Daily Research Report

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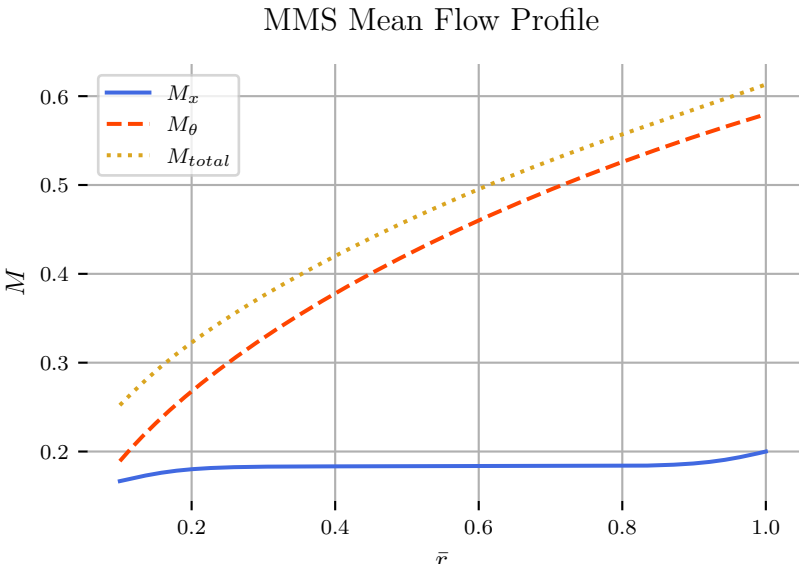

Figure 1: The manufactured mean flow test case using a summation of Tangents for A and M_x

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.

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

3 Issues and Concerns

There is an issue with the data I am data I am looking for the Source Terms. The figure that I have for the source term error should have a magnitude of near zero . I will also double check the python output and the fortran output to make sure that the perturbation variables without fairing functions $v_x v_t heta$

