Tuesday, 8 April 2025

ASSIGNMENT-3 : PYTHON WRAPPER TEST CASE

This assignment focuses on the unsteady Conjugate Heat Transfer (CHT) analysis of a flat plate using SU2's Python wrapper interface. The wrapper dynamically modifies the wall temperature of the flat plate over time based on the following temporal relation:

WallTemp = 293.0 + 257.0 * sin(π * 0.5 * time)
(Oscillates between 36°C (309K) and 550°C (823K) with 0.5Hz frequency)

The simulation is governed by the Reynolds-Averaged Navier-Stokes (RANS) equations and employs the Shear Stress Transport (SST) turbulence model. The setup corresponds to a direct, steady-state CFD problem without axisymmetric assumptions. Additionally, restart functionality is disabled, and input files are preserved to ensure reproducibility and transparency of the simulation setup.

CONFIGURATION DETAILS:

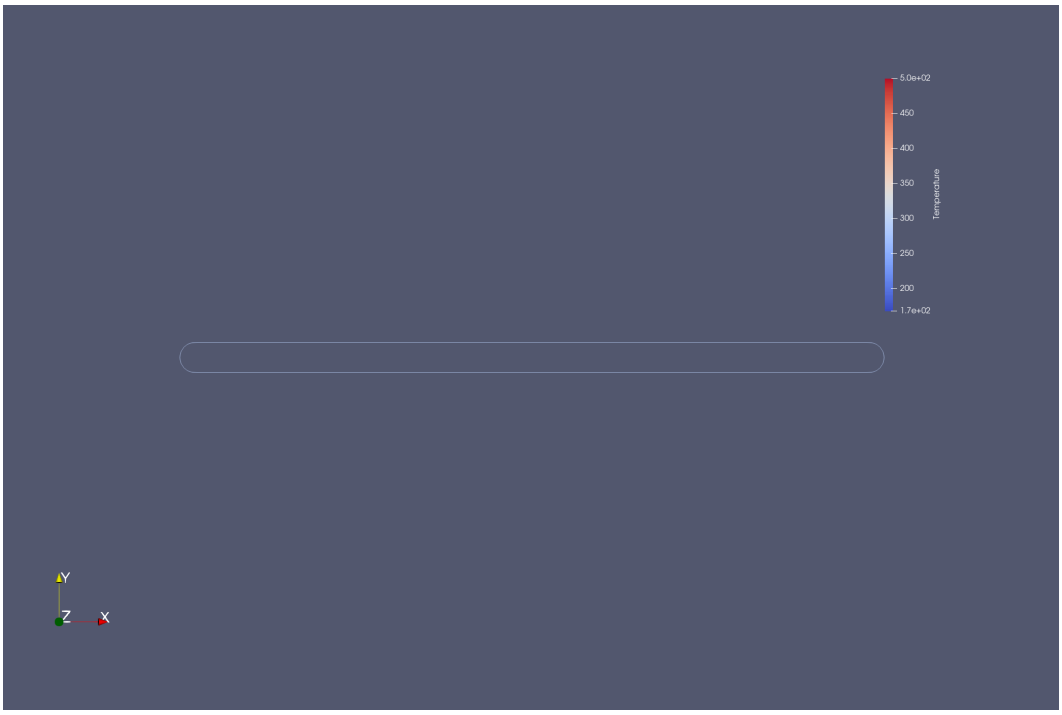
1. Solver Configuration:

   Unsteady RANS formulation with dual-time stepping
   SST turbulence model (Menter's k-ω SST)
   Coupled heat transfer between fluid and solid domains
   Second-order spatial discretization
   Implicit time integration

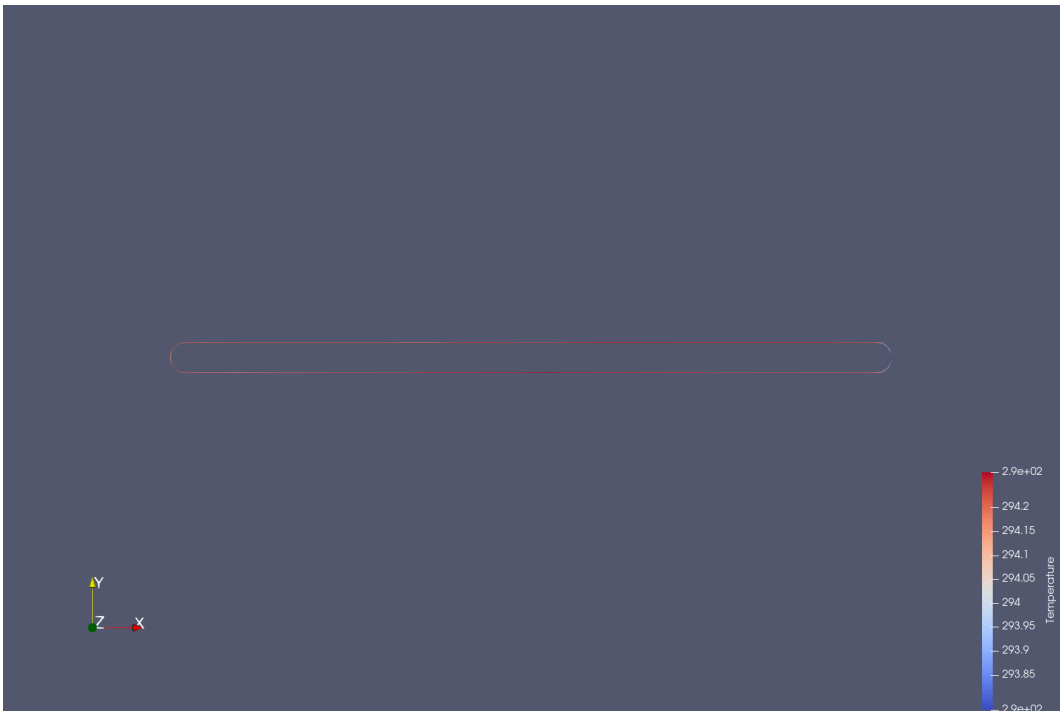
2. Computational Setup:

