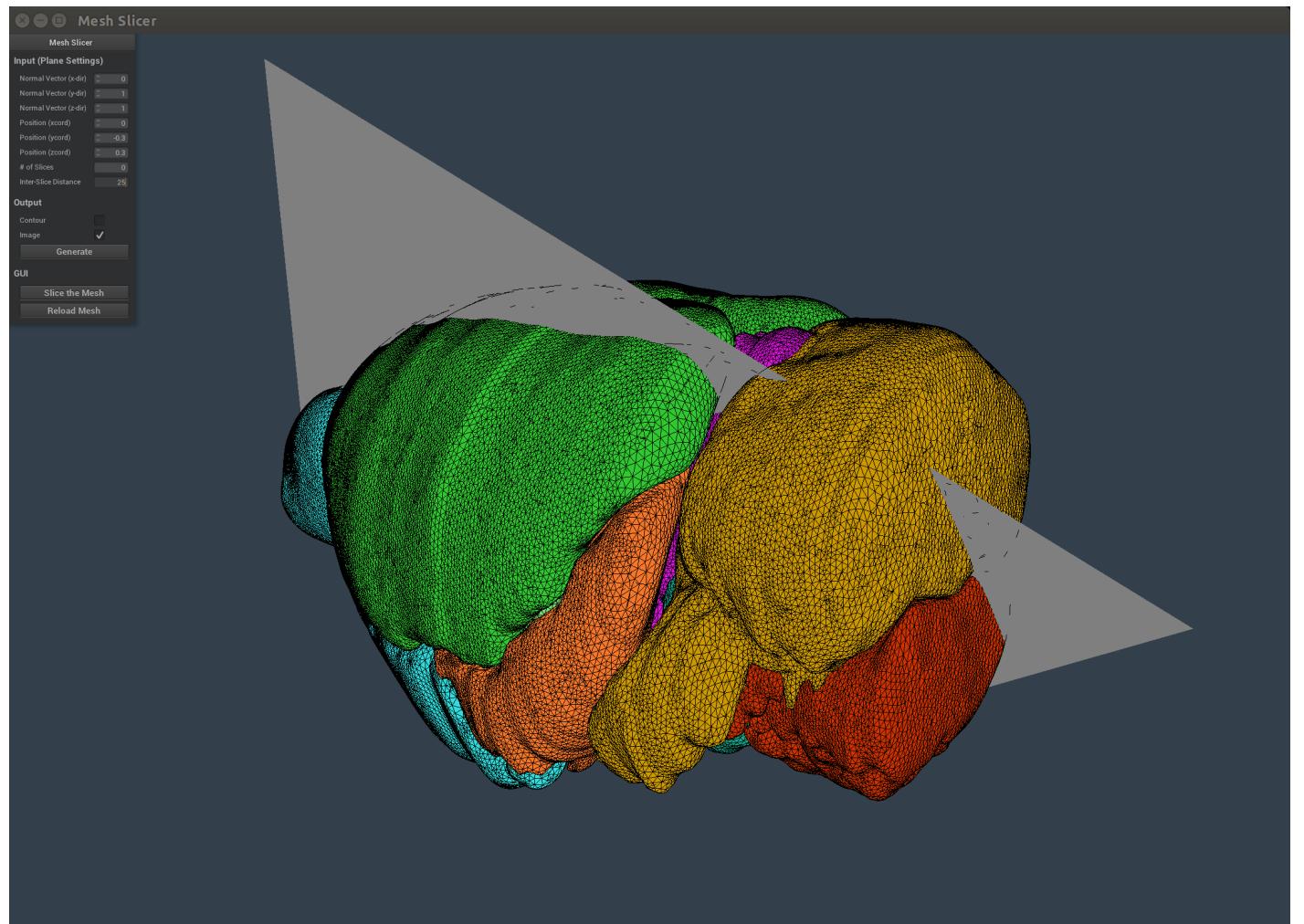


Geometry Processing of Conventionally Produced Mouse Brain Slice Images

Supplementary Document

In this supplementary document we first describe the user-interface (UI) for slicing the virtual 3D mouse brain model as mentioned in the paper. We also provide more examples demonstrating our algorithm for damage region detection and non-linear registration.

