

CS-530 Project 5 Report

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Task 1

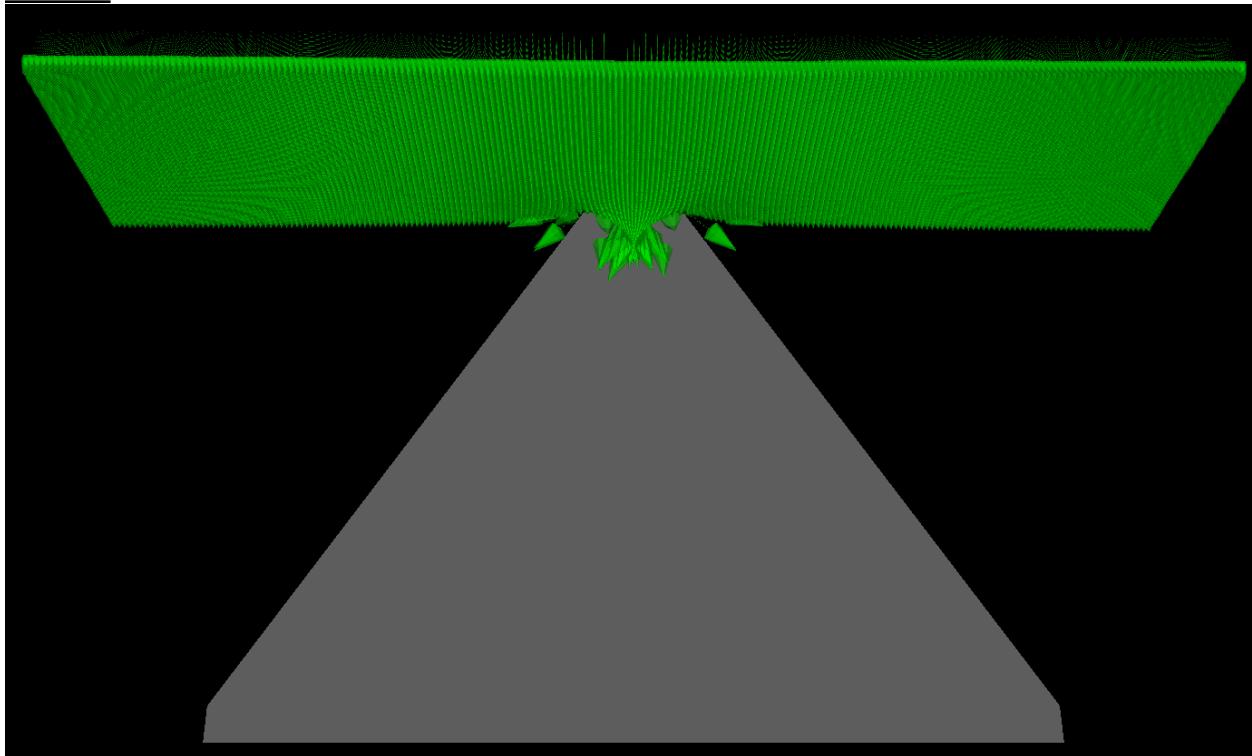


Figure 1.1 plane 1 (X-axis: 20)