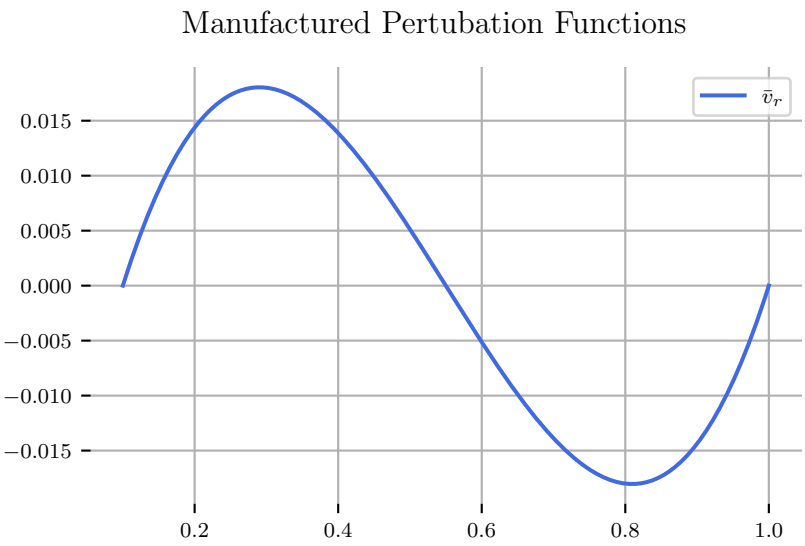

Figure 2: The manufactured perturbation functions ,v_r

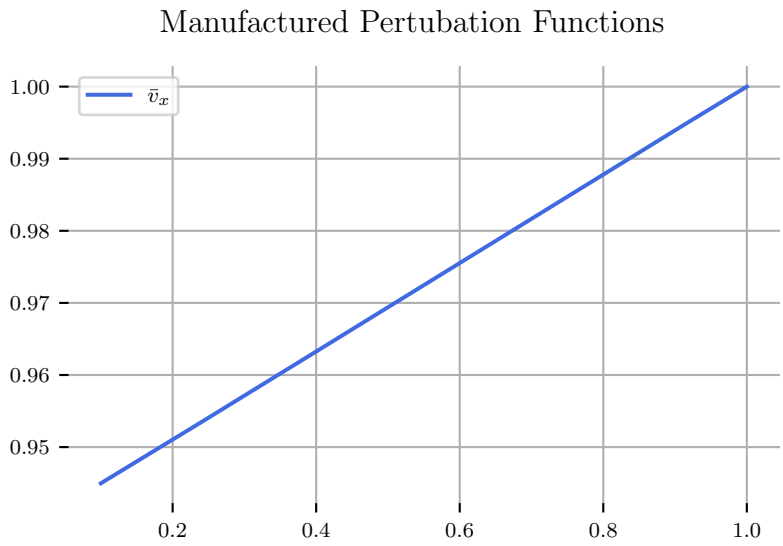

Figure 3: The manufactured perturbation functions ,v_x

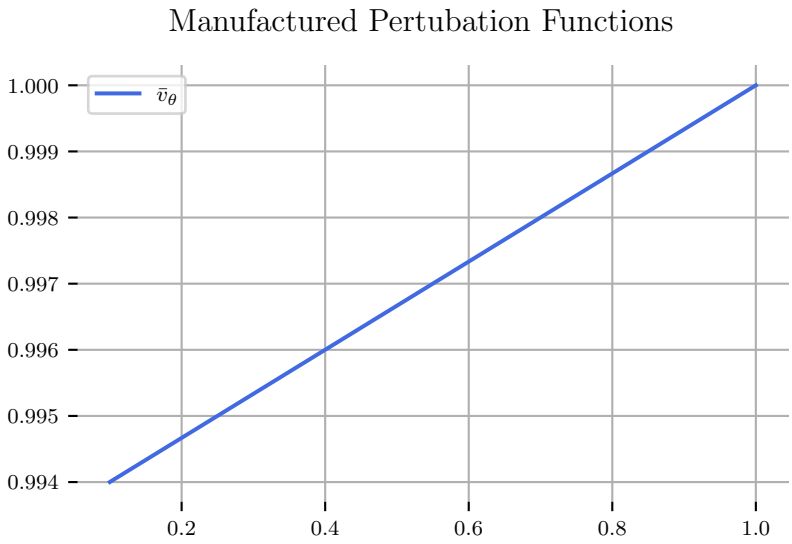

Figure 4: The manufactured perturbation functions ,v_θ

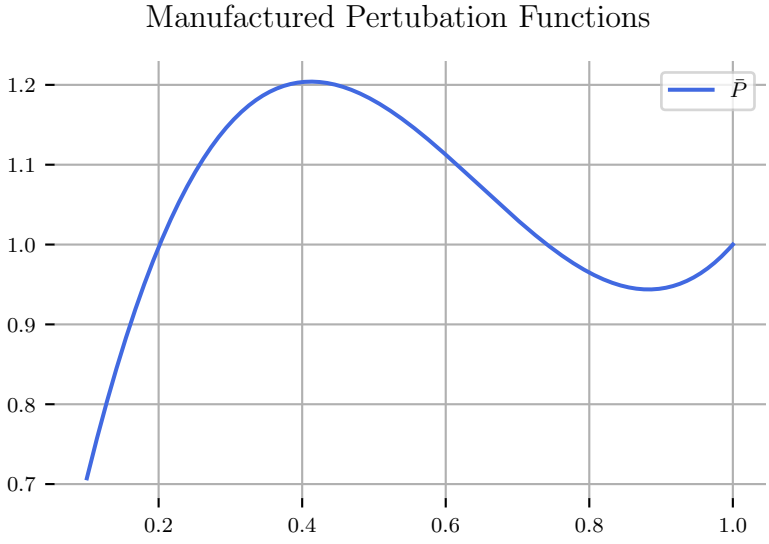

Figure 5: The manufactured perturbation functions ,P

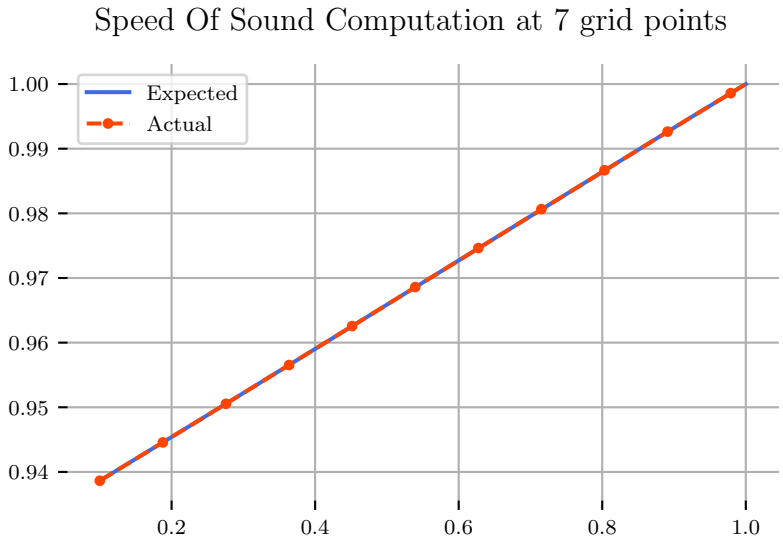

Figure 6: A comparison of the speed of sound, expected vs actual at the lowest grid to show similarities in solution

