

Fuel consumption minimization using piecewise linear speed profiles:

Brief manual

This manual is associated with the paper “*A Method for Performance Analysis of a Genetic Algorithm Applied to the Problem of Fuel Consumption Minimization for Heavy-Duty Vehicles*”, by S. Torabi and M. Wahde (currently under review, April 16, 2019).

The procedure described below carries out the necessary steps for generating (one at a time) the five panels in Figure 4 in the paper. Note that it is possible to proceed directly to Step 2, see below.

Step 1:

To run the code, apply the following steps:

- In the File menu, select Road and then Load. Open the road file over which the fuel consumption minimization should be carried out. Five roads are provided, namely the 10 km highway road sections between Göteborg and Borås (Roads 1 – 5, located in the Data/Roads/Highway/ folder).
- Then, optionally, change the GA parameters, by clicking on *Set optimization parameters*. (The default parameters usually provide good results).
- Click on *Start batch run*.

The program will then run a genetic algorithm (GA) the specified number of times (100 per default) to generate, in each run, a piecewise linear speed profile (defined by 8 points with 9 different levels, per default), for which the fuel consumption is minimal, *over the road in question*. When all 100 runs have been completed (which takes around 11 hours, with default settings), the frequency distribution of fuel consumption values (for the best speed profile in each run) is automatically saved (in the folder Results/) to a file named BatchRunResult_<roadname>.txt, where <roadname> is the name of the road.

Step 2:

In order to compare the frequency distribution obtained from the GA runs to the results obtained with a brute force benchmark computation (over all possible piecewise linear speed profiles), start Matlab, choose File – Open, and open the Postprocessing.m script (located in the top-level folder). Then press Run (in Matlab). The figure will appear within roughly 1 minute.

The postprocessing script has been tested under Matlab 2016, v17b.

Note: If one just wants to generate the figure one can skip Step 1, and just run the Matlab script, which will then make use of the data (from GA runs carried out by the authors) in the Results/ folder.