Techniques in Organ Modeling Through Image Reconstruction

Overall Project Goal

The Overall goal of this project is to create a digestive tract model through image reconstruction.

Brief Description

Image guided organ reconstruction using cad software. Real two dimensional pill-camera images used to reconstruct three dimensional geometry in order to better visualize patient specific geometry.

Heights and Semester Achievements

- Visiting the doctors office to examine and obtain good insight into what the doctor experienced in terms of difficulty in locating malignancies.
- Learnt about the image processing capabilities of mat lab and how digital images are formed and what they consist of
- Learnt the use of image processing software, such as Adobe Photoshop, Adobe After Effects and image processing via use of such software
- 1st Iteration completion failures that stemmed new ideas and understanding of software interpolation and 3D reconstruction.

SiViRT

UTSA

Techniques in Organ Modeling Through Image Reconstruction

Project Related Research Methodology Continued

STEP 1

Fig 1
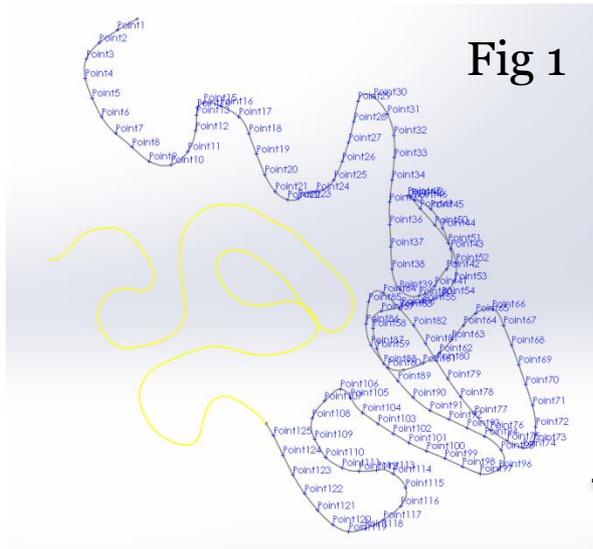
Segment the comma separated value file containing the intestine path into four quadrants. This was done to adhere to a constraint placed in SolidWorks capping the creation of more than 100 reference points per spline. Each quarter was then scripted into SolidWorks and a 4 quadrant spline was then reference with a total of 234 points, each point being a reference to a plane that would fall orthogonal to the spline.

Fig 2

SiViRT

UTSA
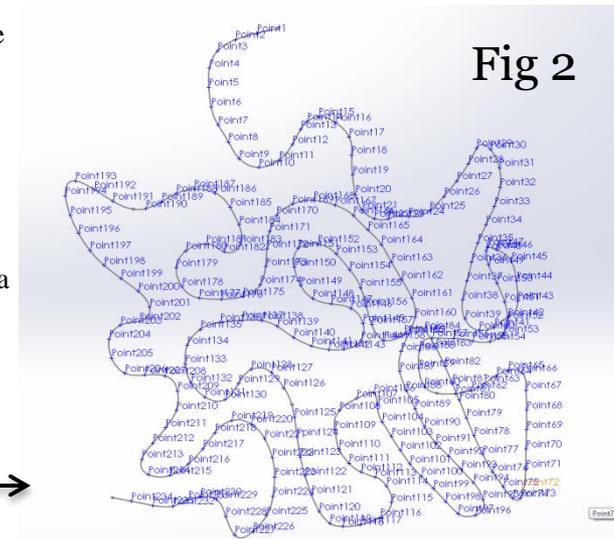
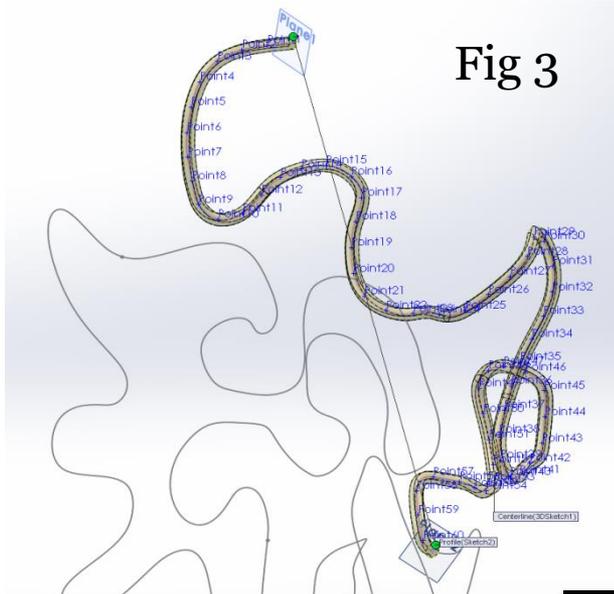# Project Related Research Methodology Continued

