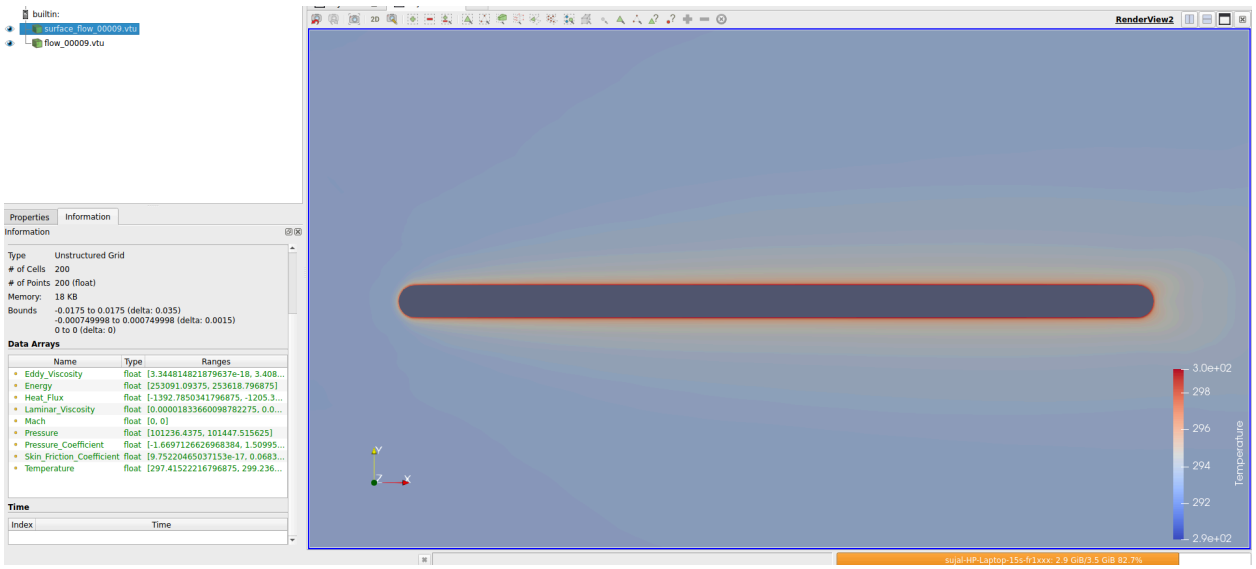
REPORT : ASSIGNMENT 3

In this assignment we are trying to analyze a problem of unsteady heat transfer from a flat plate(2D) with rounded corners using the python wrapper. The ambient is assumed to be air that has a temperature of approx. 293.15K (20℃). The plate is in unsteady state with its surface temperature varying with time as 293 + 57 sin(2*pi*t).



This is a picture obtained from Paraview. It shows the surface of the plate.The plate is the dark grey region. The light grey region is the ambient surroundings. Here we see an orange region close to the plate surface. This orange region shows that the surface of the plate is hotter than the surrounding air hence heat transfer occurs from the plate to the surroundings. This happens because it is in unsteady state. Had it been a steady state there would have been just two regions in the picture: a light grey region (air) and a dark grey region (plate). There would have been no orange and yellow region in the picture because then temperatures would have been the same everywhere.

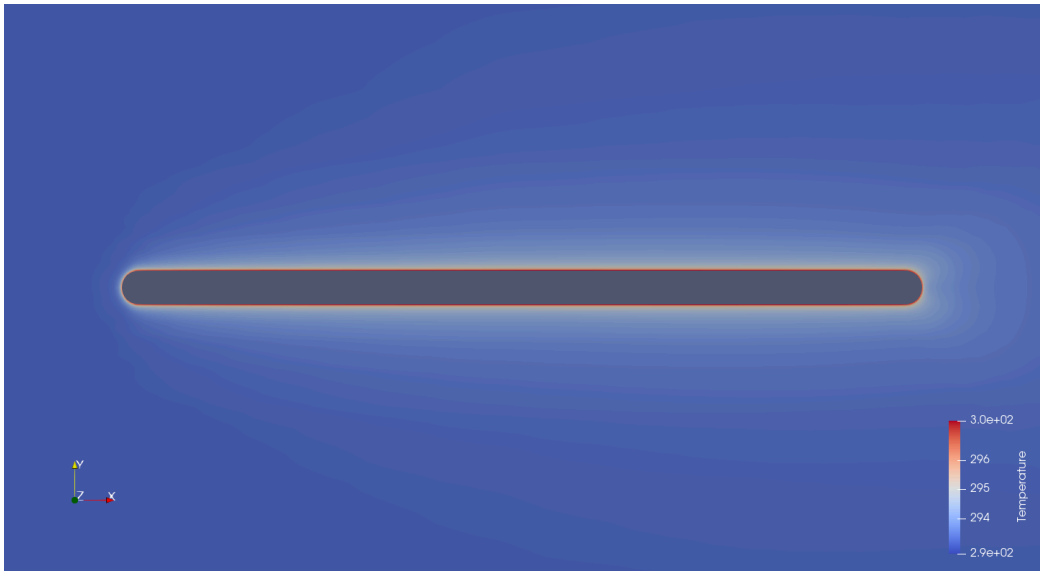
In the information box on the left bottom side of the image above, we see the ranges of values of some thermo-physical properties. There we see a slight decrease in the air pressure near the surface of the plate (101236.4 Pa). This is because near the surface we have hot air and hot air being lighter than cold air (or normal air) rises up.