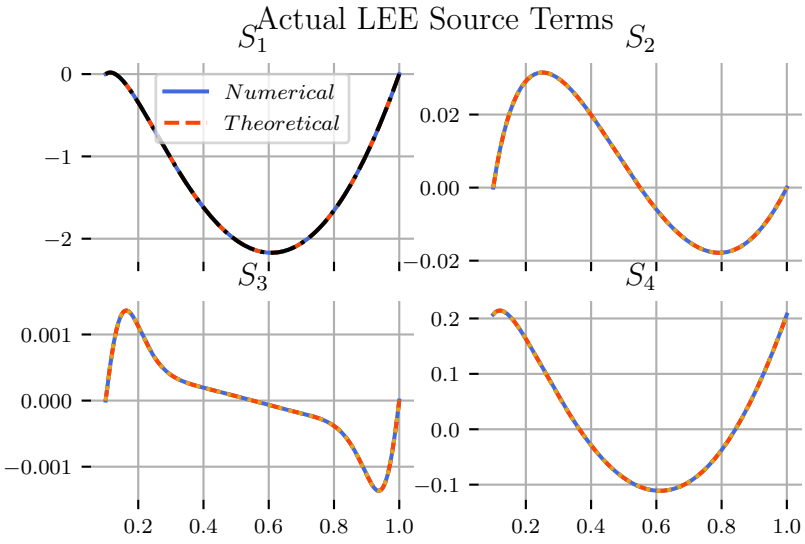

Figure 7: LEE Source Terms

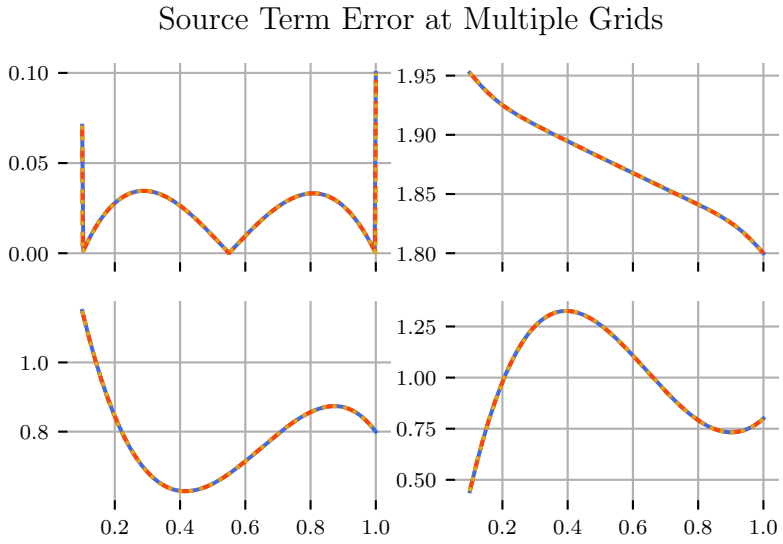

Figure 8: LEE Source Term Error

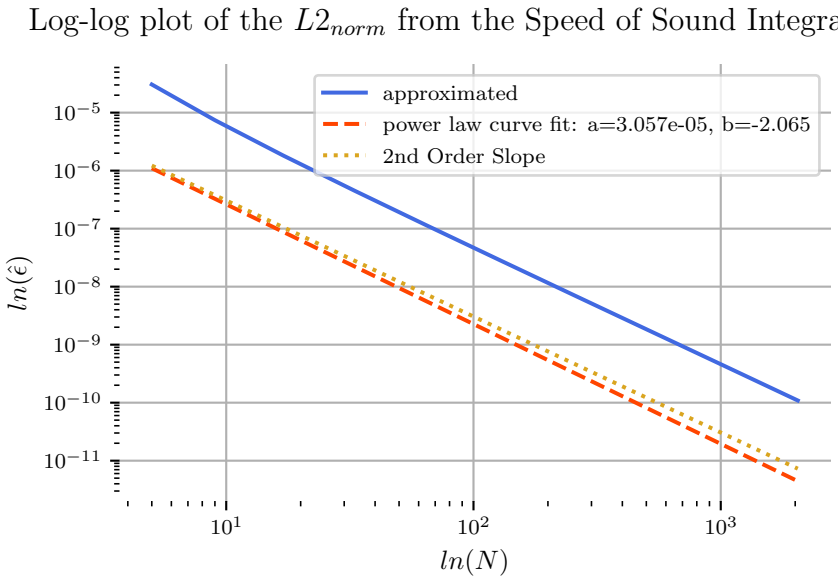

Figure 9: L2 Norm comparison for the speed of sound integration for the compound trapezoidal rule

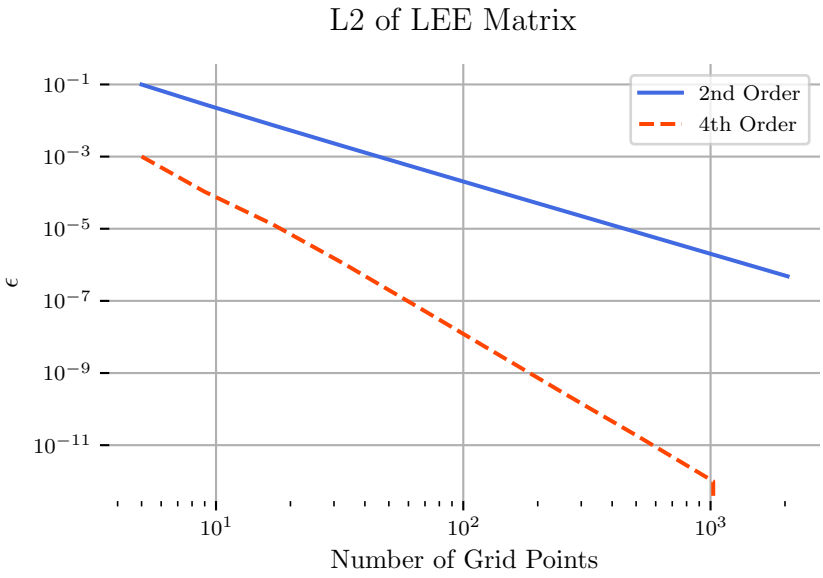

Figure 10: ROC for the speed of sound integration for the compound trapezoidal rule