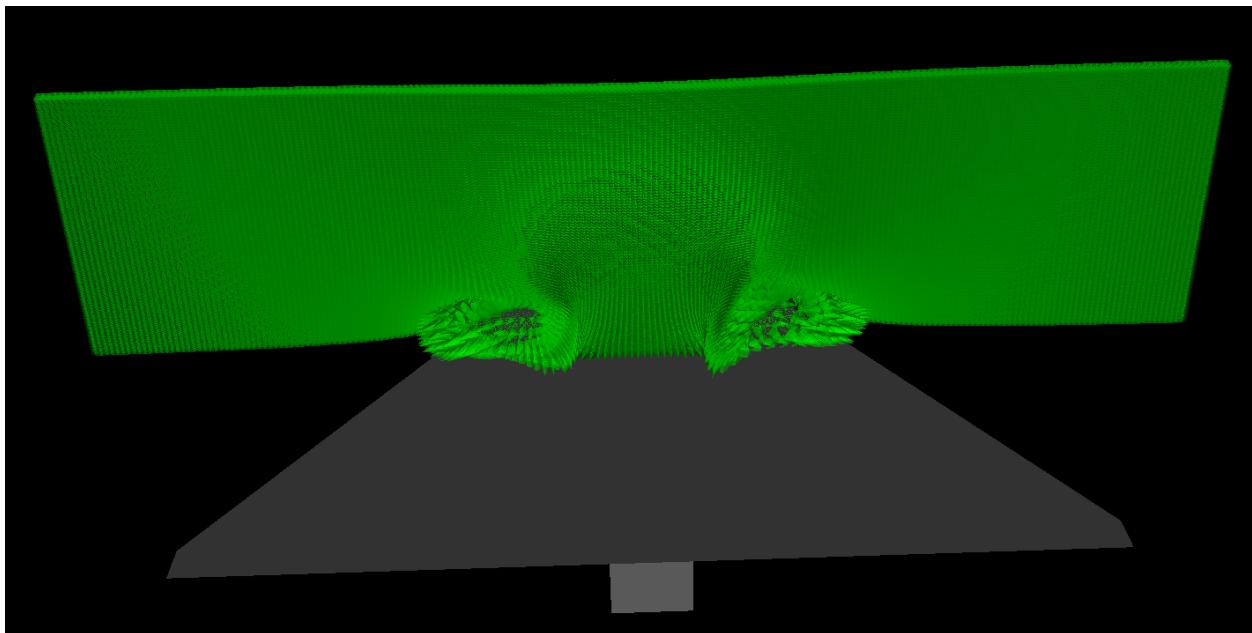


Figure 1.2 plane 2 (X-axis: 100)

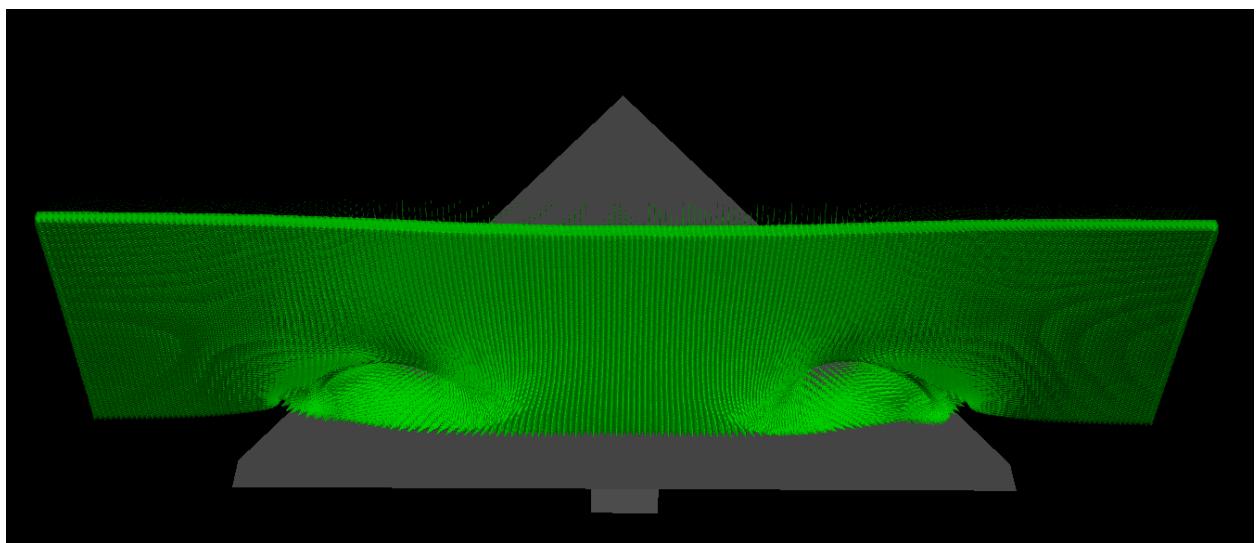


Figure 1.3 plane 3 (X-axis: 190)

