Methodologies for Analyzing Neurospatial Activation Patterns Associated with Information Retrieval Tasks Conducted on Search Engines

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The modern information seeking model, which is based on about 30 years of research, can best be characterized as an iterative process concentrated on fulfilling the Anomalous State of Knowledge (ASK) in which an actor (user) interacts with a resource (database or search engine). The search paradigm process is conceptualized as: ASK → QUERY FORMULATION→ SEARCH→ INTERPRET→ RESULT→ REFINE QUERY→SEARCH (REPEAT).

Information scientists study information seeking in an attempt to discern the cognitive components of this complex dynamic process mainly based on behavior-centric experimental approaches (Belkin 1982). It is not a surprise, therefore, that the general findings remain somewhat subjective based on observation of users and linguistic tools that estimate judgment.

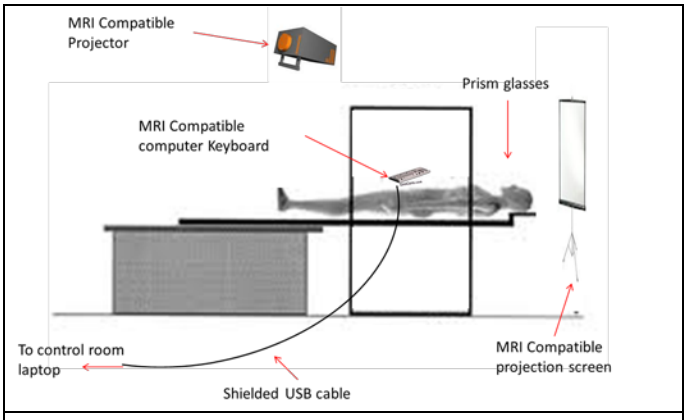

Figure 1. fMRI subject study setting

Functional magnetic resonance imaging (fMRI) is a well-studied non-invasive tool capable of localizing neuronal activation associated with complex cognitive activities in humans (Ogawa 1992). The development of a standardized methodology for identifying neuronal activation patterns associated with information search and retrieval is essential for obtaining consistent accurate results. We wish to identify cognitive neural evidence to explicate the information seeking process by using fMRI. Here we present a broad outline for data capture. The intent is to image the brain during the initiation of an information-seeking epoch. Specifically, the point of conscious recognition of an information need, the retrieval of central lexical representations that form the basis for the semantic conception of that need, and the subsequent translation into the peripheral motor responses required to express the need by typing the query into a search box. The subject will be in a controlled comfortable environment within the imager, viewing an MRI compatible monitor holding an MRI compatible keyboard. They will indicate to the investigators the initiation of a search task while being imaged. The MRI compatible keyboard will be connected, by an appropriately shielded USB cable, to a laptop located in the observation suite. The laptop will share its desktop with an MRI compatible monitor within the viewing range of the subject. The subject will initiate a typed search. The information-seeking epoch will be time logged in synchrony with the fMRI scanning process for later correlation and analysis of images (Wang 2011).

We realize there remains an immense gap between the actual mechanics involved in developing a comfortable procedure for allowing subjects to interact with a search engine while inside an MRI gantry and the voluminous data generated from the scanning process. We present this procedure only as a starting point to encourage discussion for its potential refinement. We envision the panel event to motivate further exchanges on the nature of the data captured and its analysis. If our proposal is accepted, we plan to invite two additional colleagues with established scholarly record in the intersecting areas of cognitive science and information science. We hope an outcome of the forum would be a clearer understanding of the challenges involved in establishing a robust method, as well as a foundation for future interdisciplinary collaborations in NeuroIS.

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