STEP 2

Fig 3

Solid complex geometry becomes much more complicated when surfaces start intersecting, so a initial sweep was performed in order obtain an average diameter which would be suitable for lofting. Ref Fig 3. The image to the right illustrates the process undertaken to create the reference planes. Each plane provides a surface onto which an image can be imported. Ref Fig 4.
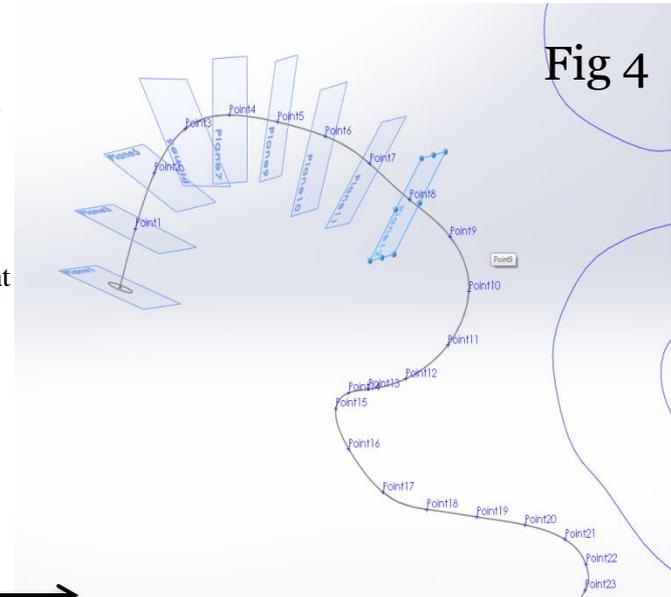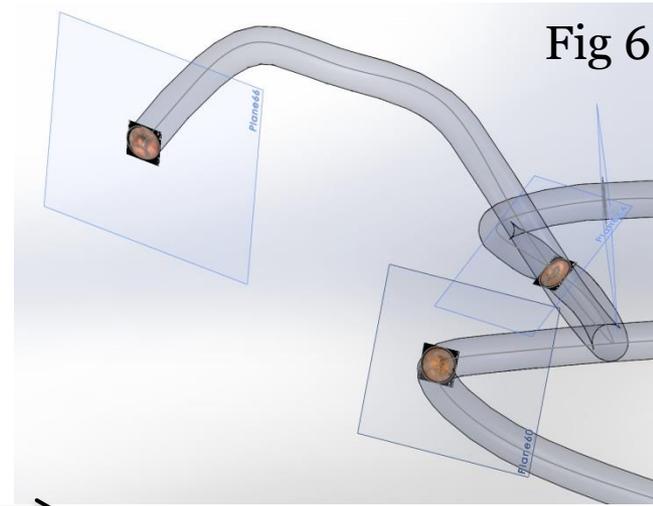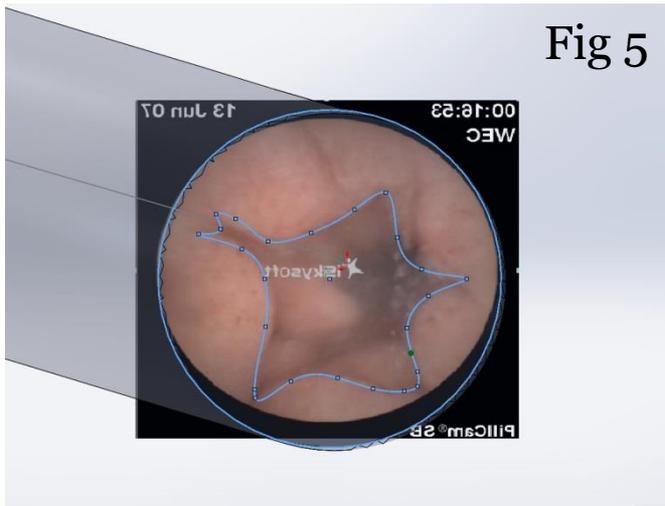

