1 About this package

This matlab package implements the three-dimensional Lagrangian flux calculation method described in the manuscript "Lagrangian Flux Calculation Through A Time-Dependent Surface For Scalar Conservation Laws" by L. Ding & B. Huang & S. Hu & Q. Zhang. This document lists the relevant files for reproducing the tables and figures in that manuscript.

2 File

2.1 ../MoveLFC/src

This folder contains the main files of our Lagrangian flux calculation method.

1. `fluxDR3D.m` is the main subroutine of this package, which constructs a spline-approximated generating surface and computes the flux of a scalar function through a moving surface by our LFC method.

2. `DRIntegral.m` is the subroutine that evaluates the integral over the spline approximated generating surface.

3. `splinegauss.m` generates the quadrature rule for evaluating the integral over a spline approximated region in 3-dimensional space.

4. `cubature_manager.m` provides nodes and weights of a quadrature routine on $[-1, 1]$, which is modified from the package maintained by Alvise Sommariva and Marco Vianello [**?**] `http://www.math.unipd.it/~marcov/software.html`.

5. `RungeKutta.m` is the subroutine that solves ordinary differential equation by explicit Runge-Kutta method.

6. `flowmap.m` is the subroutine for computing the trajectory of the Lagrangian particle.

2.2 ../MoveLFC/test

This folder contains the files which reproduce the tables and figures in the manuscript.

1. `table1.m, table2_1.m, table2_2.m,table3_1.m,table3_2.m` compute the errors and convergence rates of each tests, which respectively reproduce Table 1,2,3 in the manuscript. The Latex output files are saved in `../MoveLFC/Tables`.

2. `plot2a.m,plot2b.m,plot2c.m,plot2d.m,plotFigure3.m,plotFigure4.m` reproduce data for Fig 2, 3, 4 in the manuscript, respectively. The output data files are saved in

   `../MoveLFC/Figures/Data`

2.3 ../MoveLFC/Figures

2.3.1 ../MoveLFC/Figures/plotFigure2

This folder contains the files which reproduce the figure2 in the manuscript. To get figure2, you should run `../MoveLFC/test/plot2a.m, plot2b.m, plot2c.m, plot2d.m` to generate data files in `../MoveLFC/Figures/Data`.

1. `plotDRcomponent.m` is the subroutine that plots each component surfaces for the donating region.

2. `PaperPlotDR.m` is the subroutine that plots the whole donating region.

3. `Figure2.m` generates figure2 in the manuscript.

2.3.2 ../MoveLFC/Figures/plotFigure3&4

This folder contains the files which reproduce the figure3 and figure4 in the manuscript. To get figure3, you should run `../MoveLFC/test/plotFigure3` to generate data files in `../MoveLFC/Figures/Data`; to get figure4, you should run `../MoveLFC/test/plotFigure4` to generate data files in `../MoveLFC/Figures/Data`.

1. `plotDRcomponent.m` is the subroutine that plots each component surfaces for the donating region.
2. `PaperPlotDR.m` is the subroutine that plots the whole donating region.
3. `Figure3.m` generates figure3 in the manuscript.
4. `Figure4.m` generates figure4 in the manuscript.

2.4 ../useCase

This folder includes the moving surface, scalar functions, and velocity fields used in reproducing the tables or figures in our manuscript.