Daily Research Report

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1 Current Research Direction

2 Research Performed

2.1 Results

Hypothesis 1:

By using a composite trapezoidal rule numerical integration technique, the speed of sound is approximated using the tangential mach number. A second order convergence for the approximated speed of sound is expected (Refer to analysis). To obtain the radial derivatives, second and fourth order central differencing schemes were used and the order of accuracy will also be computed using the four system of equations for the LEE.

Why is this my hypothesis?: As the grid spacing gets smaller from one iteration to the next, the computed order of accuracy is expected to approach a known value, which is the leading error term of the truncated term in the Taylor series used to derive the scheme , which in this case is the composite trapezoidal rule. By using the MMS, a computed order of accuracy was found.

$$\bar{A} = \frac{\tanh\left(\frac{r}{30} - \frac{1}{30}\right)}{16} + \frac{\tanh\left(\frac{r}{30} - \frac{11}{600}\right)}{16} + \frac{\tanh\left(\frac{r}{30} - \frac{1}{300}\right)}{16} + \frac{709}{711} \tag{1}$$

$$M_x = 0.5 \tag{2}$$

$$0.177025756979167 \left(- \frac{0.333333}{(0.062676237268094 \tanh\left(0.0333333333333333r - 0.0333333333333333\right) + 0.0626762} \right. \tag{3}$$

The $L2_{norm}$ error of the two grids ϵ_{grid_i} and ϵ_{grid_i+1}

3 Issues and Concerns

I attempted at varying the grid aspect ratio but did not get better results. I want to report the source term expressions.

4 Planned Research

Write results and discussion for these graphs.

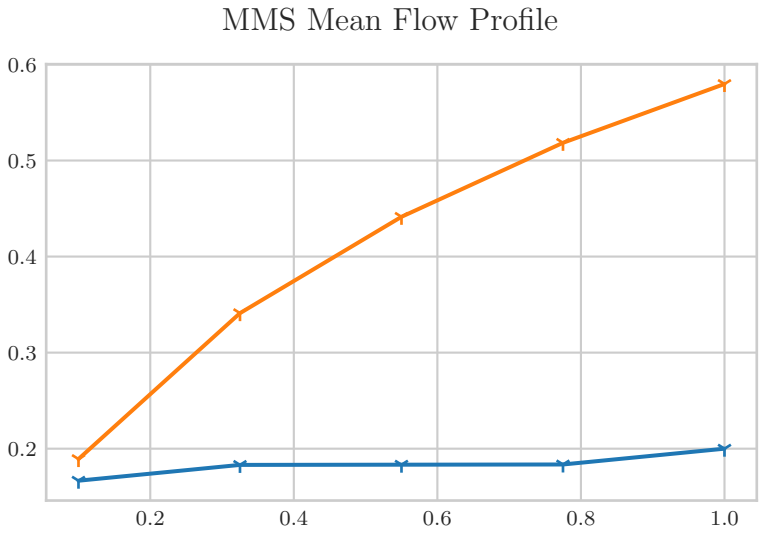

Figure 1: The manufactured mean flow test case using a summation of Tangents for A and M_x

