

arrayShow: a guide to an open source Matlab tool for complex MRI data analysis

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Purpose

The data of an MRI scan often comprises various frames which may represent different slices, echoes, encodings etc. of the same object. Within the Matlab environment, such data can be conveniently stored in a multidimensional complex matrix. However, most imaging functions are restricted to two-dimensional matrices and cannot deal with complex data. The purpose of this e-poster is the introduction of a freely available tool which has been designed specifically to overcome these limitations. It therewith offers practical solutions to some common MRI data visualization problems in Matlab.

Outline of Content

Core functionality

Figure 1 illustrates an example of the arrayShow user interface (UI) for a Fourier reconstruction of an MRI scan with 25 echoes, 10 slices, a 4-element receiver coil and a base resolution of 160 x 160 data points. The main control panels (1-6) offer quick access to different image orientations and frames (1), informations about the data origin (2), windowing (3), statistics (4), the selected complex part (5), and the cursor position (6). The core of the tool is written in object oriented Matlab language with every panel representing a different class.

Complex data

Besides explicit selection of the real, imaginary, magnitude or phase part (5), arrayShow offers a combined representation by encoding phase in color and magnitude in brightness (Fig. 1). The phase angle below the current cursor position can also be visualized with a circular plot (7).

Cursor-position functions

Selection of a "plot dimension" (8) in the data address panel allows for quick inspection of signal evolutions at the current cursor position (9). The functionality can be easily extended by user-defined functions, e.g. to include signal fitting routines or statistics (10).

Inter-object communication

Being derived from a handle class, each arrayShow instance can be controlled directly from the Matlab workspace. Besides possible access from within user-defined functions this enables arrayShow objects to "communicate" with each other. Most UI controls therefore include a "send" button which allows for copying object properties such as orientation, windowing, colormap, cursor position, or ROIs (11) to other arrayShow windows. A dedicated arrayShow browser (12) helps keeping track of the open windows and provides multi-object commands such as batch export, the creation of difference maps, etc.

Quick access to Matlab functions

To speed up workflow, keyboard shortcuts are assigned to frequently-used functions as `fft`, `fftshift`, etc. Other tools as `surf`, `rot90`, or `impixelregion` are made accessible from the menu bar (13).

Summary

arrayShow combines the flexibility of the Matlab environment with a selection of powerful custom build tools which can substantially simplify evaluations of MRI data within Matlab. The open source can easily be extended with user-defined functionality

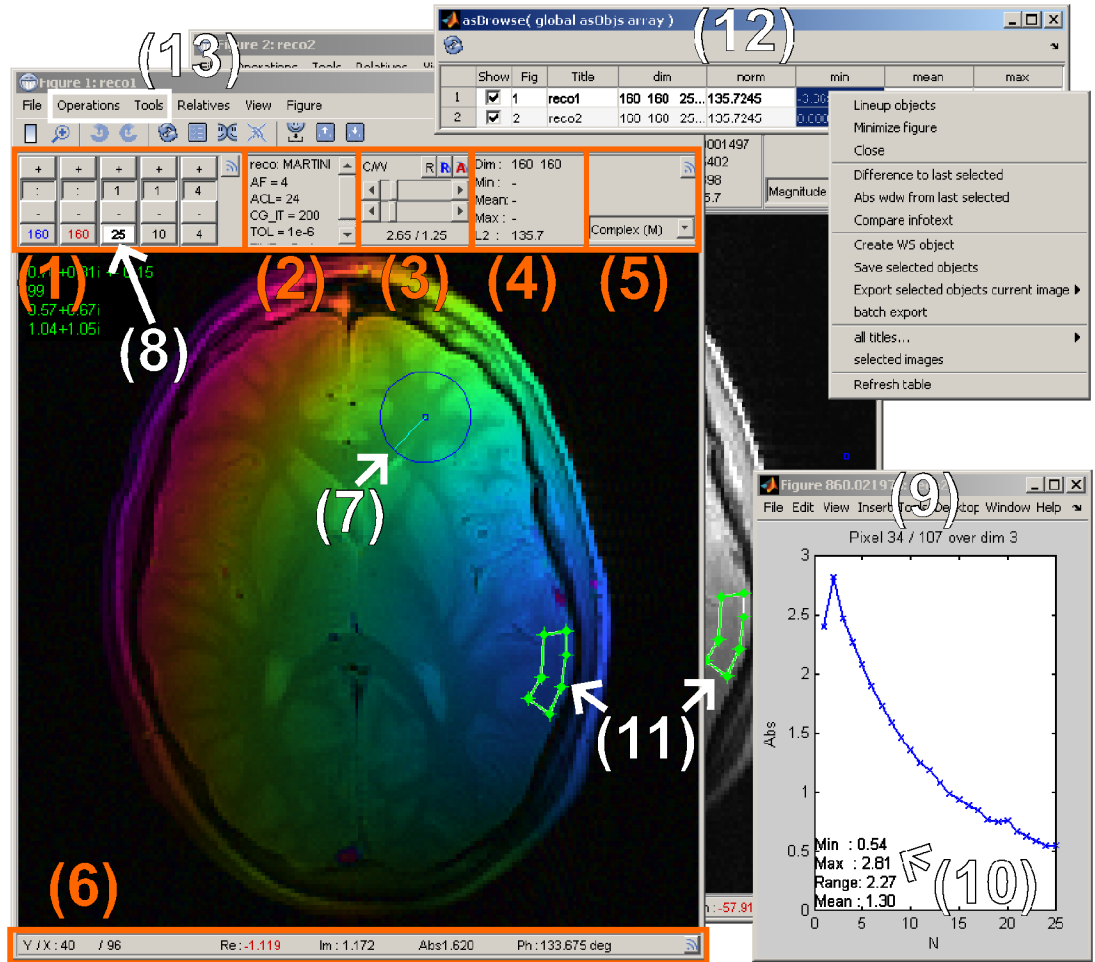


Figure 1