Fig 4

# Project Related Research Methodology Continued

STEP 3

Fig 5

Fig 6

The third step involves inserting images and approximating the internal cross sectional geometry with splines, these splines are created with assistance obtained from cross sectional images obtained from the pill camera. The splines are accompanied by an outer radius circle which provides a means for creating the outer intestinal tube wall. Ref Fig[5]. Once each plane is inserted all the images imported and all accompanying splines and radii's have been sketched the outer and inner cross sections will provide segmentation information for the software to interpolate in-between planes. Refer to Fig[6] to see what the outer lofted tube wall would look like. Keep in mine these images are only demonstrative of the first unsuccessful attempt. In the second iteration of the project more planes are to be inserted. Ref Fig[4] for a better view of how planes are spaced.

Final Results

Final Step

Fig 7
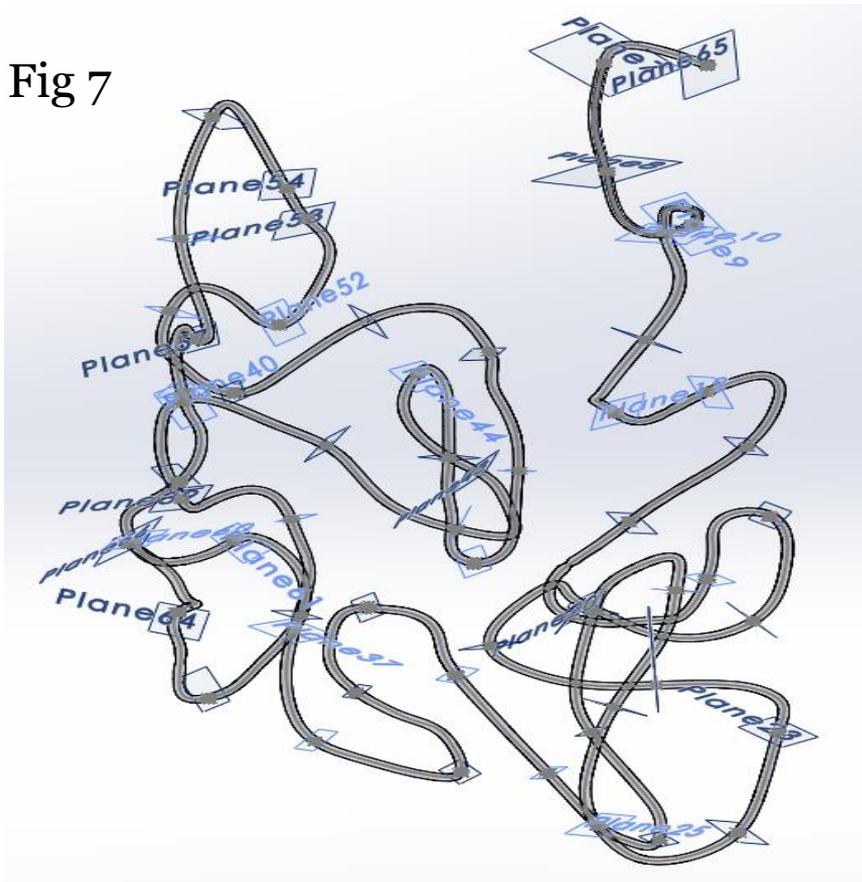
The final result should look similar to what is shown in FIG [7]. Figure 7 shows the outer structure of the intestine, however it does not accurately illustrate our second iteration of the model. Figure 7 is the result of our first attempt at creating the intestinal model. The results were inconclusive with regards to the internal structure of the intestinal wall. The planes in our second attempt will be spaced in much closer proximity and encompasses much of the work left to do before the end of the semester.