

2.0 PROBLEM STATEMENT AND RESEARCH OBJECTIVES

2.1 Problem Statement

In an earlier research effort on the evaluation of synthetic O-D trip table estimation models, potential was noted to enhance the performances of THE and the LP models' by providing improved/superior target/seed tables. In the previous work, these two models were evaluated separately for three cases of input target/seed tables for the Pulaski network. The different target/seed tables used as input were : structural tables, no-prior information tables and small error trip tables. A structural table has cell values of 0 or 1, merely to indicate if that trip interchange is feasible or not. This table is of interest for areas which do not have any old/prior trip table that can be provided as target/seed for model runs. The so called no-prior information trip table had uniform cell value for all the feasible interchanges. This value was obtained by taking the average cell values for the VDOT surveyed trip tables, for the 24-hour and peak-hour cases. This table is considered more superior than the structural table. Besides using these two tables as target/seed, small-error tables were also derived based on a similar reasoning, by inducing random errors in the VDOT surveyed trip tables. This table is considered superior to the structural target and no-prior information target tables. The motivation for using different target/seed tables was to test the sensitivity of THE and the LP models for varying degrees of information provided in the target/seed table. In general, the LP model results were superior, both in terms of closeness of modeled trip tables to the “correct/surveyed” tables, and in terms of replicating the observed link volumes, for all the case studies. The exception to this was the structural target case, for which THE produced better results. Both the models showed improvement in results with greater input information, in terms of the target table. This highlighted the importance of providing a good target table. Based on the above findings, it was considered beneficial to gauge the models performances

by using considerably superior target/seed table. This approach also shed light on the applicability of these models on other real networks for establishing current O-D tables, if an old/prior trip table existed for that area. It is also worth mentioning here that most areas do not have an old/prior trip table that can be input for model runs. But as explained previously, both THE and the LP models use a target/seed table. In absence of any old/prior trip table the use of structural table as target/seed is the only option. Although the models will synthesize a trip table with structural table as target/seed, the modeled results could be considerably off from the actual values (as observed in the earlier research). Hence, using an improved target/seed table instead of the structural table for areas with no old/prior trip table can produce better outputs for model runs.

2.2 Research Objectives

The objectives of this research are:

- To develop a methodology for establishing superior target/seed tables that can be input to the synthetic models to enhance their performances.
- To incorporate the readily available and easily accessible socio-economic/census data and link volume information to obtain superior target/seed trip tables through the trip generation and trip distribution steps of the four-step planning process.
- To evaluate the performances of THE and LP models using improved target/seed tables.
- To test the sensitivity of the LP model in terms of user input parameter sigma (σ), used for incorporating the relative belief in the target/seed trip table.

As explained previously, the quality of the modeled results depend considerably on the information contained in the target/seed trip table. Hence, as part of this research effort, a target/seed trip table was developed using the socio-economic/census data through the traditional trip generation and trip distribution steps of the four-step planning process. This

table was further input as the start table for model runs. To analyze the modeled results, VDOT's surveyed trip tables (assumed as true/correct) provided an ideal validation, as the surveyed tables were developed particularly for the purpose of evaluating the synthetic models results. As the results for the structural target case were also available from the earlier research, it was also a motivation for finding out the magnitude of improvements in the modeled outputs on using superior target/seed tables as compared to the structural target table.

2.3 Research Tasks

To accomplish the objectives of this research effort, the following major tasks were performed:

1. Review of socio-economic/census data for the town of Pulaski from various sources.
2. Gathering of socio-economic/census data for the town of Pulaski and reducing them to the TAZ level.
3. Application of MINUTP software for carrying out trip generation and trip distribution steps of the four-step planning process, using the socio-economic/census data, for developing a superior target/seed trip table.
4. Evaluating the performance of THE and LP models for the Pulaski network in terms of replicating the observed link volumes and matching surveyed trip tables; Comparing the model results obtained using the improved target/seed table to the structural target outputs and analyzing the sensitivity of the models to the quality of input information in target/seed table.
5. Testing the sensitivity of the LP model in terms of user input parameter σ .

The above tasks have been explained in details in the following chapters. In essence, the proposed methodology employed the zone-specific socio-economic/census data relevant for

application in the conventional trip generation stage of the four-step planning process. The trip table so obtained was then fed to the synthetic O-D estimation models as target/seed, and the modeled output tables were evaluated.

2.4 Scope

The performances of THE and the LP models were comprehensively evaluated in an earlier research effort. Based on the outcomes of that evaluation, the need to research the particular case when no old/prior target/seed table is available for use as input to these models was noted. This involved establishing a superior target table using readily available and easily accessible socio-economic/census data and then using this table as input to the selected synthetic models. The model outputs were then evaluated. Thus the focus of this research effort involved improving the performance of THE and LP models through the use of a superior target table.

The Pulaski highway network was used for the research. Most of the data required for the research was available from VDOT, and further data on socio-economic variables needed for the study was gathered from the town of Pulaski. Both THE and LP models' were evaluated by testing them extensively using this network.

Both the 24-hour and peak-hour surveyed trip tables for Pulaski provided by VDOT helped in the validation of the modeled results. These tables were developed specifically for evaluating the models' performances.

The Pulaski highway network used for this research (provided by VDOT) consisted of 32 zones (of which 21 were internal zones and 11 external zones), 57 intersection nodes and 230 links. These internal zones were divided according to the density of population and the

activity centers in and around the area. The data on network characteristics i.e., link length, free flow speed and capacities were also provided by VDOT. For validation of the model results, VDOT also carried out an O-D survey (Center for Survey Research, 1994), for determining the 24-hour and peak-hour trip tables for the town of Pulaski.

Data on dwelling units for each Traffic Analysis Zone was also provided by VDOT. The employment data was collected from the town office in Pulaski and Pulaski County Chamber of Commerce.