

advection PDE in 1D using Ada 2005

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1 introduction

To help me learn a little more about Ada, I wrote ¹ the following small program to solve the advection pde $u_t + au_x = 0$ with initial condition $u(x, 0) = \sin(2\pi x)$ and with periodic boundary conditions $u(0, t) = u(1, t)$.

To be able to plot the solution, I directed the output of the program to a text file, then loaded the text file to Matlab and ran the simulation that way.

The program contains 3 files

1. main.adb the main line.
2. lax_wendroff_pkg.ads the package interface.
3. lax_wendroff_pkg.adb the package body.

To compile, I did

```
$ gnatmake -gnat05 -gnatwa main.adb
gcc -c -gnat05 -gnatwa lax_wendroff_pkg.adb
gnatbind -x main.ali
gnatlink main.ali
```

To run, I did

```
./main > result.txt
```

To see the simulation, then from Matlab, I run the following script

```
A=load('result.txt','-ascii');
B=reshape(A,100,100);

for i=1:size(B,2)
    plot(B(:,i))
    ylim([-1 1]);
    drawnow();

    pause(0.01);
end
```

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