   Fluid domain: Compressible air (ideal gas)
   Solid domain: Aluminum plate (k=237 W/m-K)
   Mesh: Structured grid with y+<1 for wall resolution
   Time step: 0.01s (CFL=5)
   Total duration: 10s (1000 iterations)

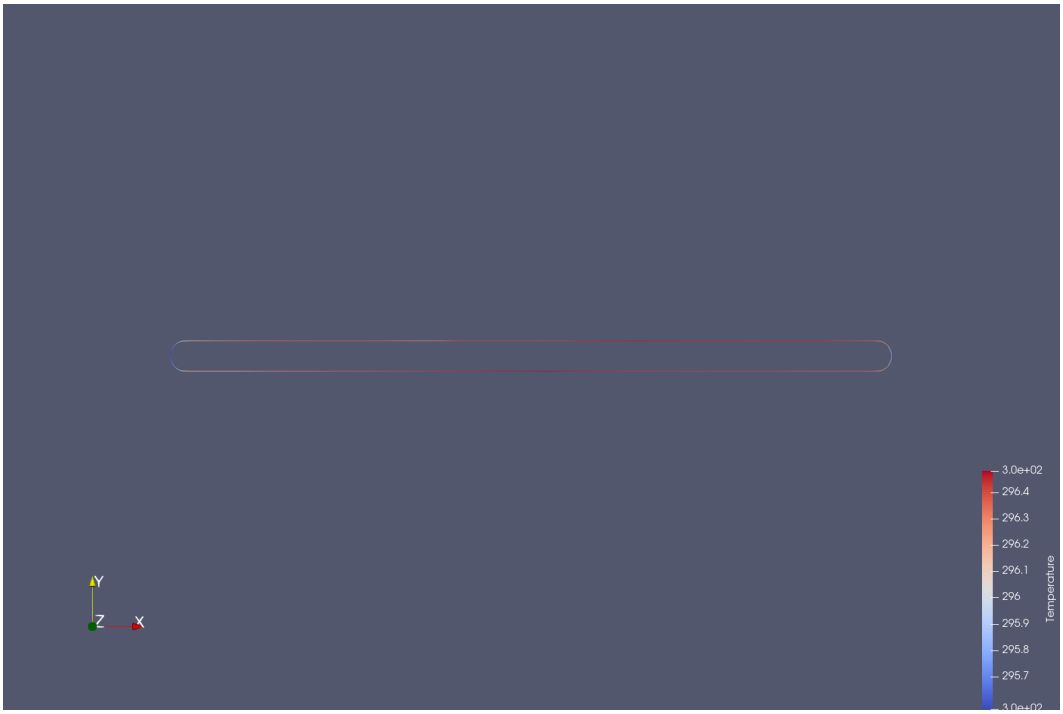
OUTPUTS:



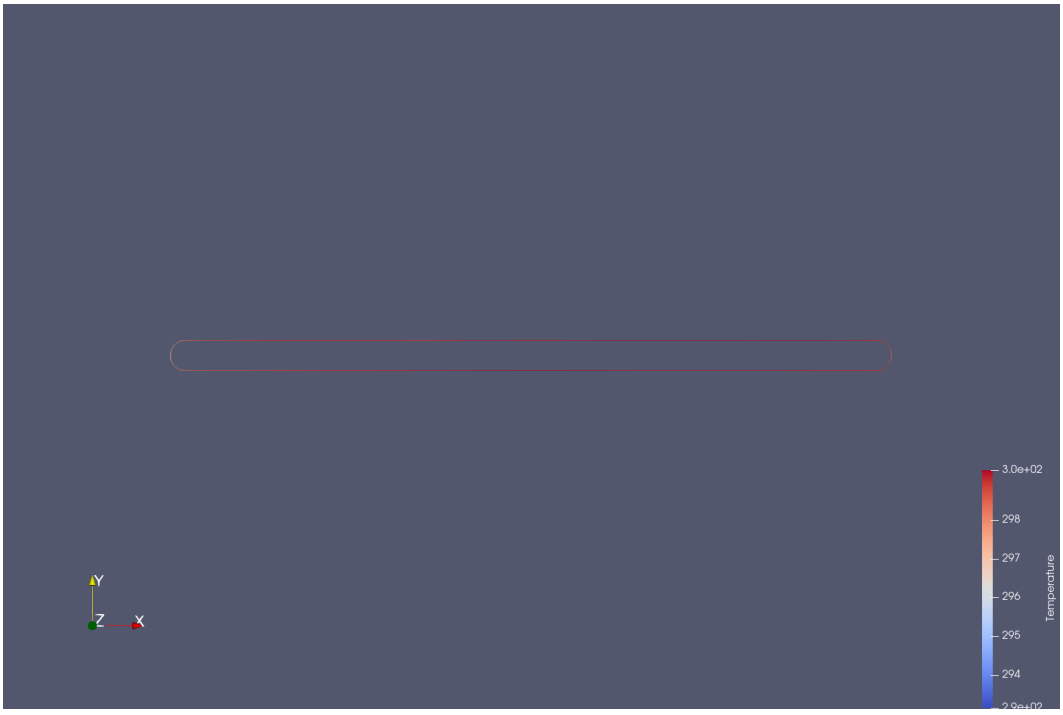
The Temperature Value At Time = 0.11111



The Temperature Value At Time = 0.33333



The Temperature Value At Time = 0.66666



The Temperature Value At Time = 0.99999