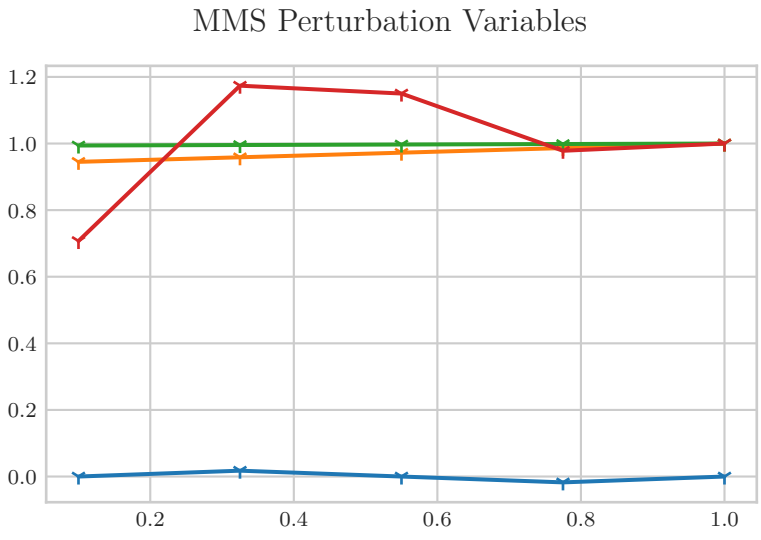

Figure 2: The manufactured perturbation functions ,v_r, v_x, v_θ, p

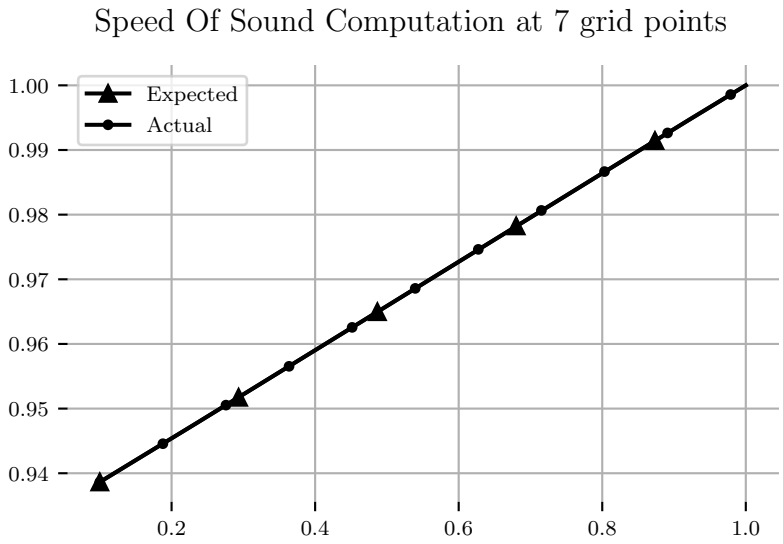

Figure 3:

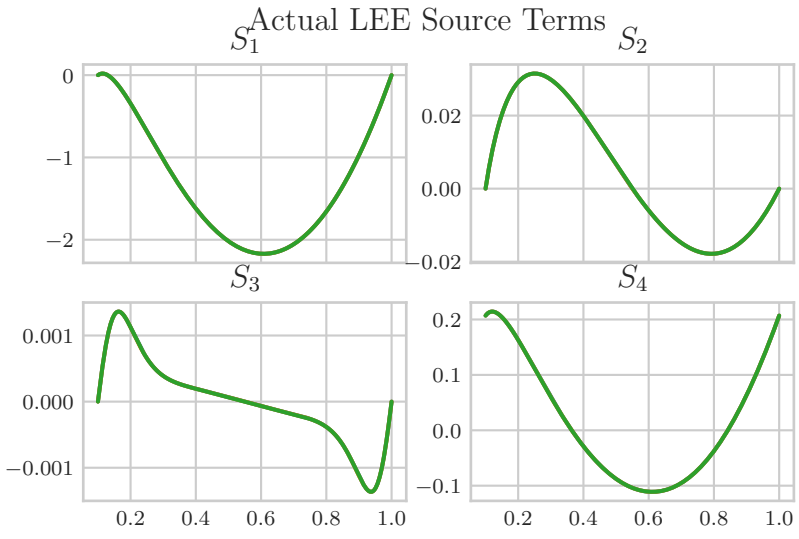

Figure 4:

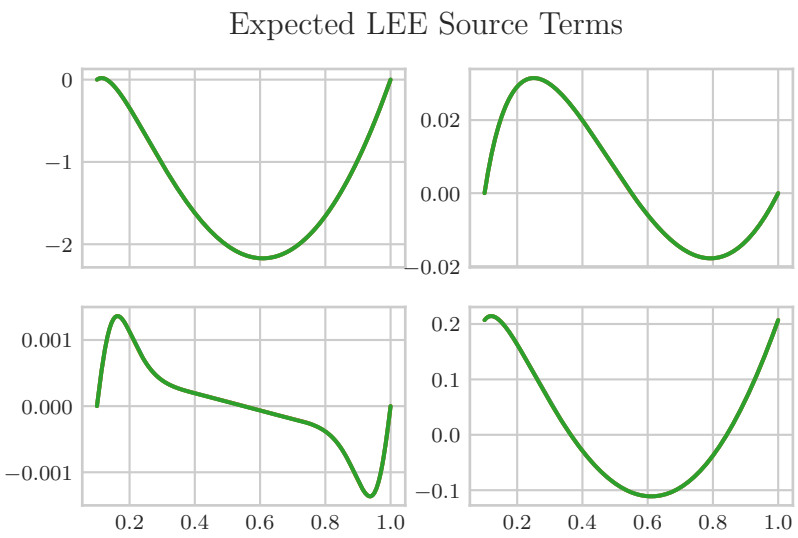

Figure 5:

