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Project Title:
Spatial Transferability Using Synthetic
Population Generation Methods

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Spatial Transferability Using Synthetic Population Generation Methods

Methodology development for the spatial transfer of survey data

WHAT IS THE NEED?

This project addressed a practical problem faced by Caltrans staff in the design and implementation of the 2010 California Household Travel Survey (CHTS).

The survey included a main core sample of approximately 42,000 households. The first attempt to identify the number of households to recruit in each county was based on a completely random sample of addresses spread uniformly throughout the state. When classifying the targeted households for recruitment by county of residence, it was found for several counties that the sample size was too small for statistics to be reliable making travel behavior models unusable. Moreover, small samples also carry a high risk of not reflecting the diversity of travel behaviors. One way to solve this problem is to recreate on computer the entire population of California together with robust predictions of their travel behavior.

WHAT WAS OUR GOAL?

The goal of this study was to develop a new method to populate data regions with small sample sizes using synthetic population generation. Associated with this goal was the development of a taxonomy describing the ability that different spatial metrics have in explaining activity travel behavior and recommendations for further practice and research.

WHAT DID WE DO?

To develop the new method we first identified suitable land use summaries to build a spatial taxonomy at any spatial scale using a detailed record of all business establishments in California. The taxonomy was tested with regression models to find the difference in the number of trips per person and VMT per person

among people living in different types of land use (center, suburb, exurb, rural).

This taxonomy was used to classify household travel survey records (persons and households) and in parallel geographic subdivisions for the entire State of California. Then, a synthetic population was generated using PopGen expanding (recreating) the records of the households responding to the survey and the entire array of travel behavior data reproduced for the synthetic population. We compared California's synthetic population with land use and without land use information to check if including land use increases precision of behavioral indicators.

WHAT WAS THE OUTCOME?

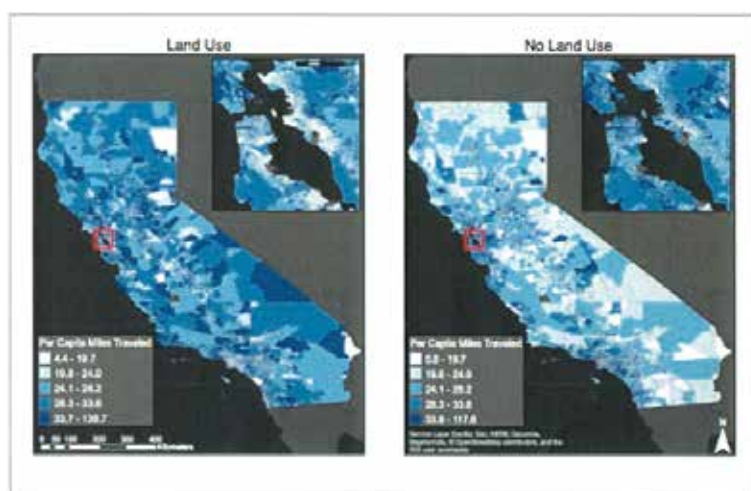
The land use indicators we used (city center, suburb, exurb, and rural) have strong explanatory power for the number of trips per day and for the vehicle miles of travel. People in city centers make more trips but travel shorter distance and people in rural environments travel longer distances with lower number of trips. The most important differences emerge from the ability of the new method to distinguish between residents of urban environments and rural environments while accounting for their social and economic differences. One clear advantage is shown by the attached maps which show that not using land use information in synthetic population walking trips are predicted for areas where they are not feasible. In contrast land use informs synthetic population producing more reasonable predictions.

WHAT IS THE BENEFIT?

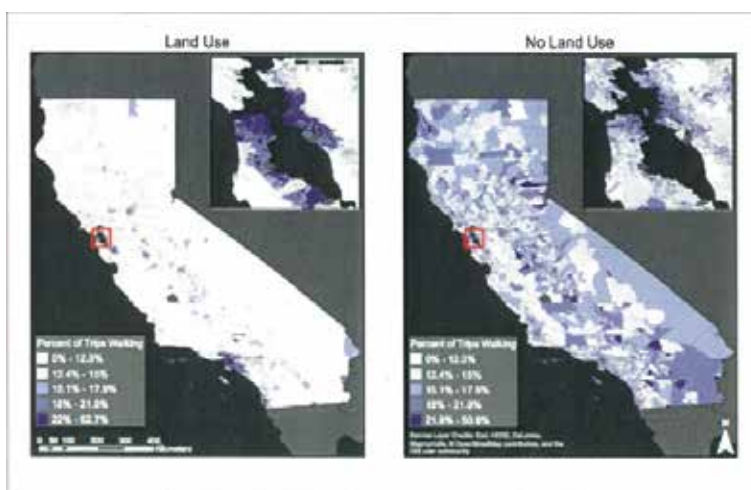
This research demonstrates a new technique of creating synthetic survey data which, in turn, will enable more communities in California to develop

effective policies to decrease Vehicle Miles Travelled (VMT) and Green House Gas (GHG) emissions. Additionally, counties with small sample sizes will be able to better estimate with models using this method and guidelines will assist future household travel survey data collection projects.

IMAGES



Synthetic Population Daily Miles of Travel Per Person



Synthetic Population Percent of Daily Trips Walking

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