Dynamic OD Estimator – REMODE

1 Introduction

The time-dependent OD demand matrix is a key input for successful application of DTA (Dynamic Traffic Assignment) and dynamic traffic management. The primary concern is to improve the final quality of OD matrices through effective utilization of **multiple sources** of information. These include any available historical static demand matrix, coupled with time-sliced traffic data (e.g. link counts, observed travel time, FCD), as well as the modelers' knowledge. Furthermore, the OD demand estimation problem in modeling applications usually deals with a large-scale network that may have thousands of links and hundreds of traffic zones. Most importantly, time-sliced traffic information may only be available on a subset of links in the study area, which increases the difficulty in inferring the dynamic OD matrix for all the OD pairs. **REMODE** tries to use effectively time-sliced data together with other information sources to estimate reliable time-dependent OD demand.

2 Functional specification

A dynamic OD estimation consists of solving a bi-level optimization problem, **REMODE** uses the following to keep the original OD structure,

$$\min Z = \left\{ (1-w)\sum_{l} W_l \times \sum_{h} [\sum_{t,i,j} p_{(l,h),(t,i,j)} \cdot d_{(t,i,j)} / c_{(l,h)} - 1.0]^2 + w \sum_{i,j} [\sum_{t} d_{(t,i,j)} / g_{(i,j)} - 1.0]^2 \right\}$$

where

w = a positive weight between 0 and 1

W_l =a specific weight for each count

p = link flow proportion, for departure time t, origin i and destination j, at link l (or turn-move) and observation interval h

d = estimated traffic demand

c = measured traffic flows

g = historical static demand

Note that the whole method here applies also to static OD estimation if time dimensions t and h are set to 1, and all other inputs are similar.

3 Major input files

Main input needed to run the dynamic OD estimation **REMODE** consists of the following:

- `Network, with zone, node and links`
- `Time period and simulation slices`
- `A priori OD Demand in time slices`
- `Traffic counts (link and/or turn move) in time slices`
- `Dynamic assignment map for O-D demand in time slices`

4 Extra functionality

The program can take any mapping files from either static or dynamic assignment programs such as Questor, OmniTrans, Aimsun or Vissim. It is fully compatible with mesoscopic DTA program **Dynasmart**. In execution, it will read Dynasmart files and generate the Dynamic assignment map automatically. Other dynamic assignment programs are also workable. It also gets Floating Car Data (**FCD**) and generates a priori matrices for the use in estimation process.

5 Main performance

Key characteristics of REMODE are (1) keeping original structure and (2) fast calculation time. A test example shows the following:

- `Synthetic data by a dynamic simulation model; output replicates input`
- `all counts are increased by 25%; output matrices are proportionally adjusted`
- `all counts are decreased by 25%; output matrices are proportionally adjusted`
- `half counts are increased by 25% and others are decreased by 25%; results as expected`

REMDOE has been applied to Beijing dynamic model, handling more than 600 zones and 10000 links, with 12 matrices sliced at 15 minutes each, 500 counts at 10 minutes of observation interval.

Currently **REMODE** can handle 240 minutes of simulation time in 10 minutes of interval, network of more than 800 zones and 25000 links, and 660 counts (Utrecht network). The computation time is within 15 minutes. Since more than 15 years, it has been applied to various cases such as Grand Paris, Dutch national base OD matrix, and many regional studies.

A relevant article in Dutch can be found on the journal “Verkeerskunde, Mei 2009”. Another article in English:

“Estimation of dynamic origin-destination matrices using floating car data”, with van Zuylen HJ & Asmundsdottir R, in proceedings of the 10th TRAIL Congress, Delft, 2008.

6 Contact

REMODE is available at commercial basis. For further info, contact:

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