CS 530 Project 4

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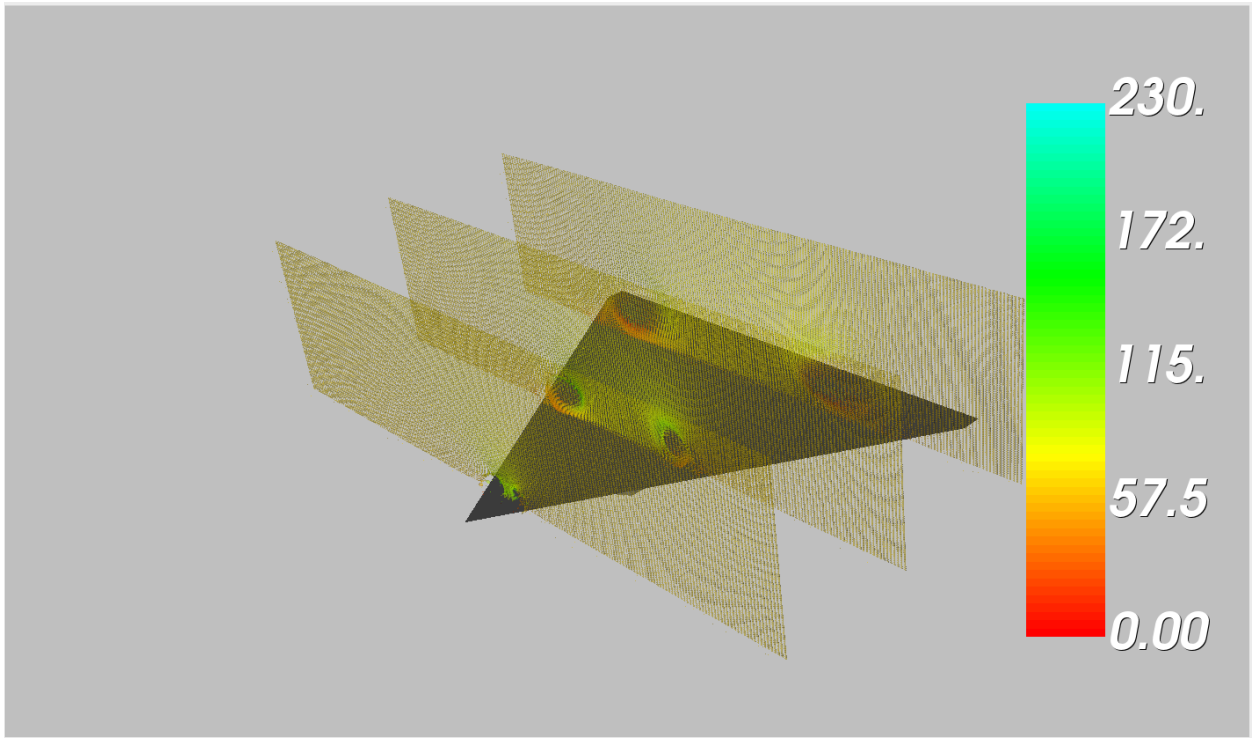