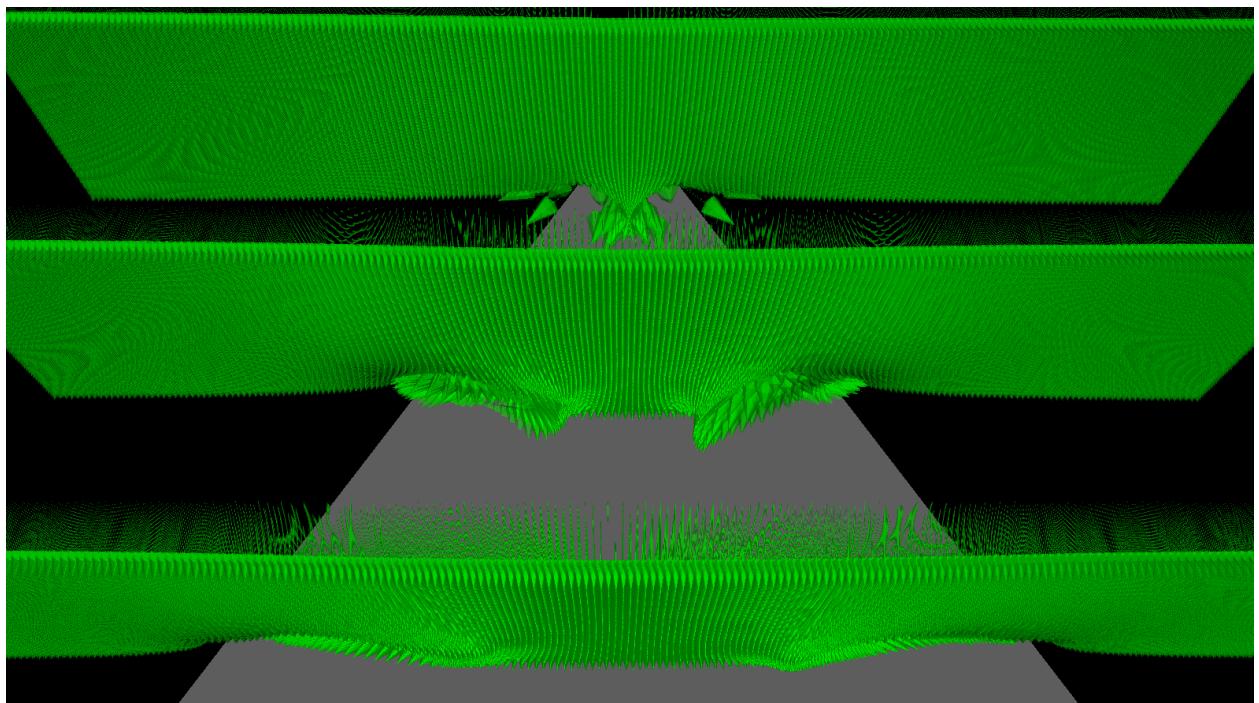


Figure 1.4 all planes

In this task, I used 3 temporary sliders to change the x-axis of the 3 planes. I selected 3 planes which x-axis are 20, 100, 190. For the plane with x-axis=20, it shows the start of 2 tunnels of the flow. For the plane with x-axis=100, it clearly shows 2 tunnels. For the plane with x-axis=190, it is almost the end of 2 tunnels. Combining the 3 planes, we can observe the direction of the 2 tunnels of the flow.

