Software for Multimodality Image Coregistration

Ian Jacobsen
ian.jacobsen.92@gmail.com

Description:

This software is used to perform multimodality image registration. The two modalities are acoustic microscopy (SAM), and H&E histology. The algorithm finds the best match of the SAM image within the histology based on an information theoretic criterion. When it is not clear where the location of the tissue shown in the SAM image exists within the histology image, the algorithm may not give a satisfactory registration; therefore it is important for a human to confirm the output of the algorithm.

The software consists of two classes, and a sample script. The class *ImageClass* was written to store images, image metrics, and useful functions that can be performed on the images. The class *RegClass* was written to manage the registration between two images. *RegClass* has two members of type *ImageClass* which are to be registered, as well as the functions required to perform the registration. The sample script, *main.m*, demonstrates how to use the classes.

How to Use:

To use the software, you must pass in the histology image and SAM amplitude image as arrays. In the sample script we show how to read in the histology .ndpi files, and the SAM .mat files. The pixel size specified in micrometers must also be passed in for each image.

Outputs:

The registration function returns the registered histology image. The sample script shows three useful visualizations of the registered images.

The first plot shows the original search region of the histology image, and the corresponding SAM image to register.

The second plot shows the overlay between the two registered images. The blue region corresponds to the histology image, the yellow region corresponds to the SAM image, and the grey area corresponds to the overlap of the two images.

The third plot shows the three parameter images that are obtained in the SAM process, as well as the registered histology image.

