README for "Heterogeneous Multiclass Traffic Flow Model With Creeping" MATLAB Source Code

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Abstract

This document describes the implementation of the source code for numerical simulations carried out in the article "Heterogeneous Multiclass Traffic Flow Model With Creeping" by Fan and Work, submitted to the SIAM Journal of Applied Mathematics. A preprint of the article is available for download on the author's website. The source code is hosted at `https://github.com/shimaof/heterogeneous-traffic-model`.

1 License

2 Publishing results using this software

We kindly ask any future publications using this software include a reference to the following publication:

S. Fan and D. B. Work, "Heterogeneous Multiclass Traffic Flow Model With Creeping", *submitted to SIAM J. Appl. Math.*, June 2014.

3 Structure of the code

Below we give a description of the script included in the software.

`solver_heterogeneous_creeping_ctm.m`

is used to perform the numerical simulations in the publication. The script contains a numerical solver for both the *n–populations model* and the *creeping model*, which is a heterogeneous extension of the Cell Transmission Model. Based on the Godunov scheme, the numerical flux of each vehicle class is determined by analyzing the sending and receiving of vehicles of the class on each cell boundary.

The numerical solver has two input variables: *model* and *test*, i.e.,

```
function solver_heterogeneous_creeping_ctm(model,test),
```

where "model" specifies the heterogeneous models involved in the simulation, with $model = 1$ representing the creeping model and $model = 2$ standing for the n–populations model. The second variable "test" is applied to identify different experiments in the article. Here, the simulation with $test = 1$ is the experiment that verifies *overtaking* of the two models, and the simulation with $test = 2$ is to test for the *creeping* scenario in both models. For instance, by inputing in the command window of MATLAB that

```
solver_heterogeneous_creeping_ctm(1,1),
```

one obtains the numerical simulation of the creeping model that designed to verify the creeping phenomenon.

4 Important Settings of the Numerical Simulations

For information of the settings of model parameters, sizes of spatial (Δx) and temporal (Δt) grids, initial and boundary conditions, one refers to the publication:

S. Fan and D. B. Work, "Heterogeneous Multiclass Traffic Flow Model With Creeping", *submitted to SIAM J. Appl. Math.*, June 2014.

5 Running the code

The provided m-file can be used to reproduce the results of "Test 1" (experiment designed for testing overtaking) and "Test 2" (experiment designed for testing creeping) presented in the publication.

1. Test 1, overtaking of the creeping model: create a full evolution of the traffic density of each vehicle class by using script

   `solver_heterogeneous_creeping_ctm.m`

   with input parameters: $model = 1$, $test = 1$.

2. Test 1, overtaking of the n–populations model: generate a full evolution of the traffic density of each vehicle class by running

   `solver_heterogeneous_creeping_ctm.m`

   with input parameters: $model = 2$, $test = 1$.

3. Test 2, creeping of the creeping model: run the script

   `solver_heterogeneous_creeping_ctm.m`

   with input parameters: $model = 1$, $test = 2$.

4. Test 2, creeping of the n–populations model: run the script

   `solver_heterogeneous_creeping_ctm.m`

   with input parameters: $model = 2$, $test = 2$.