

LAB Session

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1D Euler Equations

Exact Riemann Solver

Test 1. Modified Sod.

Test 2. 123 Problem.

Test 3. Left Woodward & Colella.

Test 4. Collision of 2 shocks.

Test 5. Stationary Contact.

Test 6. Stationary Contact 2

1D Euler Equations

Exact Riemann Solver

Input File

```
1.0 ! DOMLEN : Domain length,          TEST 1 (Modified Sod)
0.3 ! DIAPH1 : Position of diaphragm
1000 ! CELLS : Number of cells in evaluating exact solution
1.4 ! GAMMA : Ratio of specific heats
0.20 ! TIMEOU : Output time
1.0 ! DL   : Initial density on left section of tube
0.75 ! UL   : Initial velocity on left section of tube
1.0 ! PL   : Initial pressure on left section of tube
0.125 ! DR  : Initial density on right section of tube
0.0 ! UR   : Initial velocity on right section of tube
0.1 ! PR   : Initial pressure on right section of tube
1.0 ! PSCALE : Normalising factor for pressure and energy
```

1D Euler Equations

E1FOCE.F

- 1.- Lax-Friedrichs
- 2.- FORCE
- 3.- Godunov Centred

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1D Euler Equations

E1FOCE.F

Input File

```
1.0      ! DOMLEN   : Domain length  TEST 1 (Modified Sod)
0.3      ! DIAPH1   : Position of diaphragm 1
100      ! CELLS    : Number of computing cells
1.4      ! GAMMA    : Ratio of specific heats
0.2      ! TIMEOU   : Output time
1.0      ! DLINIT   : Initial density on left section of tube
0.75     ! ULINIT   : Initial velocity on left section of tube
1.0      ! PLINIT   : Initial pressure on left section of tube
1.0      ! DMINIT   : Initial density on middle section of tube
0.75     ! UMINIT   : Initial velocity on middle section of tube
1.0      ! PMINIT   : Initial pressure on middle section of tube
0.125    ! DRINIT   : Initial density on right section of tube
0.0      ! URINIT   : Initial velocity on right section of tube
0.1      ! PRINIT   : Initial pressure on right section of tube
0.3      ! DIAPH2   : Position of diaphragm 2
0.9      ! CFLCOE   : Courant number coefficient
0        ! IBCLEF   : Type of left boundary conditions
1        ! IBCRIG   : Type of right boundary conditions
10       ! NFREQU   : Output frequency to screen
10000000 ! NTMAXI   : Maximum number of time steps
1.0E+00  ! PSCALE   : Pressure scaling factor for printing
2        ! FLUX     : Choice of intercell flux
```

1D Euler Equations

E1GODF.F

- 1.- Roe
- 2.- HLLC
- 3.- HLL
- 4.- Rusanov

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1D Euler Equations

E1GODS.F

- 1.- Exact Riemann Solver
- 2.- Two-shock Riemann Solver
- 3.- Adaptive Riemann Solver
- 4.- PVRS (Linearized)

Test 1. Modified Sod.

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1D Linear Advection

ADER Finite Volume

1. Run 1st to 3rd order and compare solutions at $t=16$
2. Introduce in the code the third and fourth time derivative. Ader.f90
3. Compile and run the code for 4th to 5th order.