

Computational Aerodynamics

Assignment 3 — Grid Generation

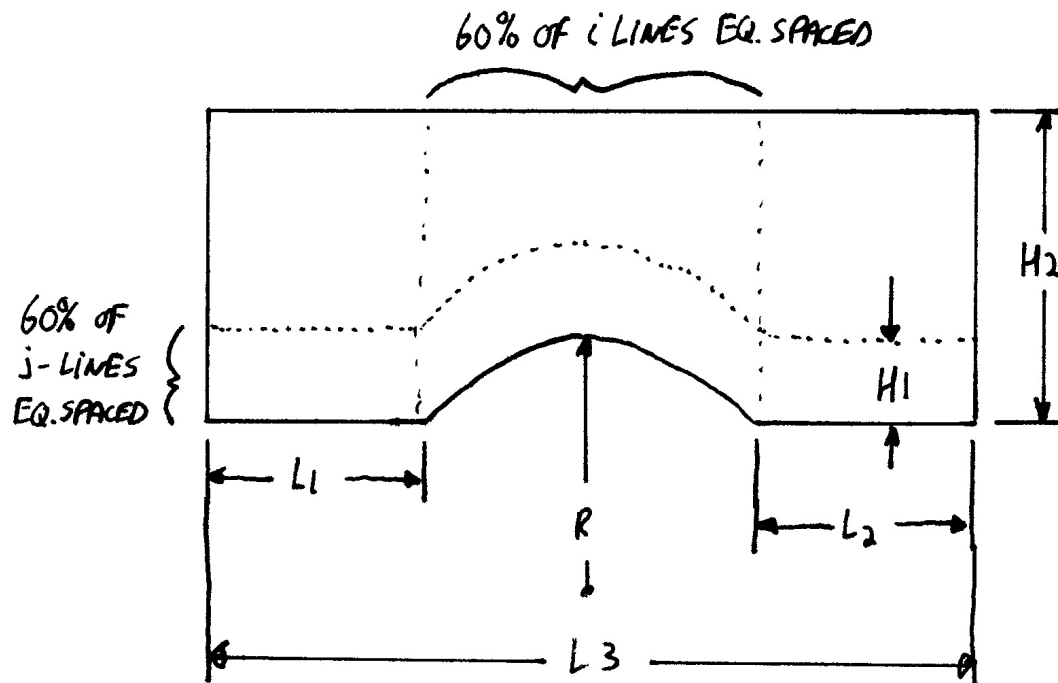
Instructions

When answering questions in this assignment, please generate the mesh using the warp code on the AERO server to make sure that your grid is generated correctly. For each problem proceed as follows:

1. Outline clearly the strategy used.
2. When building the mesh, make sure that the grid spacing does not vary abruptly at any location.
3. Once the grid looks fine when viewed in GNUPLOT, then print out the part of the control.wrp that is related to grid generation.
4. Print out the grid as seen in the gnuplot window.

Question #1

Create a mesh for a bump in a channel as follows:

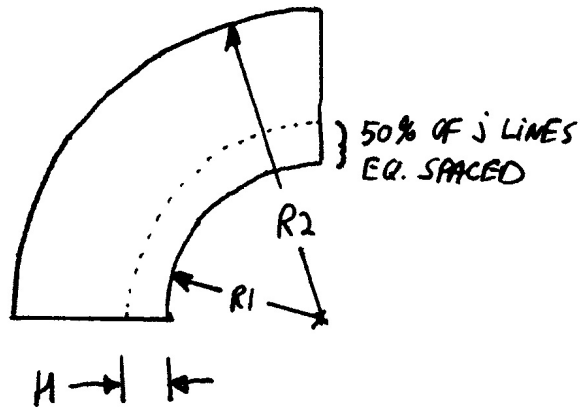


The mesh should have 70 grid lines along i and 70 grid lines along j with $L_1 = 0.3$ m, $L_2 = 0.3$ m, $L_3 = 1.0$ m, $R = 0.7$ m, $H_1 = 0.1$ m, and $H_2 = 0.5$ m.

Question #2

Grid the following quarter circle with 70 grid lines along i and 90 grid lines along

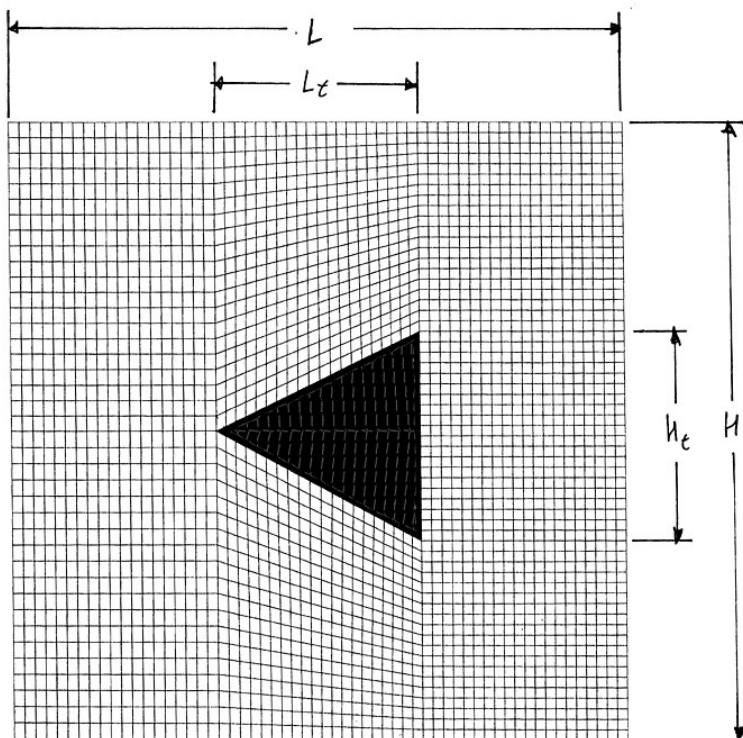
j :



with $R_1 = 1$ m, $R_2 = 2$ m and $H = 0.1$ m. Make sure that the grid is uniformly-spaced along i .

Question #3

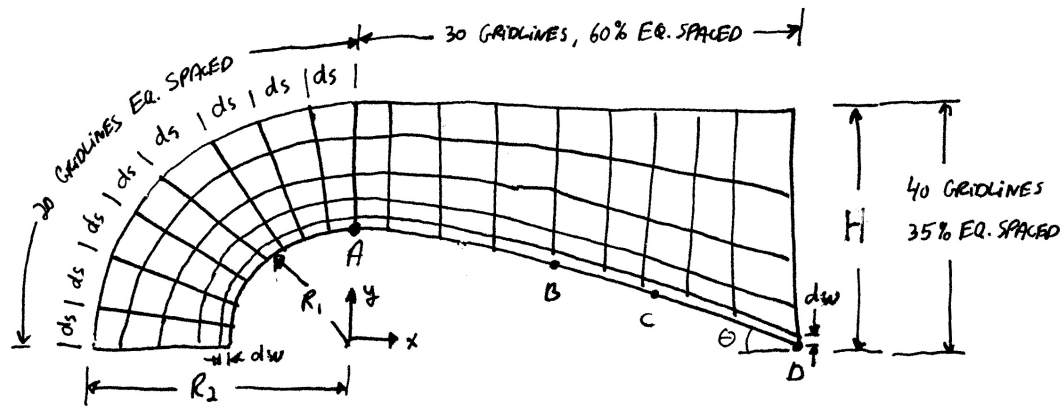
You wish to simulate an external flow interacting with a triangle as follows:



The flow infinitely far from the triangle has a temperature of 300 K, a pressure of 20 kPa, and a velocity (in the right direction) of 600 m/s. Knowing that the grid is made of 60 gridlines in each dimension, and that $L = 2.1$ m, $H = 2.1$ m, $L_t = 0.7$ m, $H_t = 0.7$ m, that the grid on each side of the domain is uniformly spaced, and that the triangle is centered within the domain, write the code needed within the `Grid()` module to simulate this problem.

Question #4

Create a grid for the following problem



given the dimensions $dw = 10^{-4}$ m, $R_1 = 0.5$ m, $R_2 = 1$ m, $x_A = 0$, $y_A = R_1$, $x_B = 0.5$ m, $y_B = 0.9R_1$, $x_C = 1$ m, $y_C = 0.7R_1$, $x_D = 2$ m, $y_D = 0$, $H = R_2$, and $\theta = 20^\circ$. Notes:

- Outline clearly the strategy used.
- Make sure that the grid spacing does not vary abruptly at any location.
- Points A, B, C, D are not in a straight line and should be joined using a smooth curve.

Due on Thursday April 4th at 16:30. Do Questions #3 and #4 only.