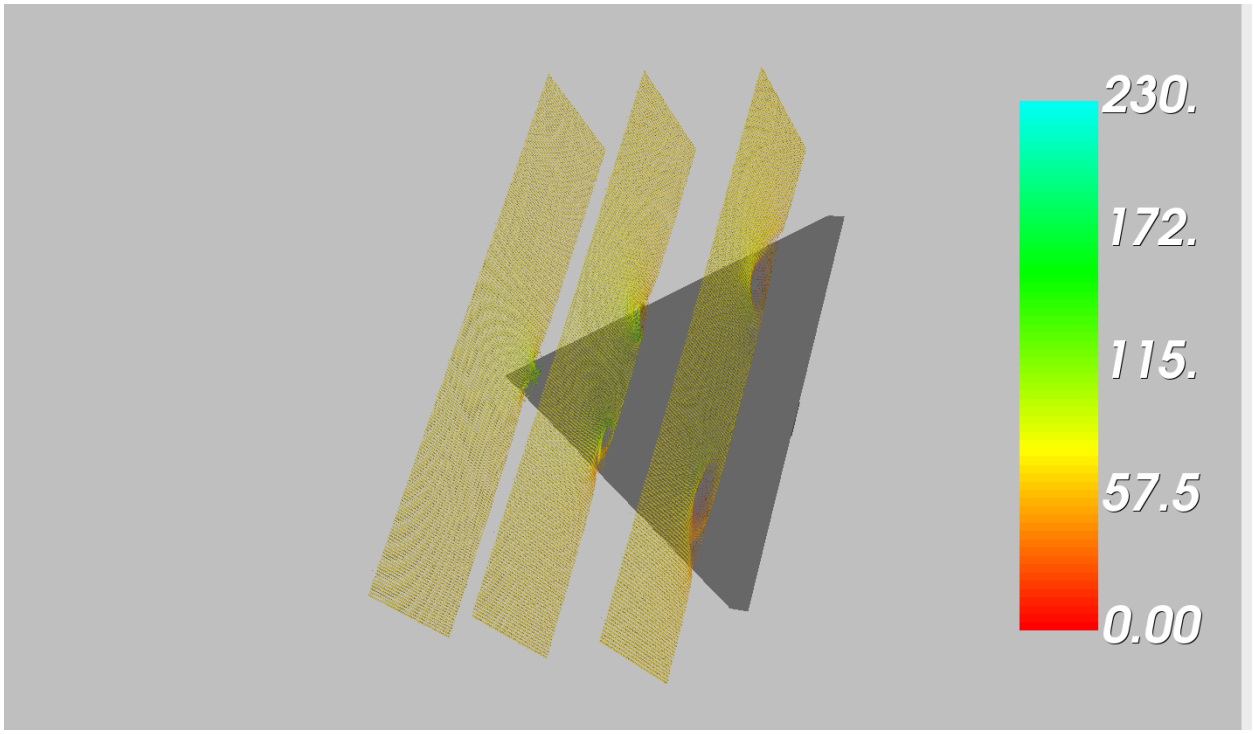
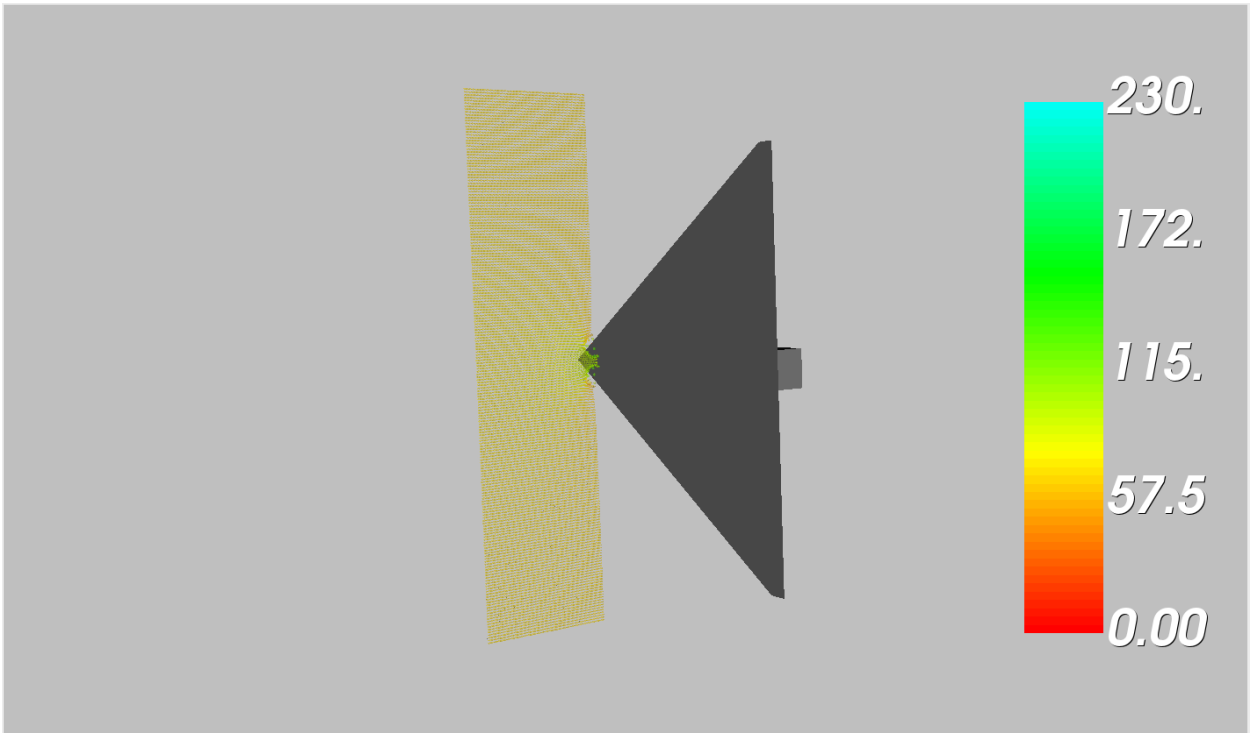
Task 1:

Rendering Results of the Dataset:

Plane positions at [20, 100, 190]




230.
172.
115.
57.5
0.00


230.
172.
115.
57.5
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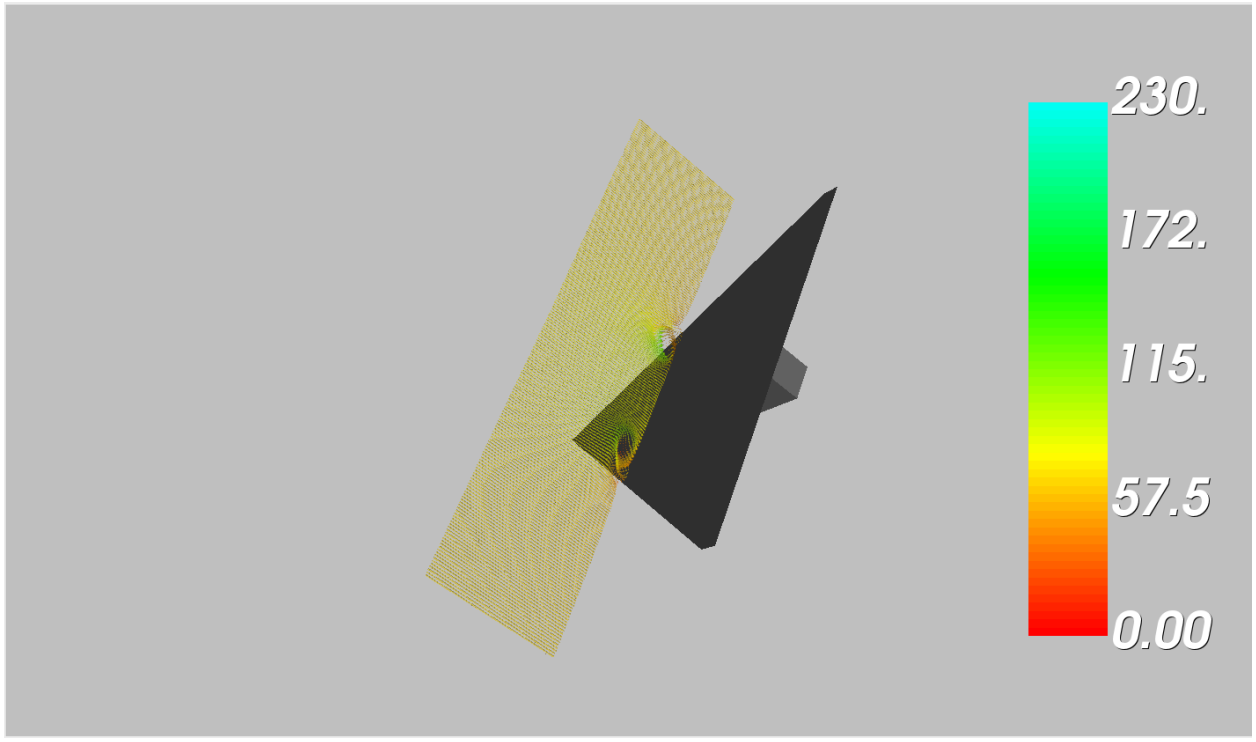
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