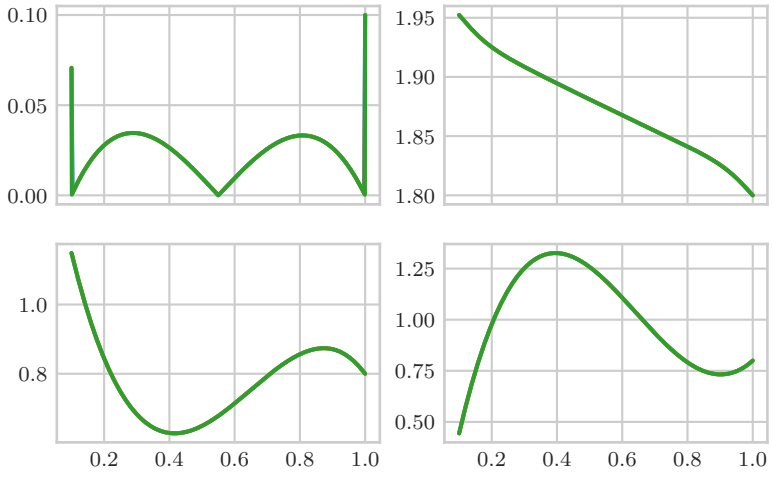

Figure 6:

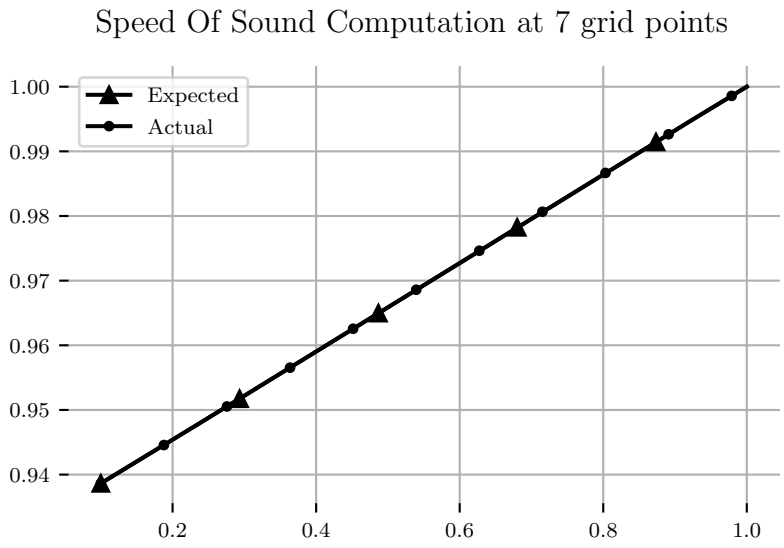

Figure 7:

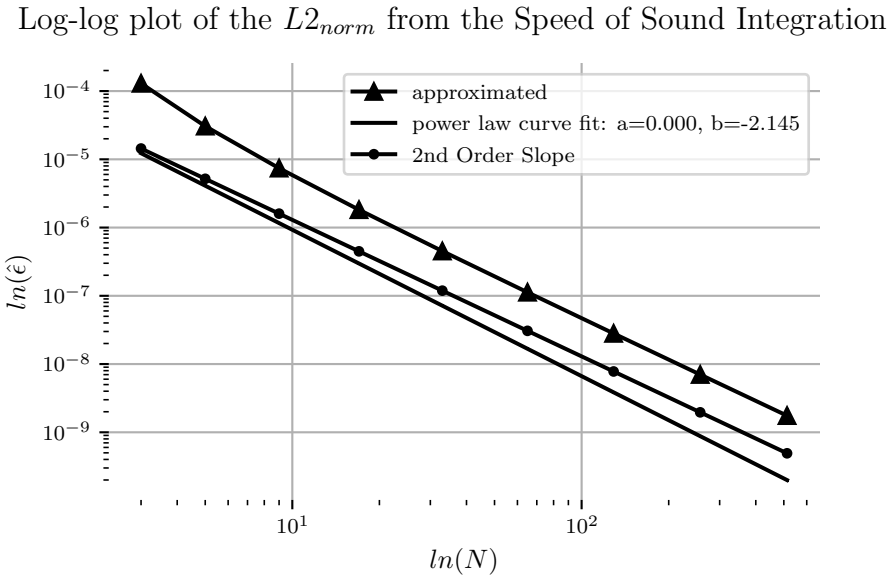

Figure 8:

