Matlab Utility Pack 2
http://www.DIR-lab.com
Available for download: 12/4/09

Included software provides for the following:

- Continuous scrolling/visualization of 2D orthogonal displacement vector projections, overlain the anatomic image content.
- 3D isosurface rendering of anatomic image content, overlain with 3D vector rendering
- "Estimated" image generation via input displacement field and source/target image pair

This software package includes an interface application for visualizing the spatial distribution of three-dimensional displacement vectors, overlain the corresponding anatomic image data. The included functions *require* the Matlab Image Processing Toolbox, as well as a Matlab release of 2008b or later. They should be added to the Matlab path prior to use, which can be done from the Matlab interface through the "File" menu, under the "Set Path..." option.

The included application is comprised of 3 individual p-files, though the basic viewer may be operated with only the parent file "dViewer.p". Note, however, that not all functionality will be available if all three functions are not kept together (see below). The support functions should not be called directly, but must accompany the parent function in the Matlab path. All included function files are saved in the locked Matlab *.p format. Thus, the actual code may not be edited or reviewed.

A brief description of the included content is provided below. As always, please direct any questions, comments, or bug reports to Inquiries@DIR-lab.com.

Content:

- dViewer.p
- EstimateImageOutput.p
- RenderAnalyzeDIR.p
- MatlabUtilityPack2.pdf

The specific functions are described below:

dViewer.p: General interface function for visualizing three-dimensional displacement vectors overlain the anatomic target in axial, coronal, or sagittal projection. No header or image information files are required.

The interface is launched from the Matlab command line without any input arguments, and does not require variables in the current workspace. Properly formatted workspaces are imported directly into the application via the "File : Import Workspace" menu options. Properly formatted workspaces include the following variables:

vX, vY, vZ: Individual three-dimensional variables representing the X (RL), Y (AP), and Z (SI) component displacement images, class "double".

ImageVol: Three-dimensional image variable representing the "Source" anatomic image volume, where $T(\mathbf{x}_{Source}) = \mathbf{x}_{Target}$, class "int16." This volume is visualized with displacement vectors overlain.

TargetImageVol: (optional) Three-dimensional image variable representing the "Target" anatomic image volume. Though this volume is not visualized directly, it is required to utilize the "Image : Estimate Source Image" menu option. Note that the function EstimateImageOutput.p is also required to perform this task.

Edit controls allow the user to set various display and set-up parameters such as voxel size, vector line thickness, vector scale factor, and spacing of the displayed vectors. Additionally, the "PlotType" option provides two schemes for applying the user-defined spacing. The "Uniform" option plots vectors uniformly at every N^{th} voxel position. The "Adaptive" option only considers voxel positions for which the anatomic image volume has an intensity greater than zero. The vector spacing is applied only over this initial set of positions for each 2D slice.

Screen captures of the current interface display may be written to file using the "Image : Export View" menu item.

A three-dimensional isosurface rendering of the anatomic image data may be displayed and overlain with 3D vector renderings using the "Image : Render Displacements" menu item, which launches a separate Image Render window. Transparency of the isosurface rendering, isosurface image intensity, view setting, and spacing of the displayed vectors may be edited manually via the interface. Please note that it is NOT advised to use the render option on image data that is not already segmented in some fashion. The rendering process is computationally expensive, and can "hang" for minutes if asked to render an isosurface for an unsegmented input. The function RenderAnalyzeDIR.p is required to perform this task.

Notes:

- Only one instance of the dViewer application may be open at a time
- The required variables include three separate displacement images, class "double", each the size of the "Source" anatomic image (e.g., 512 × 512 × 128). Depending on the user hardware and operating system, this could easily surpass memory constraints. Be aware of any "out of memory" error messages in the command line.
- Memory considerations also apply to the Render and Estimate Image options
- The software does not provide a "Create Workspace" option. Properly formatted workspaces may be constructed using the image import capabilities provided in the DIR-lab MatlabUtilityPack1, which is available for download. Once the appropriate variables are present, the workspace may be saved via the Matlab "File : Save Workspace As..." menu options.

function call: `>> dViewer;`
Supplementary support functions: EstimateImageOutput.p, RenderAnalyzeDIR.p