Task 2

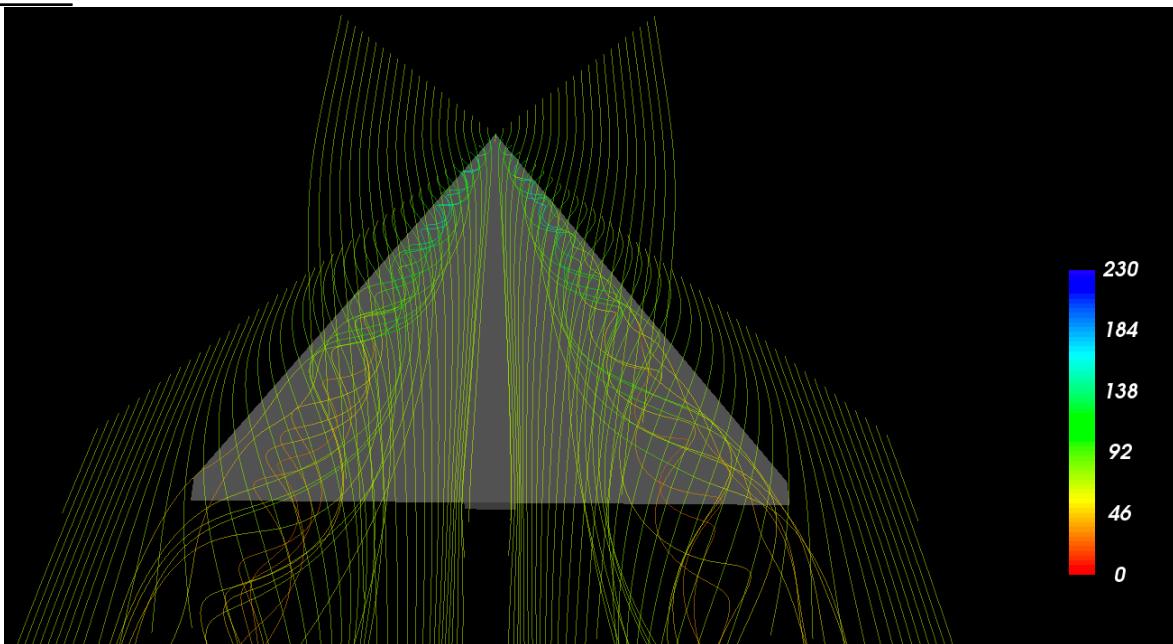


Figure 2.1a stream lines

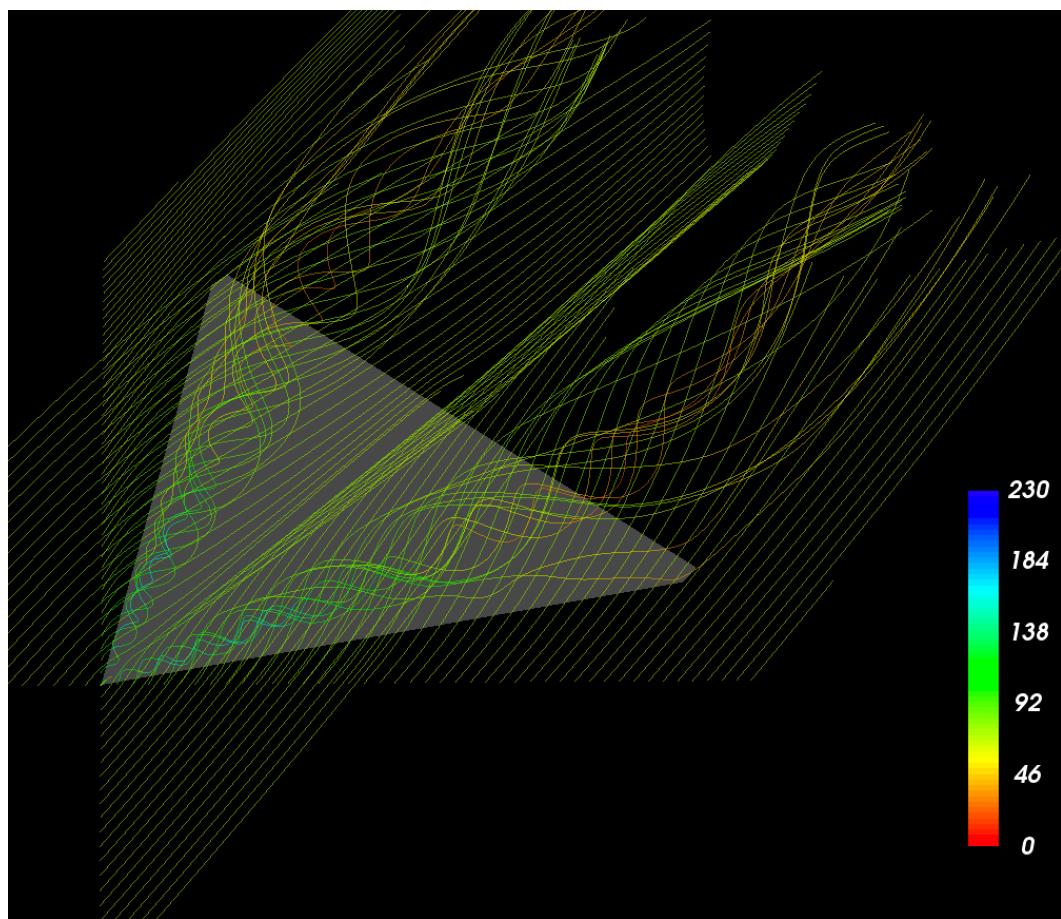


Figure 2.1b stream lines

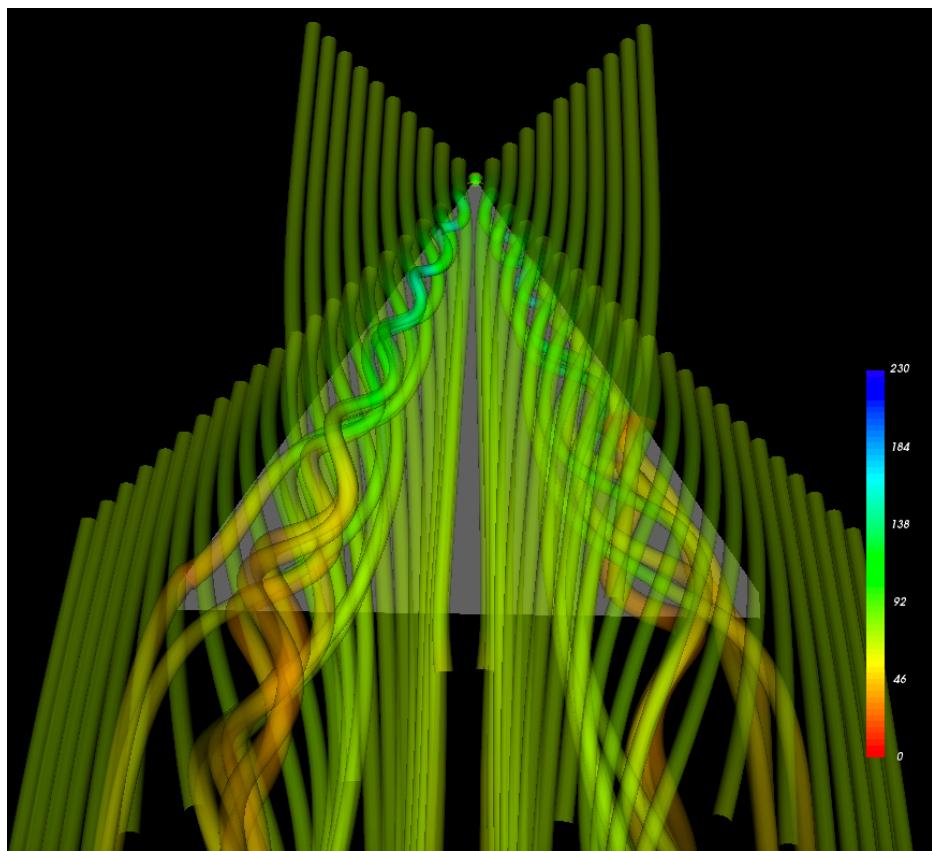


Figure 2.2a stream tubes

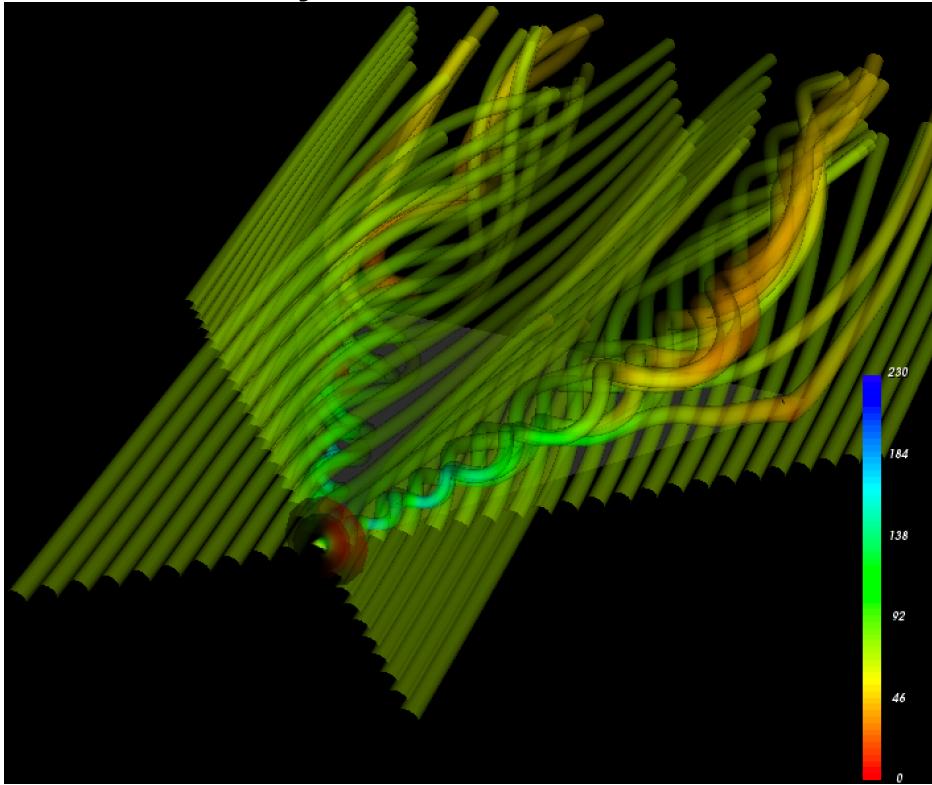