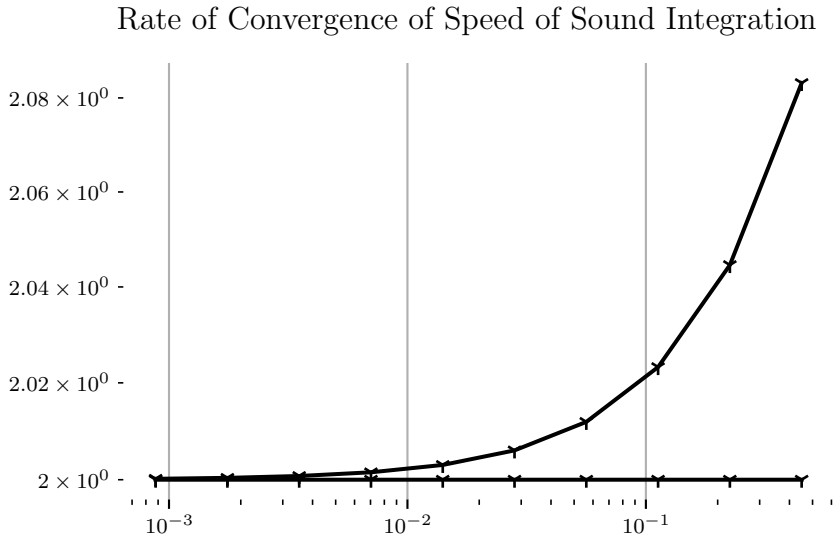

Figure 9:

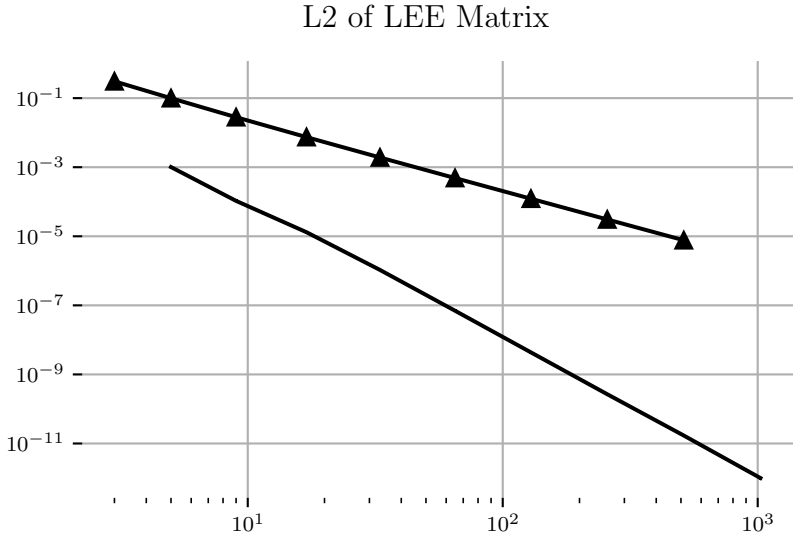

Figure 10:

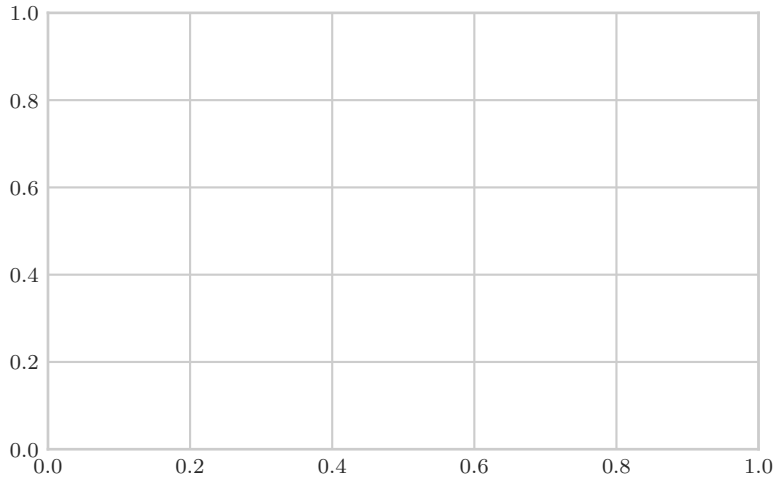

Figure 11: