MAKING A GREAT PLACE

Metro

Modeling Services

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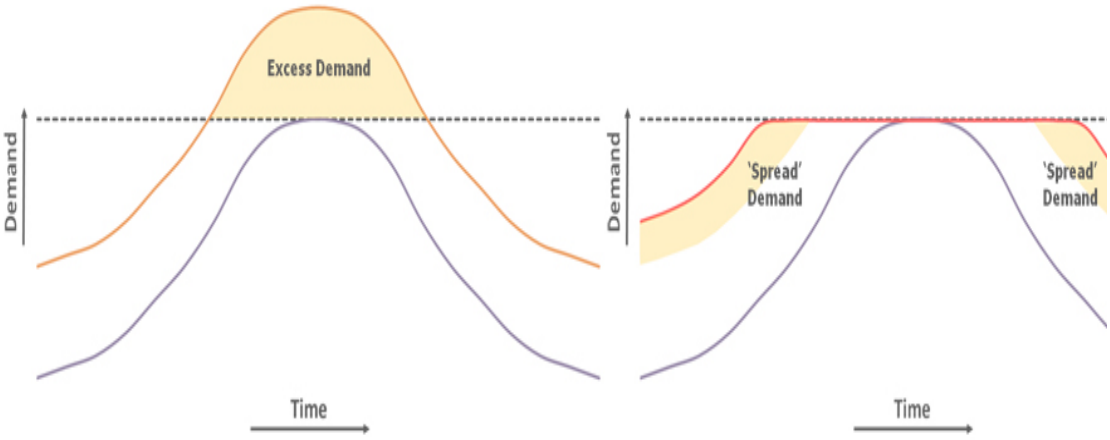
Research Center updates

Temporal redistribution algorithm



What's new?
Modeling Services has implemented a temporal redistribution algorithm within its regional transportation model that is designed to selectively adjust auto demand prior to network assignment. The algorithm operates in a succession of hourly periods, moving demand outward from peak to shoulder periods in corridors where auto demand far exceeds available highway capacity. In contrast to conventional peak period assignments that cover multiple hours and use unadjusted demand, the temporal redistribution algorithm is capable of producing a conditioned assignment for any single-hour period.

How does it work?
The temporal redistribution algorithm relies on a travel time index (TTI), which is calculated as the ratio of congested to free flow travel time between each origin-destination (OD) pair in the network. A TTI of 1.6 is asserted as the threshold for congestion tolerance, the level of congestion beyond which travelers will begin shifting their trips from peak to less congested periods. This value, derived from the section of I-5 northbound from downtown Portland to the Columbia River, corresponds to the highest corridor-based TTI present in the base-year network.

The process begins with an assignment for the "peak of the peak" period (7 to 8 a.m. or 5 to 6 p.m.), after which the TTI is calculated and OD pairs with an index in excess of the 1.6 threshold are flagged. Based on the degree to which the TTI threshold has been surpassed, a share of the initial demand between each of these OD pairs is shifted to the adjacent hourly periods.

The above process is then repeated multiple times, following an hourly progression spanning 5 to 11 a.m. and 2 to 7 p.m. Several rules that protect against excessive removal of trips are observed throughout and the process concludes with a final assignment for each hourly period using the adjusted demand.

Why does it matter?
The temporal redistribution algorithm addresses, in part, several weaknesses inherent to the prevalent transportation modeling framework. Foremost among these is a lack of strict capacity constraint in static network assignments, which can result in unrealistic levels of congestion in certain locations. By conditioning vehicle flows prior to assignment, the temporal redistribution algorithm minimizes occurrences of this phenomenon.

Another key improvement that the temporal redistribution algorithm introduces is the ability to capture the temporal effects of congestion. Since the methodology produces a series of interdependent assignments on both sides of the peak, it is possible to simulate the behavior of actual travelers choosing to alter trip start times to avoid recurring congestion.