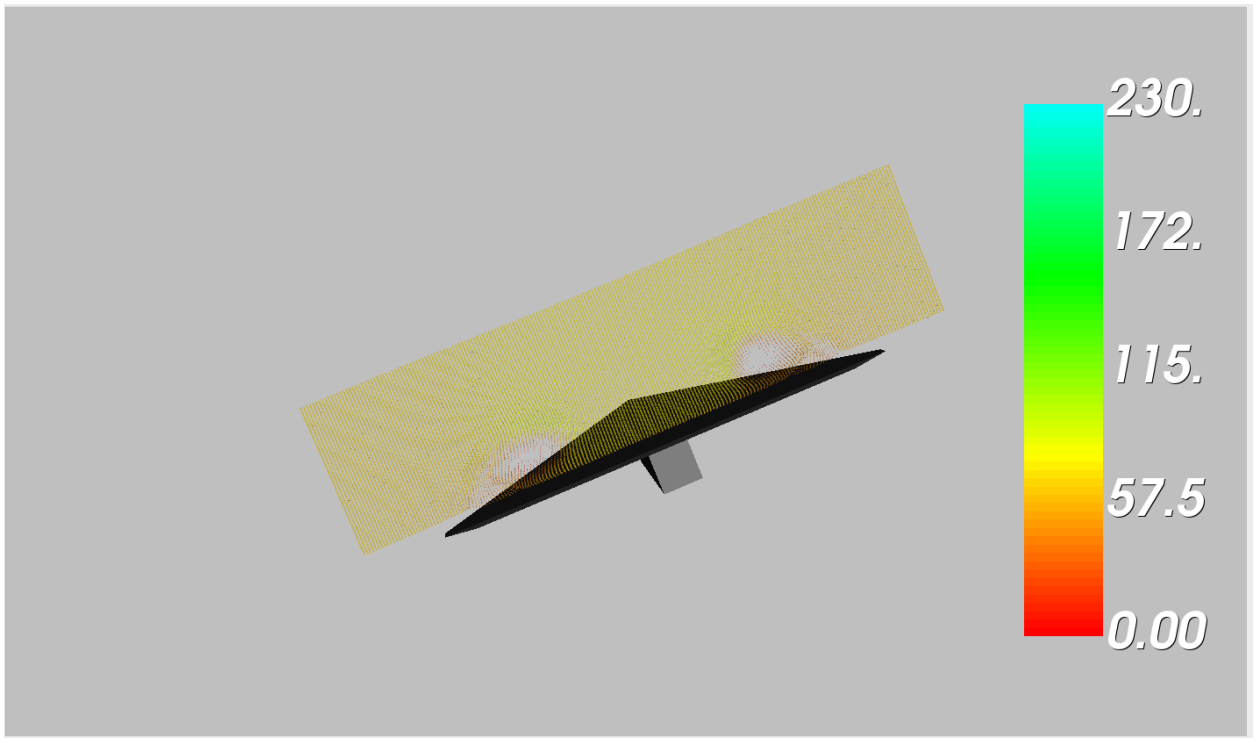
230.
172.
115.
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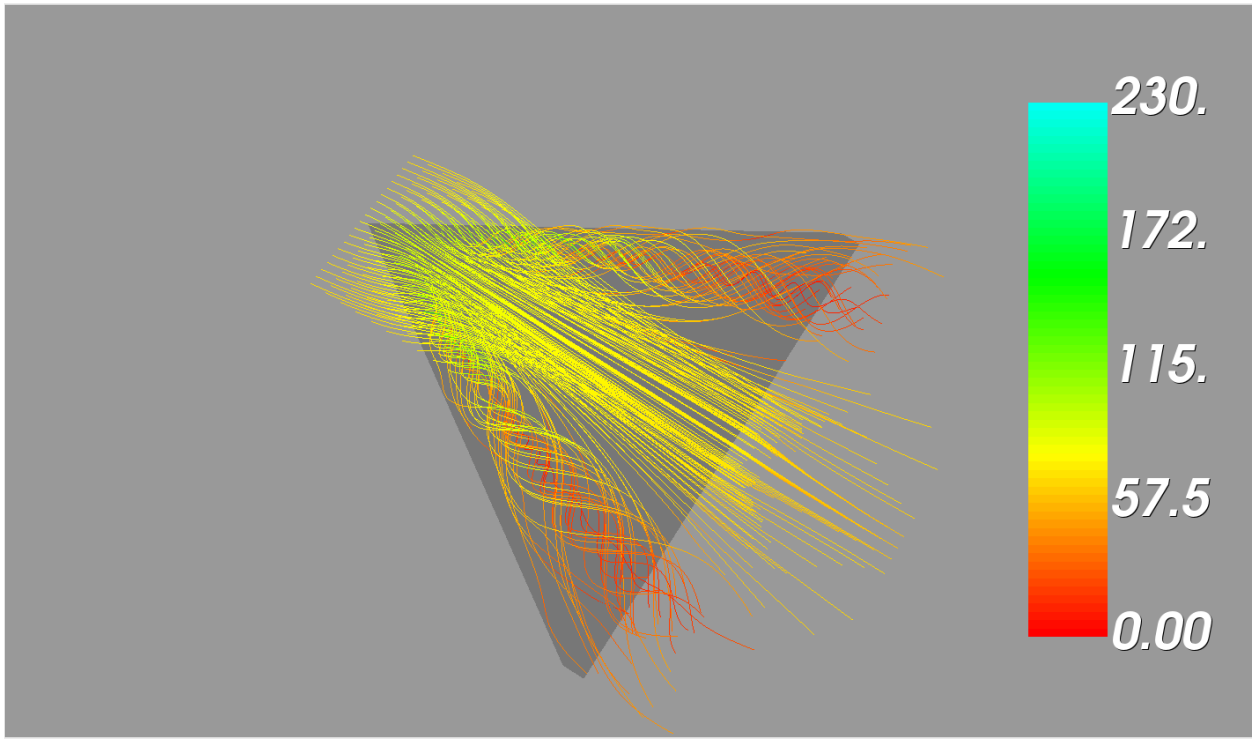
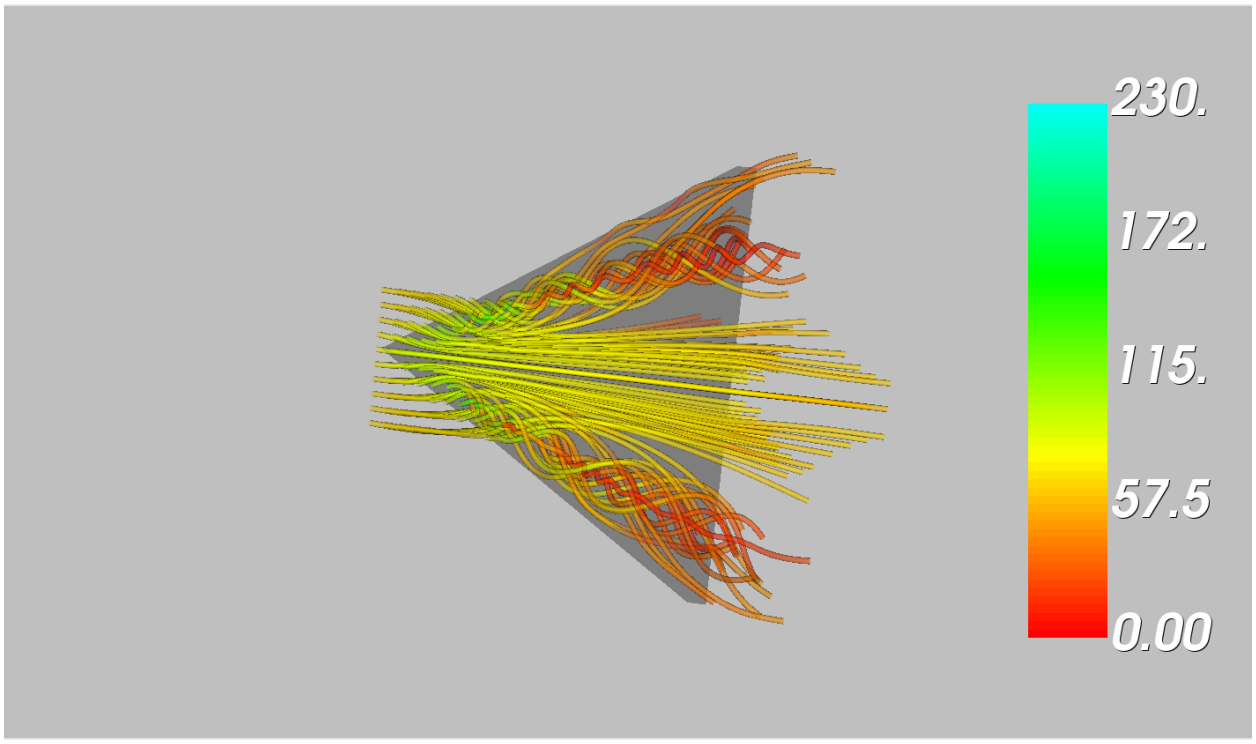
Q: how you selected the planes used in your implementation and comment on the properties of the flow that you can discern in your visualization.
A: I choose the origins of planes at [20, 100, 190], namely at the front, middle, and end of the glyph. From the planes we can see that there are two symmetric vortices at two wings of the triangle.

