CSIgui v1.0 – Help

Introduction

CSIgui development started as a hobby project to quickly visualize MRI and MRSI data in Matlab. The original intent was to merge the MRI data into MRSI space to localize the spectral data. During development however, multiple functions were added, ultimately creating a backbone for raw MRS data processing. It supports single- and multi- dimensional data, is capable of loading different file types, process raw data and allows for specific processing tasks. This improved and sped up MRS data processing for me and now hopefully also for you. Though it is still a beta release, it is ready (enough) for others besides the developer to start using this application.

Launch the GUI by simply typing CSIgui in the Matlab command window, enjoy.

Load Data

Loading data in CSIgui can be done in multiple ways, either within the GUI by selecting "*File > Open*" in the top menu or by using specific input arguments in Matlab scripts or the Command window.

Supported data types:

.data/.list:	raw data stored in a two column float32 format and parameter list file.
.spar/.sdat:	data stored as VAX CPX float and the gyroscan spectroscopy parameter file.
*.dcm:	Images stored as Philips DICOM v4.2.
.par/.rec:	Images stored as Philips PAR/REC v4.2.

Supported input arguments:

CSIgui can be called as a regular function in Matlab. This allows for using CSIgui after your own processing of data to easily view multidimensional spectral data. Examples of how to use are shown below.

>>> *CSIgui(data, 'data description label');*

Supported data and data description labels:

data;	structure output from csi_loadData() for loading list/data files
list;	structure output from csi_loadList() or csi_loadData() for loading list files
csi;	array of any size with spectra or fids.
spec;	see csi.
mrs;	see csi.
labels;	labels per dimension of the data array, use with mrs, csi an spec input.
filepath;	file path to spectroscopy data file – *.SPAR/SDAT or *.list/data.
filepathi;	file path to an image data file – *.dcm or PAR/REC.
NB.	The filepath(i) label arguments require to be wrapped into a cell array. See examples below.

Examples:

>>>   fp = 'D:\Data\MyData\raw_001.data';
>>>   CSIgui({ fp } , 'filepath');

>>>   fp = 'D:\Data\MyData\raw_001.data';
>>>   fpi = 'D:\Data\MyData\FFE.dcm';
>>>   CSIgui({ fp } , 'filepath', {fpi}, 'filepathi');

>>>   load('someSpectra.mat', 'specArray');
>>>   CSIgui(specArray, 'mrs')
>>>   CSIgui(specArray, 'csi');
>>>   CSIgui(specArray, 'spec');
        % All have equal functionality in CSIgui.

Data Indexing
Information on how the data structure is treated for both MRSI and MRI data.

MRSI Indexing
CSIgui excepts MRSI arrays of all sizes, but data display is linked to its size indexing. By default, the application expects the following dimensional indexing for MRSI data:

Index 1:	Samples of a spectrum; either frequency or time domain.
Index 2/3:	The X and Y index of multi or single dimensional data.
Index >4:	Slice or Z index of multi or single dimensional data.

To correct any indexing differences of the MRSI data, the buttons "*Reorder*" or "*Auto Reorder*" can be used. For more details, see below.

Example:
MRSI array of size: 1024 x 4 x 5 x 3 x 6;
Each spectrum of 1024 samples will be shown in a 2D plot of size 4x5 with slice selection of 1 to 3 and 1 to 6.

MRI Indexing
CSIgui expects the width and height of the image array to be the row and column index respectively e.g. the first and second index. Higher indexes or dimensions are treated as slices. Loading image data using the application itself is advised if merging of both MRSI and MRI data is requested.

Displaying Data

Both the MRS and MRI data can be visualized separately or merged. All options are explained below.

View MRSI

Pressing the "*Show CSI*" button will open up a 2D plot of the MRSI data. The second and third dimension of the MRSI data set will be shown as the X (width) and Y (height) in this plot. Other higher dimensions are accessible for display through a small automatically launched window called "*CSIgui display panel*".

A single spectrum can be viewed by selecting a spectrum of interest in the CSIgui 2D plot window. This opens a 1D plot of the clicked spectrum and allows processing of this single displayed spectrum. The selected spectrum is highlighted in the 2D plot window. If correct x-axis scaling is required, enter frequency information by pressing the "*Frequency*" button in the *set* section of CSIgui.

View MRI

Pressing the "Show IMG" button will open up MRgui2, a separate application. This application allows displaying of multiple image types and enables scrolling through all images loaded.

Merging MRSI and MRI

To merge the MRI data to MRSI space is coordinate information of both data sets is required. Pressing the "*convert*" at the IMG options of CSIgui will calculate the coordinates of the images, calculate the coordinates of the MRSI data set and convert the images to MRSI space. Spatial information of MRSI data will be requested as these are not stored in the current supported file formats. For images, if no parameter structure is loaded, required parameters will be request too. Otherwise, the image coordinates are automatically calculated. The latter is applicable if the image data is loaded using CSIgui. The desired image type for conversion has to be given if multiple image types are available. The coordinate parameters can be entered separately by pressing the "*Coordinates*" button at the CSI and IMG section of CSIgui.

MRSI coordinate parameters:

1. Voxel size;
   The size of each direction. For *.list/*.data files, use the acquisition voxel size, not the reconstruction voxel size.
2. Offset;
   Offset of the dimensional MRSI stack.

MRI convertion parameters:

1. Image type;
   Image type such as magnitude (M), phase (P) or specific maps (Ex. B0) to use for conversion to MRSI space.
2. Correct FFT method;
   Due to the FFT method a half voxel shift is present. Setting this option to 1 corrects for this offset. Default input is set to 1. Setting it to 0 will disable this correction.

Processing

TBD

Available data processing functions

Exporting Data

TBD

Save data as SPAR/SDAT-, text- or mat- file (in development).

Troubleshooting

TBD

If you mess up: there are no bugs, only unwanted features. ;)

Future Features

TBD

This is a to-do list and in no way a promise the function will end up in a stable release. Please contact me if you would like a custom function integrated in the GUI.

Contact

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