Figure 2.2b stream tubes

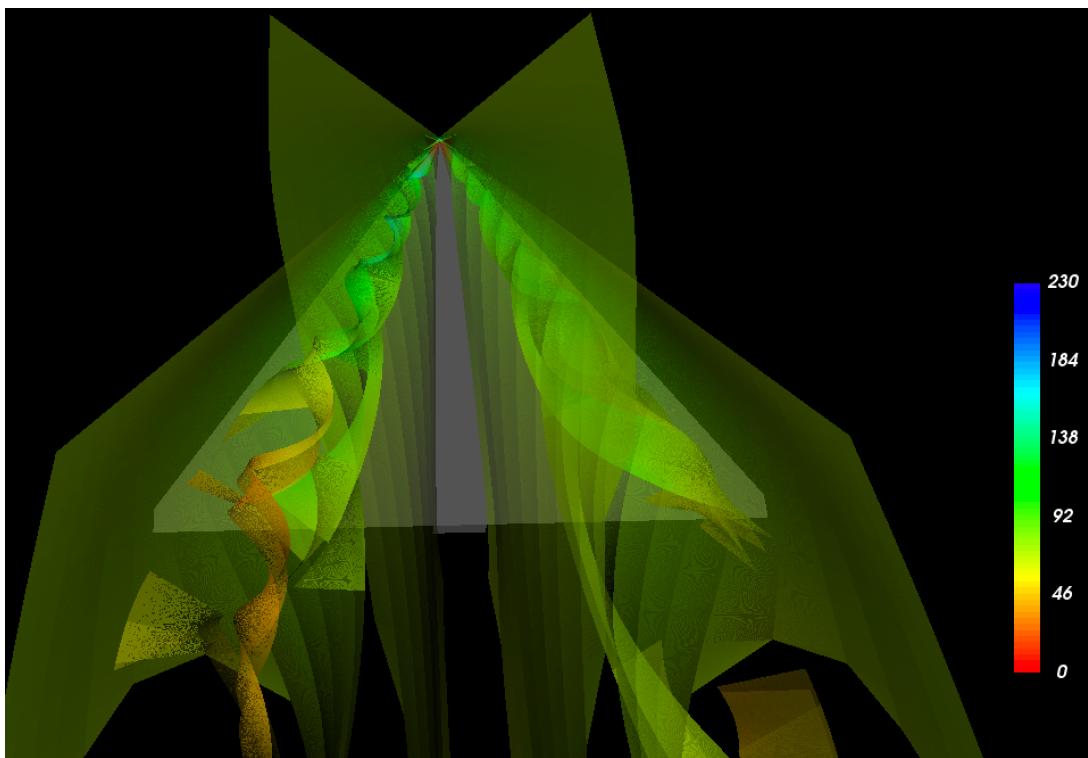


Figure 2.3a stream surfaces

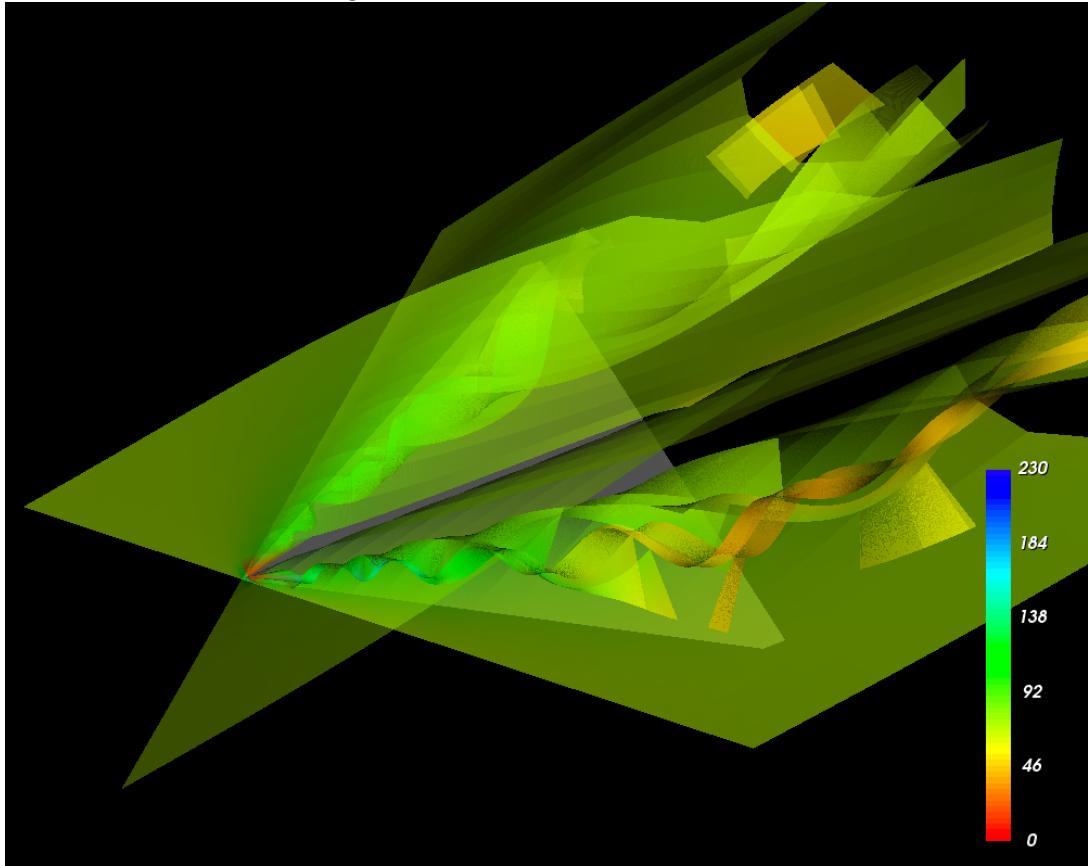


Figure 2.3b stream surfaces

In this task, by the observation from task 1, it would be better to select 2 seeds from the head and the tail of the wing. I selected a vtkLineSource with point $(-230, -230, 0)$, $(230, 230, 0)$ and another vtkLineSource with point $(230, -230, 0)$, $(-230, 230, 0)$ as the seeds. The 2 seeds can explicitly show the 2 swirls of the flow. For the stream lines and tubes, they both help to visualize the flow. However, the stream surface did not perform as well as lines and tubes on my laptop. It might be because the transparency effect is not good enough due to my graphic card limitation.

