual field map. Each scan (pre-surgical, post-surgical and late term recovery) produces a slightly different set of points due to variability in location of the head between scans and due to noise in the fMRI response to the visual target. Sometimes the effect of the surgery for epileptic seizures produces direct effects on the visual cortex; sometimes it affects the cortico-cortical connectivity. A spatial-temporal non-homogeneous Poisson process is used to test for changes in the density of the active voxels. Changes may occur both post-surgery, as well as during cortical reorganization during the healing process. The non-homogeneity of the process is due to the nonhomogeneous distribution of the active cells in the retina and, correspondingly, in the visual cortex. Spatial diagnostics are used to examine the adequacy of the model for the spatial inhomogeneity. Using simulations we demonstrate the amount of change that can be identified and the robustness of the model.