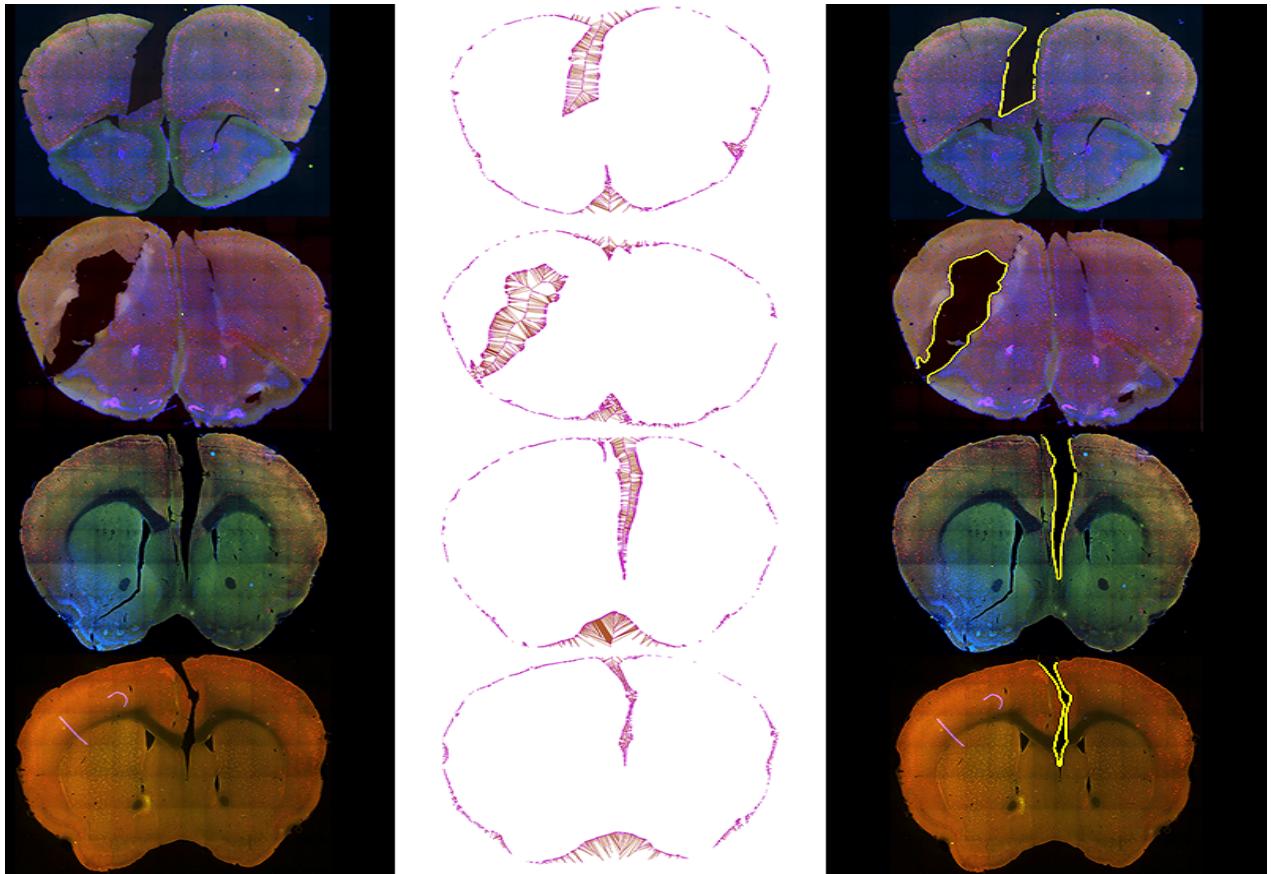
1 Mesh Slicer

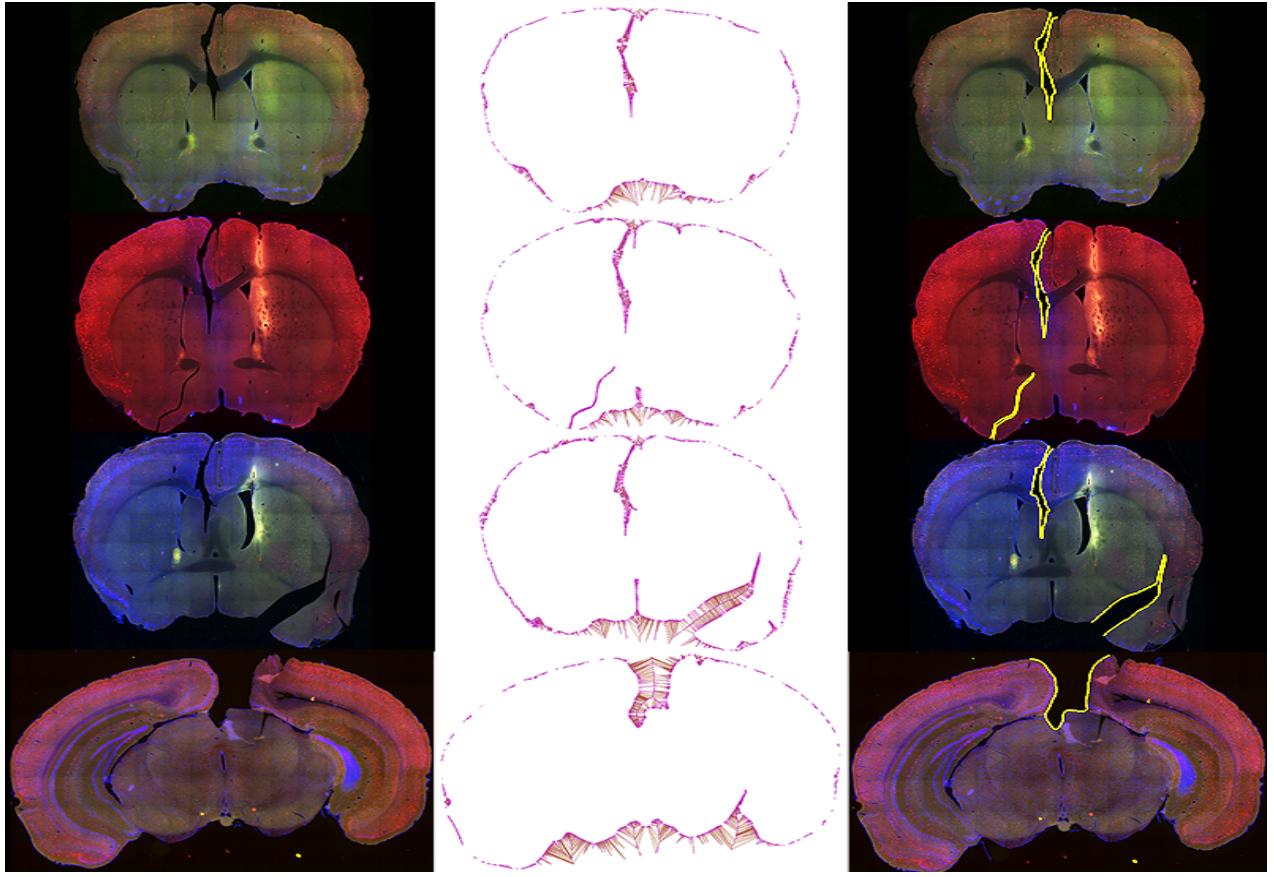


The above image shows the user interface (UI) used to slice the virtual mouse brain model in arbitrary direction to generate annotated atlas images. The input to the user interface is a reconstructed mesh of the mouse brain consisting of 20 different anatomical regions. The orientation of the cutting plane is given by its normal vector in x, y and z direction. The position of the cutting plane is given by the position of its center in x, y and z coordinates in the clip space. Both orientation and position can be adjusted to match the slicing plane which was used to slice the actual mouse brain. The user can also specify the number of slices they want or the inter-slice distance depending on how the microscopic slices were generated. The output of the mesh slicer can either be a series of mesh files with vertices of the contours or a series of rasterized section images where regions are annotated accordingly to the color of that region in the 3D mouse brain model. Further, to assist the user in visualizing what output files would be generated, the user can slice the mesh in the UI itself and see the section. After which they can reload the mesh to slice at a different orientation.

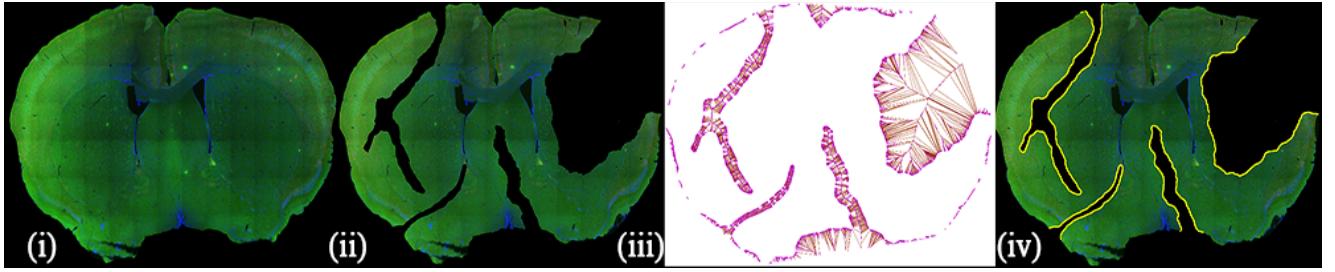
2 Damage Region Detection

The below figures show the results of our automatic damage region detection algorithm on few microscopic mouse brain slices. A sample of eight high-resolution mouse brain slices with single or multiple histological artifacts (tears and missing data) are shown in the first column. Exterior Voronoi vertices (magenta) and edges (brown) are shown in the second column. Detected contours of the damage regions (yellow) in all eight images are shown in third column. All the sample images were obtained from different datasets spanning different regions of the mouse brain and we successfully identified *all* the damage regions in all the eight images.





To show the variety of damages our damage region detection algorithm can handle, we ran our algorithm on a synthetically created damaged slice image with four different types of tissue tears at different locations as shown below. (i). Original mouse brain microscopic slice image. (ii). Synthetically damaged slice image with four tissue tears. (iii). Exterior Voronoi vertices (magenta) and edges (brown). (iv). Detected contours of all the damage regions (yellow) overlaid on the damaged slice image. We successfully detected all the four different types of tears in the mouse brain slice image. Note we were able to detect tears which were present on both half of the tissue slice, tears which are thin, deep and also tears which had branches.



3 Non-Linear Registration

The below figures show the result of our non-linear registration on a few conventionally produced mouse brain microscopic slice images. A sample of ten high-resolution mouse brain slices are shown in the first column. Overlap of the microscopic and atlas contour image (white) before registration is shown in the second column. While the third column shows the overlap after registration. All the sample images

were obtained from different datasets spanning different regions of the mouse brain and we successfully registered *all* the microscopic images to their corresponding atlas images. (please zoom in for details)

