Energy Loss due to Traffic Congestion

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This research is aimed at estimating and predicting energy loss due to traffic congestion at link-level in the transportation network. INRIX data, for the year of 2012, for the city of Charlotte, North Carolina was considered for research and analysis. The raw data contains travel time information for every minute of the day during the year. Three different times of the day were considered for research and analysis. They are: morning peak hour (8 am - 9 am), off-peak hour (12 pm - 1 pm) and evening peak hour (5 pm - 6 pm). The variations in energy loss patterns on a weekday and a weekend day during the selected times of the day were examined. Mathematical equations were used to compute delay due to congestion and the energy loss.

Energy loss maps at link-level and Voronoi maps were generated in Geographic Information Systems (GIS) environment to examine spatial variations in energy loss. The Voronoi maps have the potential to predict energy loss for links with missing data.

Corridors such as Brookshire freeway and I-485 in the city of Charlotte were observed to experience the highest energy loss during most of the times considered in this research. The energy losses were higher towards the downtown/uptown area and decreased as the distance from the downtown/uptown area increased. Further, the energy loss due to recurring and non-recurring congestion was observed to be the highest during evening peak hour on a weekday and off-peak hour on a weekend, respectively.