Instructions

Running the Code

In order to run the code, please extract the zip file, after which you will get a folder which should have a folder named Matlab Code Reimann.

About the Code

1. The folder contains three types of Matlab scripts (.m files), which are Function_set.m, Plotter.m, Test_1.m,Test_2.m,Test_3.m,Test_4.m,Test_5.m.

2. The **Function_set.m file is used to set the function** that we will use based on whether we have right or left rarefaction, contact, shock, etc. Below picture shows the reference.

$$f(p, \mathbf{W}_{\mathrm{L}}, \mathbf{W}_{\mathrm{R}}) \equiv f_{\mathrm{L}}(p, \mathbf{W}_{\mathrm{L}}) + f_{\mathrm{R}}(p, \mathbf{W}_{\mathrm{R}}) + \Delta u = 0 \ , \ \Delta u \equiv u_{\mathrm{R}} - u_{\mathrm{L}} \ , \quad (4.5)$$

where the function f_{L} *is given by*

$$f_{\mathrm{L}}(p, \mathbf{W}_{\mathrm{L}}) = \begin{cases} (p - p_{\mathrm{L}}) \left[\frac{A_{\mathrm{L}}}{p + B_{\mathrm{L}}} \right]^{\frac{1}{2}} & \text{if } p > p_{\mathrm{L}} \ \textit{(shock)} \ , \\ \frac{2a_{\mathrm{L}}}{(\gamma - 1)} \left[\left(\frac{p}{p_{\mathrm{L}}} \right)^{\frac{\gamma - 1}{2\gamma}} - 1 \right] & \text{if } p \leq p_{\mathrm{L}} \ \textit{(rarefaction)} \ , \end{cases} \quad (4.6)$$

the function f_{R} *is given by*

$$f_{\mathrm{R}}(p, \mathbf{W}_{\mathrm{R}}) = \begin{cases} (p - p_{\mathrm{R}}) \left[\frac{A_{\mathrm{R}}}{p + B_{\mathrm{R}}} \right]^{\frac{1}{2}} & \text{if } p > p_{\mathrm{R}} \ \textit{(shock)} \ , \\ \frac{2a_{\mathrm{R}}}{(\gamma - 1)} \left[\left(\frac{p}{p_{\mathrm{R}}} \right)^{\frac{\gamma - 1}{2\gamma}} - 1 \right] & \text{if } p \leq p_{\mathrm{R}} \ \textit{(rarefaction)} \ , \end{cases} \quad (4.7)$$

and the data–dependent constants A_{L}, B_{L}, A_{R}, B_{R} *are given by*

$$\left. \begin{aligned} A_{\mathrm{L}} &= \tfrac{2}{(\gamma+1)\rho_{\mathrm{L}}} \ , \ B_{\mathrm{L}} = \tfrac{(\gamma-1)}{(\gamma+1)} p_{\mathrm{L}} \ , \\ A_{\mathrm{R}} &= \tfrac{2}{(\gamma+1)\rho_{\mathrm{R}}} \ , \ B_{\mathrm{R}} = \tfrac{(\gamma-1)}{(\gamma+1)} p_{\mathrm{R}} \ . \end{aligned} \right\} \quad (4.8)$$

   Also, **set the initial conditions for the particular case** in this file.

3. Now, the files **Test_1.m, Test_2.m, Test_3.m, Test_4.m, Test_5.m. corresponds to each of the tests given in the textbook**. The code blueprint for all is the same;

the only difference occurs in the definition of the regions.

4. Next, we have the **Plotter.m file, which is mainly for the plotting of the Tests.**

Suppose we plot for Test 5; we set the function for this case in Function_set.m and its initial conditions, then run it. Then go to the Test_5.m file and run that as well. Now go to the Plotter.m file and set data as Test_5(time) (note that this will change with corresponding tests); also set the time instance value like, say, 0.035. The first three lines of the Plotter.m file should look like this if we are plotting for Test 5.

```
time = 0.035;
data = Test_5(time);
figure,
```

Finally, Run it, and we get the plot.