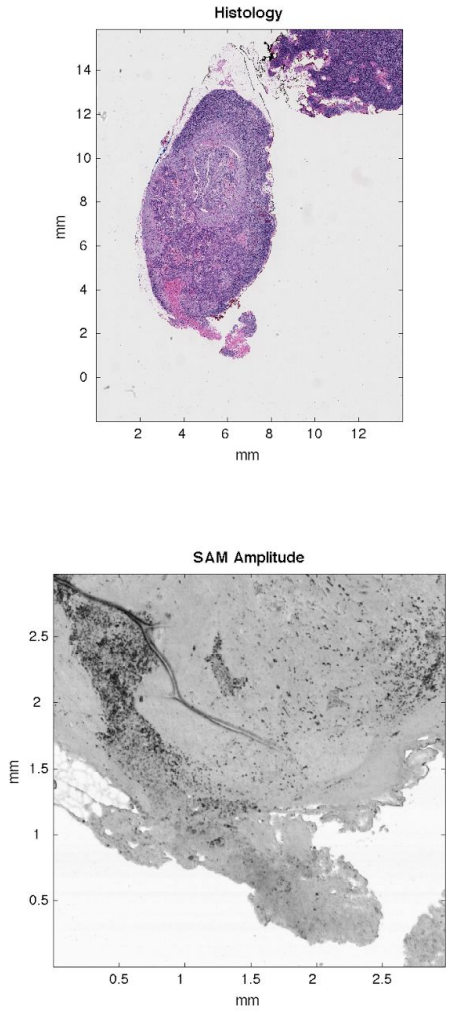

Figure 1: Images to Register

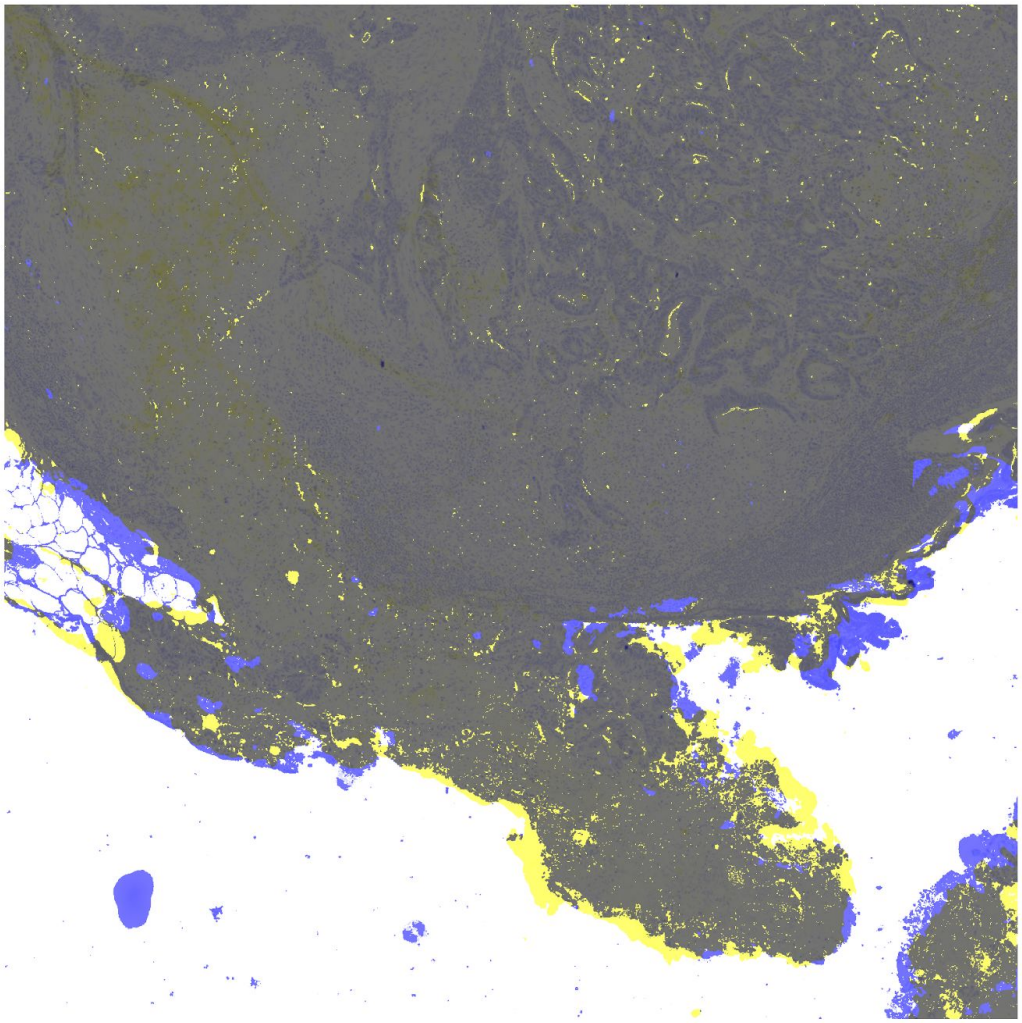

Figure 2: Overlay of Registered Images

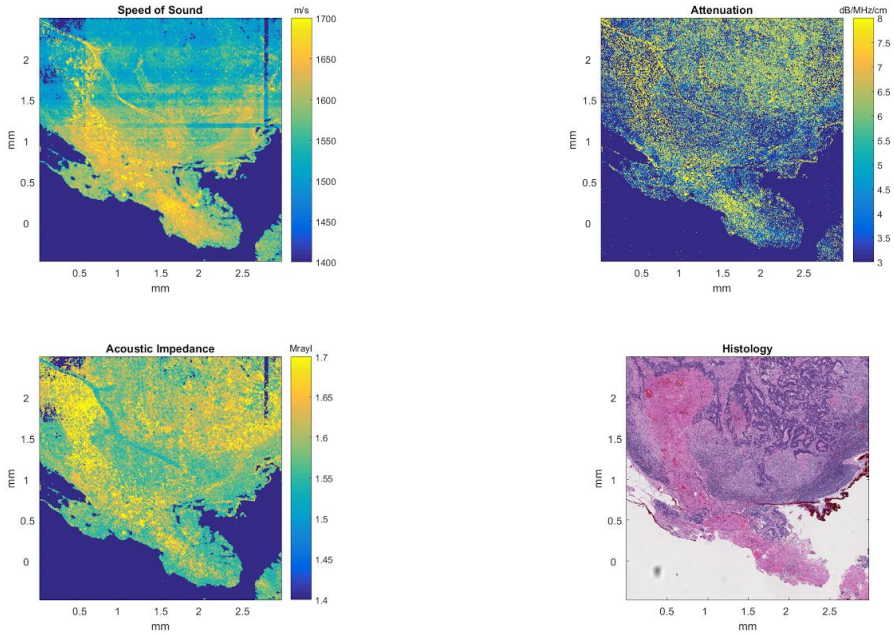

Figure 3: Parameter Images with Histology Image