Figure 11:

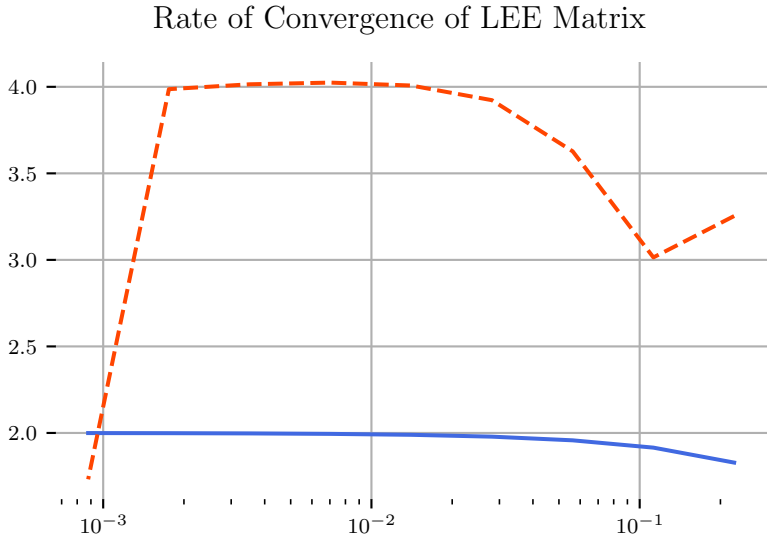

Figure 12:

Figure 13: ROC for the speed of sound integration for the compound trapezoidal rule

4 Planned Research

Update Captions and labels Discuss the ROC and the choice of scheme and number of grid points for the MMS. Discuss the L2 procedure in detail and make sure this data is what I think it is.