Task 2:

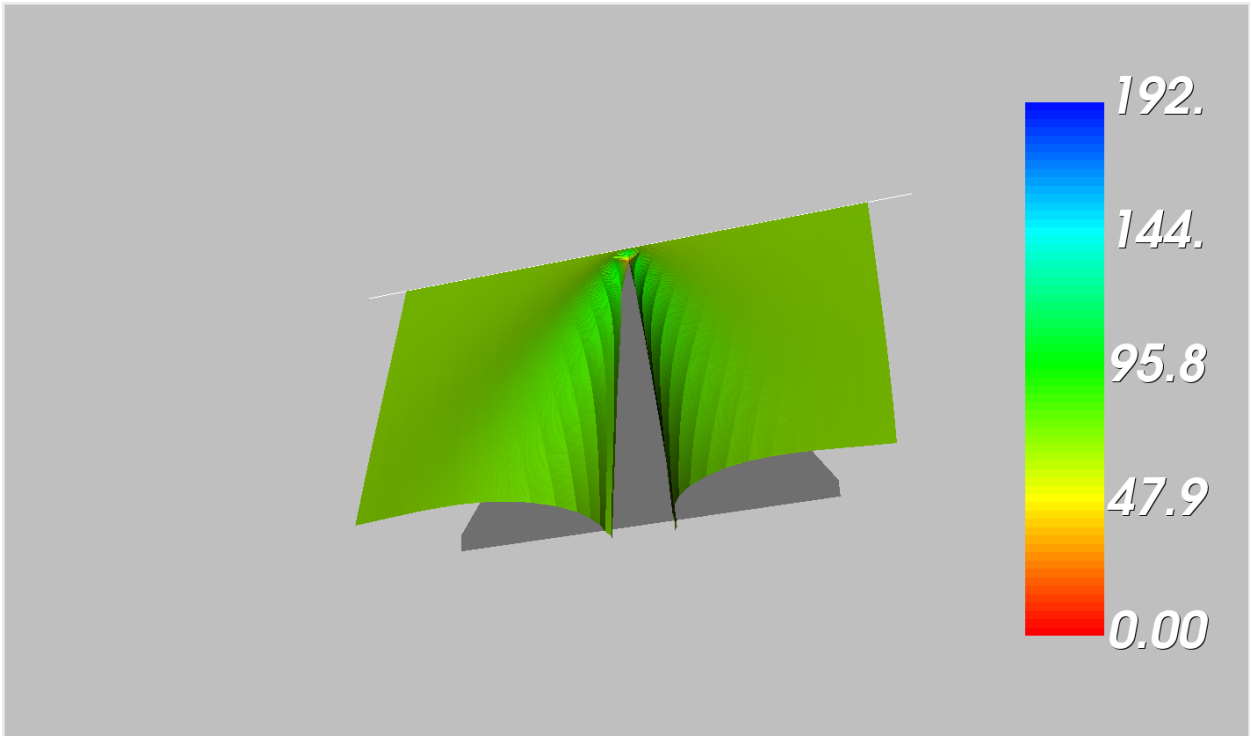
Streamlines:



Stream tubes:



