

AbstractID: 10251 Title: KTool: A Web-Based Educational Application for Exploration of K-Space Properties

Purpose: The goal of this project was to develop a web-based tool (named “KTool”) for visual demonstration of how changes in k-space data are manifest in changes of MR image appearance. The tool should be usable on a variety of computer platforms for wide-ranging access by Radiology residency programs. The purpose of this endeavor is to help cultivate an intuitive understanding of what k-space is, to improve understanding of the relationship between raw data and images produced during the MRI image formation process.

Method and Materials: KTool was programmed as an Applet using Java on a Dell Precision workstation with a Linux-platform, and deployed on the Medical College of Georgia Department of Radiology web-server. The applet was embedded in a webpage for viewing, and was successfully accessed using computers with three different platforms/environments (Windows XP, Mac OS X, and Redhat Linux).

Results: KTool allows the user to examine three different broad concepts of k-space via different tabbed view panels. First, the user can manipulate k-space directly via zero-filling, to demonstrate how image appearance depends on k-space. Second, the user can visualize—more intuitively and less mathematically—how properties of images and k-space are reciprocal, related through the symmetry of the forward and inverse Fourier transform. Third, the user can add image artifacts to an image and visualize their appearance in k-space, to associate malfunctions in MRI equipment during image formation to corruptions in k-space and to image artifacts.

Conclusion: We have introduced a new tool for a more intuitive understanding of k-space, relying on visualization and intuition instead of mathematics. This tool may be useful for Radiology residency education (e.g., we use it at our institution), or for serving as a reference to the Medical community at large.