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1 from UpwindSolver import upwind_solver
2 from AnalyticSolution import analytic_solver
3 from EOC import cv_and_conquer
4 from InputVariables import cvAnalysis, nx, iniCond, var, nu_max
5 from FixedVariables import xmin, xmax
6 from TimeIntegration import make_mesh
7 from timeit import default_timer as timer
8 import matplotlib.pyplot as plt
9
10 start = timer()
11
12 if cvAnalysis == 'false':
13     solution, time = upwind_solver(nx)
14     plot = 'solution'
15 elif cvAnalysis == 'true':
16     convergence = cv_and_conquer(nu_max)
17     plot = 'convergence'
18 elif cvAnalysis == 'dissipation':
19     num_sol = upwind_solver(nx)[-2][-1]
20     a_sol = analytic_solver(nx, 0.2)
21     plot = 'dissipation'
22
23 end = timer()
24
25 # defines the elapsed time between the start of the computation and
    the end of the computation (the computational
26 # effort to plot the results is not counted
27 def chrono(start, end):
28     elapsed = end-start
29     return elapsed
30
31 print("time elapsed = ", chrono(start, end))
32
33 # plots the solution for every time snap
34 if plot == 'solution':
35     X = make_mesh(xmin, xmax, nx)
36     X.pop(0)
37     X.pop(-1)
38     for i in range(len(solution)):
39         if iniCond == 'acoustic' and var == 'mass density':
40             plt.axis([0, 1, 0.1399, 0.1415])
41         if iniCond == 'acoustic' and var == 'velocity':
42             plt.axis([0, 1, -0.005, 0.005])
43         if iniCond == 'acoustic' and var == 'pressure':
44             plt.axis([0, 1, 0.0999, 0.1011])
45         elif iniCond == 'fixed':
46             plt.axis([-0.5, 0.5, 0, 9])

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47         plt.xlabel('x')
48         plt.ylabel(var)
49         plt.title(" t = %1.3f" %time[i])
50         plt.plot(X, solution[i], marker='.')
51         plt.show()
52
53 if plot == 'convergence':
54     NU = [i for i in range(3,nu_max+1)]
55     plt.axis([3,nu_max, -0.3, 0.7])
56     plt.title("Empirical Order of Convergence")
57     plt.xlabel("nu")
58     plt.ylabel("EOC_nu")
59     plt.plot(NU, convergence)
60     plt.show()
61
62 if plot == 'dissipation':
63     X = make_mesh(xmin, xmax, nx)
64     X.pop(0)
65     X.pop(-1)
66     plt.plot(X, num_sol, marker='.')
67     plt.plot(X, a_sol, marker='.')
68     plt.axis([-0.5, 0.5, 0, 9])
69     plt.title('t = 0.2')
70     plt.xlabel('x')
71     plt.ylabel(var)
72     plt.legend(['numerical solution', 'analytical solution'])
73     plt.show()
74
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