Task 3

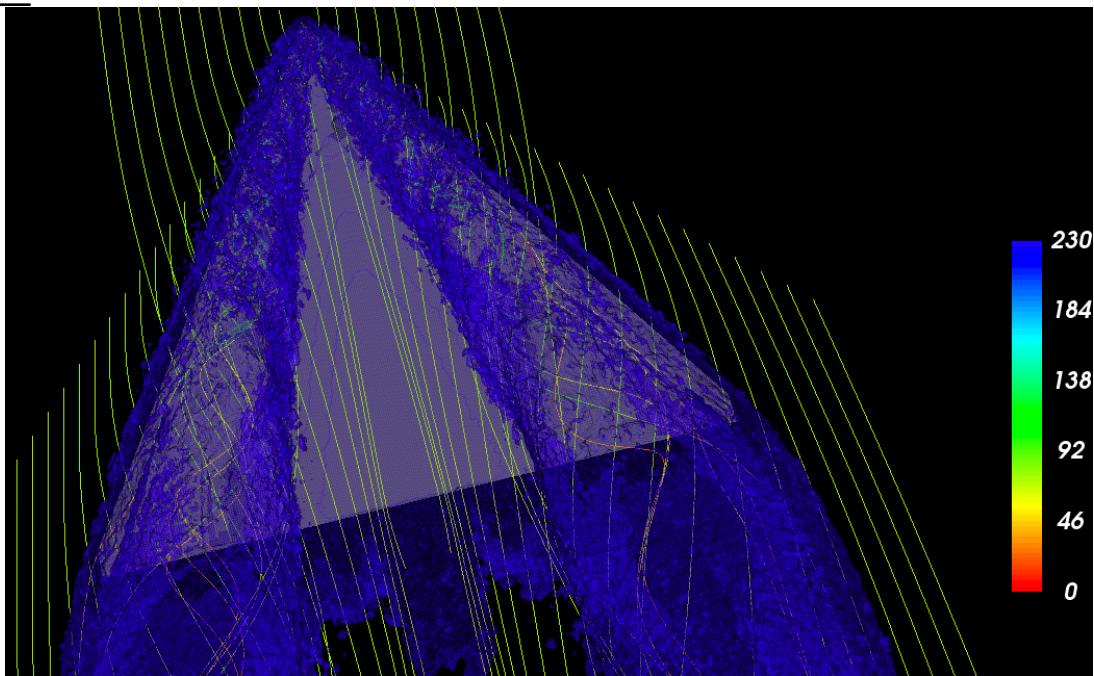


Figure 3.1 Combining Scalar and Vector Visualization

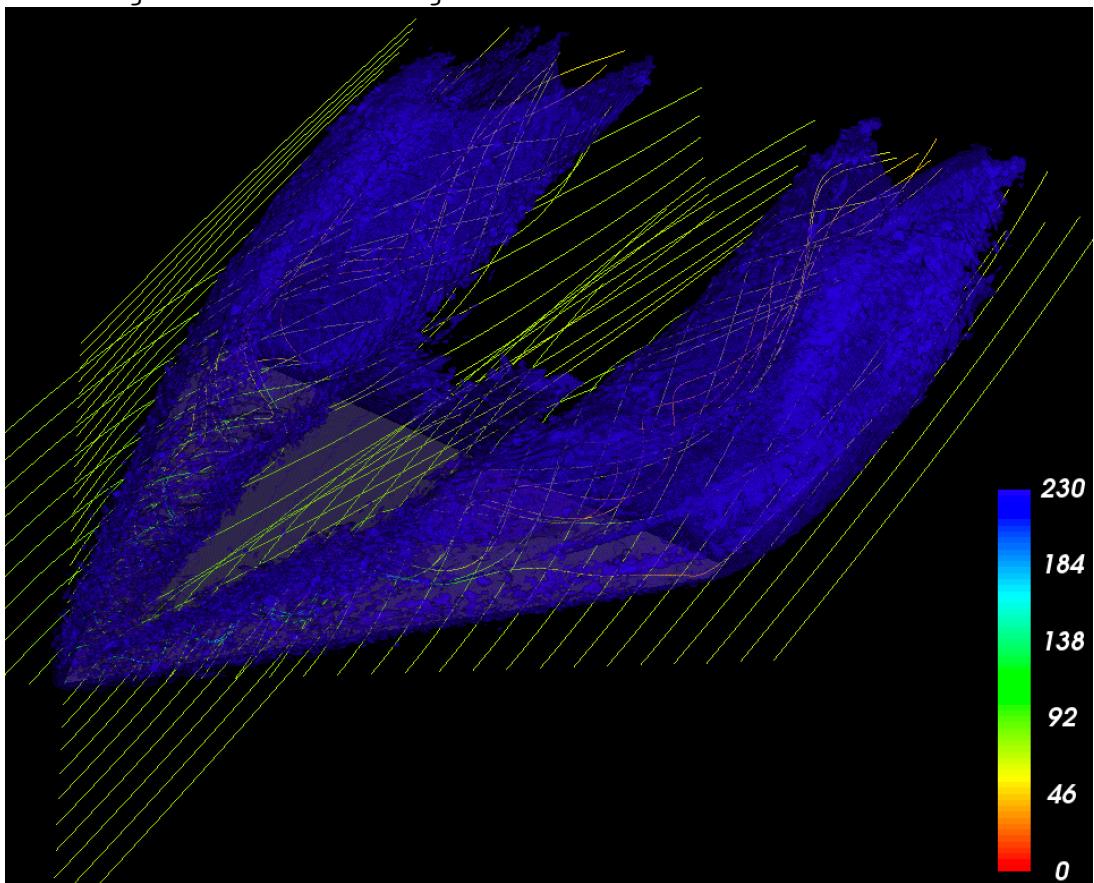


Figure 3.2 Combining Scalar and Vector Visualization

The performance is not very good due to the limitation of my graphic card. The problem is the same as when displaying the stream surfaces in task 2. The transparency effect is not good so the images are not very impressive. However, we can still observe the 2 streamline tunnels of the flow are aligned with the 2 isosurface tunnels. Moreover, by observing the isosurfaces, it is easier to see the boundary. By observing the streamlines, we can clearly see the direction and intensity of the flow.

Task 4

For task 1, the combination of glyph planes can help to observe the flow, say, the direction and intensity of the 2 tunnels. Another benefit is the planes can isolate important areas in the data. Moreover, selecting meaningful planes is relatively easier than selecting seeds for stream lines. Nevertheless, it is somehow hard to observe the images when two planes are close to each other. In the case, we have to move the camera because of the interruption by the overlap of several planes.

For task 2, stream lines, tubes and surfaces can help us to observe the direction and intensity of the flow better than glyph planes by clearly showing the flow of the velocity. Furthermore, there is no interruption issue caused by the overlap of several planes in task 1. However, the selection of seeds becomes very important and is actually difficult. Improper seed selection will lead to unimportant stream lines.

For task 3, by combining the isosurface and streamlines, we can see a better image, which has a clear boundary produced by isosurfaces and the information of direction and intensity of the flow by observing streamlines. This approach takes benefits from both isosurfaces and streamlines. However, due to the limitation that the transparency effect of my graphic card is not good enough, the images are not quite impressive. I believe the performance would be much better on other machines with high-end graphic cards.