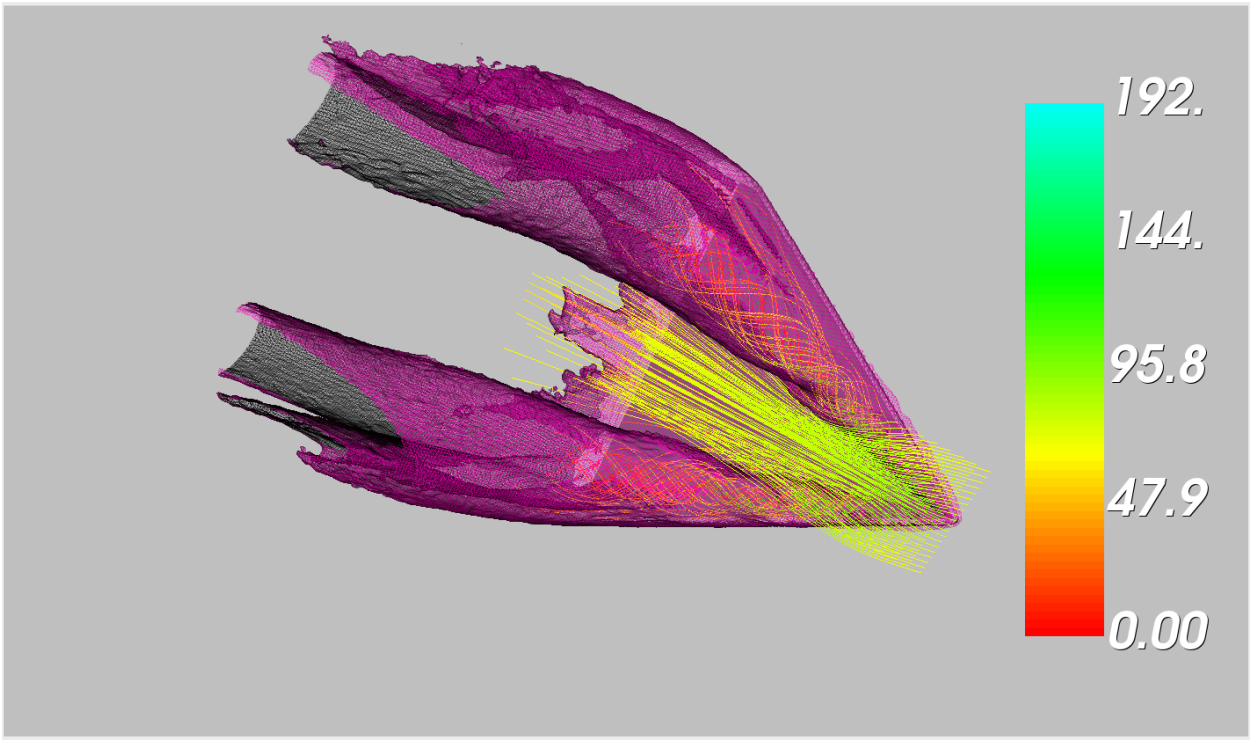
Stream surfaces:



Q: Explain in the report how the seeding locations were chosen for each of these three techniques and how they relate to the observations made in Task 1.
A: For streamlines and stream tubes, I set the x-coordinate to range[0, 100]; y-coordinate to range [-50, 50] and z coordinate to 10. So the results are lines / tubes symmetric to the central axis of the triangle. From the results, we can see that the vortices observed in task 1 correspond to low magnitude, twisted regions (colored in red) on the wings. For the stream surface, the seeding I used are two rakes from (0, 0, 0) to (0, 230, 0) and (0, 230, 0).

Task 3:

Rendering Result:



Q: Describe in the report the things you tried before arriving at the proposed solution and explain why your final selection is a good one. Show the delta wing geometry in each image for context.
A: I kept the method for generating streamlines in Task 2 because I thought that is sufficient to give a whole picture of the shape of the dataset. I then used a slide bar to select the isosurface and found out that when isovalue equals to 300, the result isosurface nicely separates the straight streamlines from the vertices. Therefore, I kept this particular isosurface in the result.

Task 4:

Q: Comment on the effectiveness of the resulting visualizations for your understanding of this dataset. What were the pros and cons of each technique?

A: The streamlines and stream tubes are good for keeping track of the path of a single particle, but are not ideal for showing the distribution of velocity vectors at a particular position, which is why we should use the vector planes as a complementary means.

Q: Comment on the results you were able to achieve in Task 3 by integrating isosurfacing and vector visualization. Did you find this combination beneficial?
A: The isosurface technique can be used to separate distinct regions of the dataset if used properly, but is unable to give more specific features of each region in the dataset. On the other hand, streamlines cannot directly give us the information of the boundary isovalues to separate regions in the dataset. So I find this combination beneficial.