The plate is unsteady with the temperature varying with time as 293 + 57 sin(2*pi*t). Because of which initially we do not see much temperature difference between the plate surface and the ambient. But as time increases the temperature difference increases.

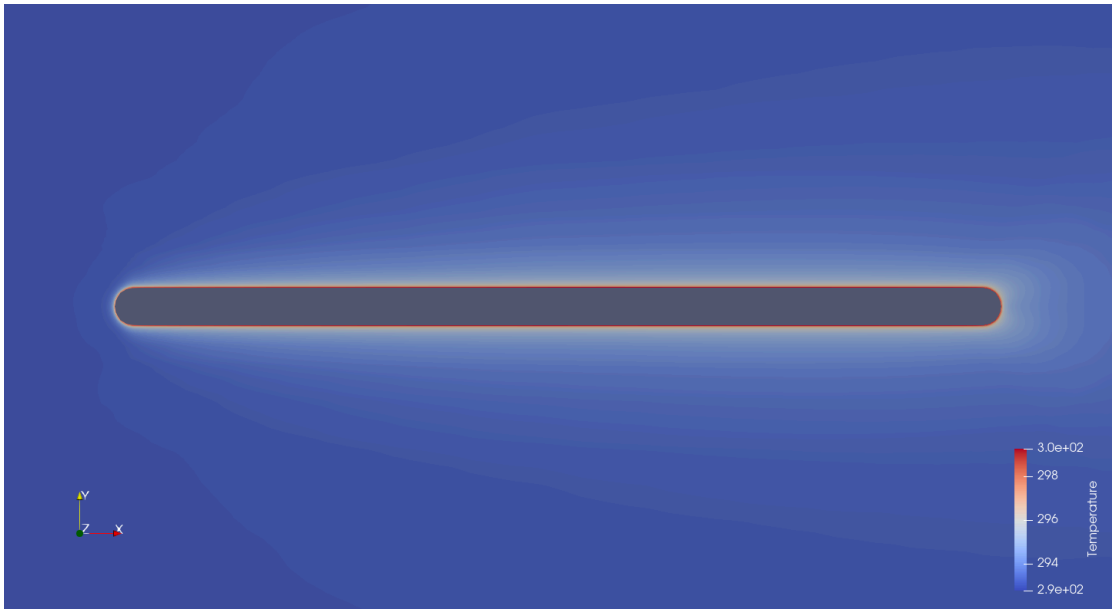
Here's a representation of the plate at t = 0

Representation of the plate at 4th iteration of time

Representation of the plate surface at 7th iteration of time



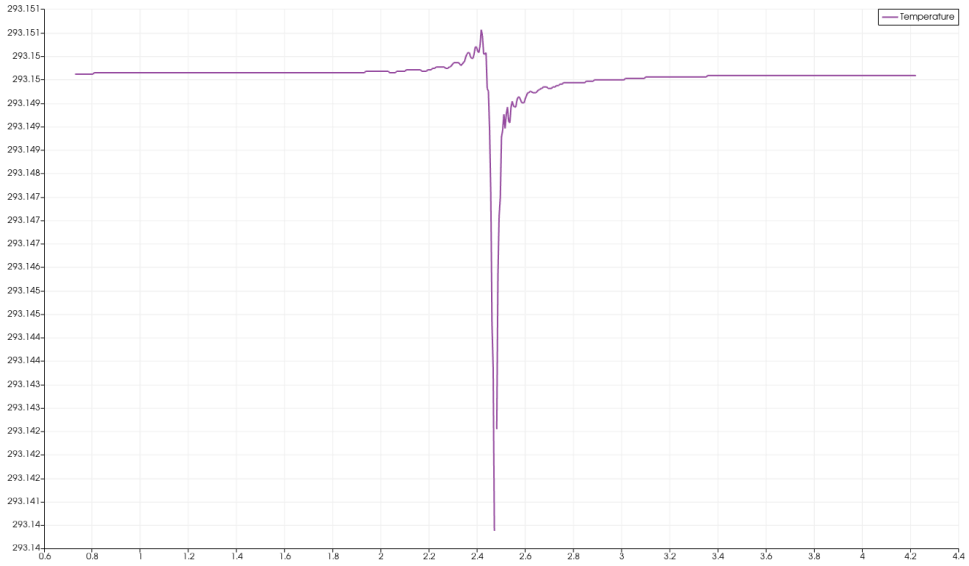
Representation of the plate surface at 9th iteration of time



