ALTERNATIVES FOR ESTIMATING SEASONAL FACTORS ON RURAL AND URBAN ROADS IN FLORIDA

PROBLEM STATEMENT

In the current practice at the Florida Department of Transportation (FDOT), seasonal factors (SFs) are used in the calculation of annual average daily traffic (AADT) at portable traffic monitoring sites (PTMS). The permanent traffic monitoring sites (TTMSs) are first manually classified into different groups (known as seasonal categories) based on similarities in traffic characteristics of roads and on engineering judgment. FDOT districts then assign a seasonal factor category to each PTMS according to the site's geographical locations, assuming that seasonal variability and traffic characteristics at the short-term and permanent count sites are similar in the same geographic area.

The purpose of seasonal factor grouping is to assign labels representing the clusters to the TTMSs, which are then assigned to short counts to calculate Annual Average Daily Traffic (AADT). Seasonal groups are commonly constructed based on Monthly Seasonal Factors and cluster analysis has been recommended by the Federal Highway Administration for identifying roadway sections with similar traffic patterns. Often the number of seasonal factor groups is unknown, as is to which group a TTMS belongs. Although conventional nonparametric clustering models such as Ward's Minimum-Variance method have been widely applied in the seasonal factor grouping, these methods do not provide guidelines with regards to the choice of the optimal number of groups. Even more problematic is the lack of specification of definable characteristics to allow the objective assignment of short counts to the seasonal factor groups.

Traffic patterns are usually associated with roadway functions, topography, and land use patterns, which may be the dominating factors in determining roadway groupings. Such factors are so far not well identified or quantified. Understanding how these factors affect seasonal traffic patterns is important to both creating seasonal factor groups and assigning established seasonal groups to short period counts. An objective method for seasonal factor grouping and assignment based on such factors is needed.

OBJECTIVES

The goal of this research was to develop objective, data-driven methods to improve the current seasonal factoring process in traffic monitoring for estimate traffic volumes on Florida's urban and rural roads. The objectives of this research included:

1. Identify, evaluate, and develop alternative approaches that have the potential of improving the current seasonal factor grouping process.
2. Identify possible explanatory variables that allow more accurate assignment of short-count sites to a given seasonal factor group.
3. Develop a method for assigning seasonal factor groups to short-term counts based on the identified explanatory variables.

FINDINGS AND CONCLUSIONS

The findings from this study are summarized as follows:

1. The model-based clustering analyses were shown to be able to provide a good starting point for transportation professionals to obtain seasonal factor categories in a systematic and data-driven fashion by grouping TTMSs based on both their seasonal traffic patterns and their spatial proximity to each other.

2. Seasonal residents, tourists, retired people aged between 65 and 75 with high income, and retail employment were identified as significant indicators for seasonal traffic changes on urban roads in southeast Florida. For the rural roads, variables such as roadway functional classification, percentage of seasonal households, retired population, and truck factor were identified as potential explanatory variables.

3. A fuzzy decision tree was constructed to determine the seasonal factor category for a given PTMS in Southeast Florida urban areas based on the explanatory variables identified. For a given short count site, the values of the explanatory variables are calculated. Based on these values, the fuzzy classifies the count site to an established seasonal factor group that share similar values of the explanatory variables. The decision tree is easy to apply and visualize, and the assignment results are self-explanatory.

The following recommendations were made based on the findings from this research:

1. Additional studies need to be carried out to determine whether the variables identified in this study for the urban areas in southeast Florida are applicable to other urban areas in the state. It is possible that different urban areas might have their own set of seasonal traffic pattern predictors.

2. The regression models for estimating MSFs for rural roads currently have relatively low R^2s. Further analyses are necessary to improve the model performance and identify better MSF predictors.

3. A standard procedure should be developed by FDOT based on the results from this study and future studies. This standard procedure should be based on a set of statistics based methods for seasonal factor grouping and assignment that are more objective and data-driven and that minimize the reliance on individuals' experience and subjective judgment.

4. The prototype GIS program developed in the study is a demonstration program developed for FDOT District 4. It needs to be expanded to include all FDOT districts.

BENEFITS

This research made important contributions to the understanding of the underlying causes of seasonal traffic patterns by identifying plausible predictors for seasonal groups, confirming the importance of geographic location and providing a theoretical basis for considering them in seasonal grouping, and developing a practical approach for assigning seasonal factor groups to short count stations. A computer program implanting the procedure developed in this study and applicable statewide will help transportation analysts in Florida obtain more accurate AADT estimates, rely less on individuals experience, avoid subjective judgment, and increase productivity. Most importantly, the quality of the transportation data used in important decision making processes, such as project selection and funding allocation, will be improved.

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