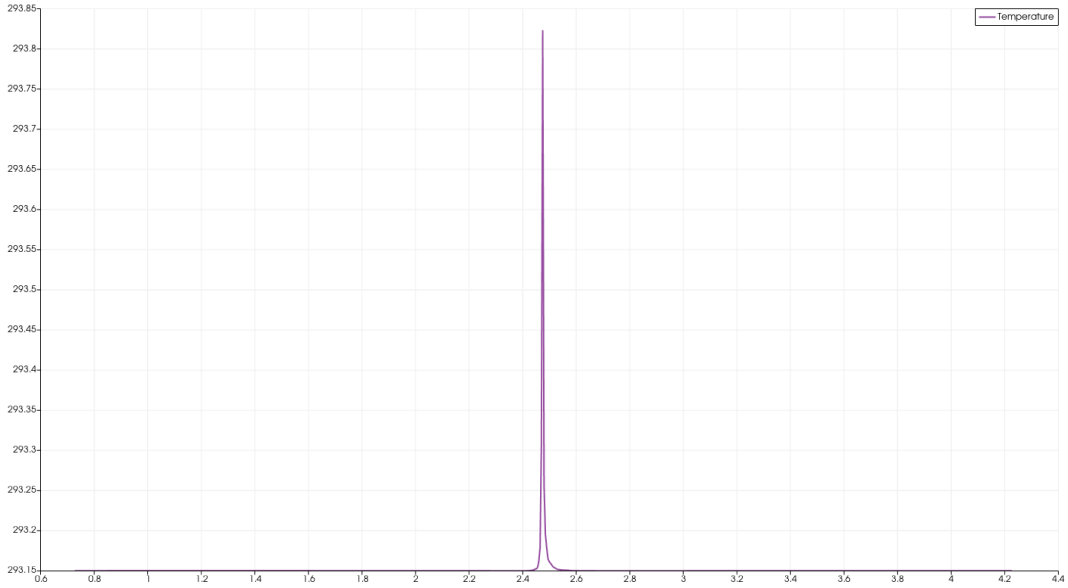
A look at the plots over line for different time stamps

The sharp peak/decline depicts the plate surface and the flat part of the curve shows the air.

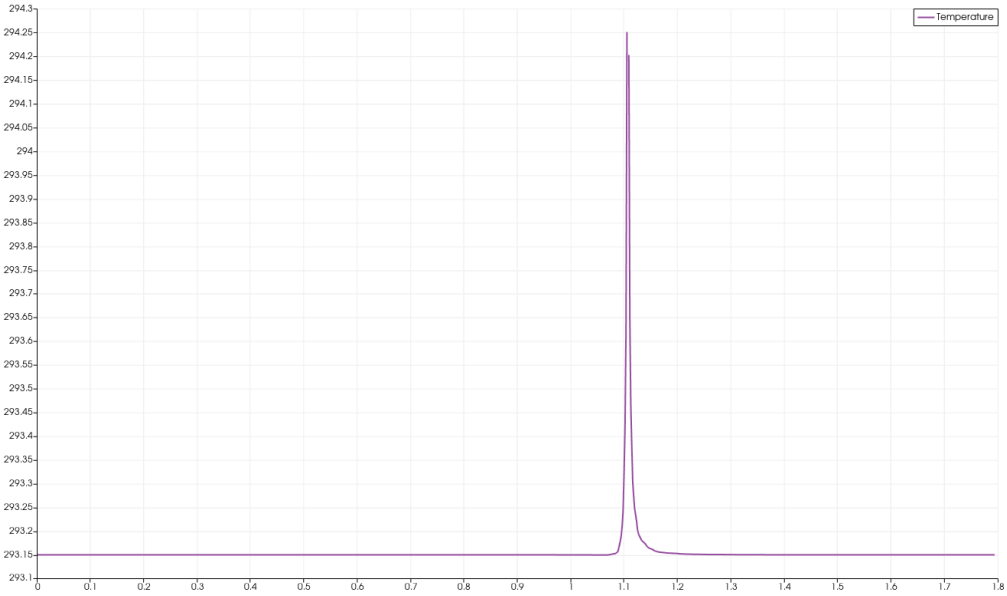
1) At t=0 the temperature is almost 293.15 everywhere over the line.



2) At 4th timestamp the temperature of air = 293.15K and temperature of plate = 293.83K.



3) At 7th timestamp the temperature of air = 293.15K and temperature of plate = 294.25K.



4) At 9th timestamp the temperature of air = 293.15K and temperature of plate = 294.75K