



Research Fact Sheet

Research project: Energy Efficient Transportation Modeling

What's the issue?

By 2014, congestion in the U.S. had caused travel delay to increase to 6.9 billion hours per year, and congestion costs reached \$160 billion. Sustainable transportation modes – such as cycling, walking, and use of public transit and electric vehicles – can reduce toxic greenhouse gas emissions and noise levels. But tools, measures, and planning techniques need to be developed for cycling and multimodal trips. The development of such tools depends greatly on understanding cyclists' behaviors, for example, the power with which cyclists of varying abilities accelerate, akin to a gas pedal and how aggressively a driver uses it. And what's the energy consumption if the cyclist bikes to another mode of transportation, like a bus or train?

What did the research discover?

Ten employees (3 females and 7 males) at the Virginia Tech Transportation Institute were asked to carry a smartphone with a GPS app on their trips in 2015. They selected their travel mode before starting the trip, and data collection was conducted on different workdays during working hours on different road types with different speed limits in Blacksburg, Virginia. From that data, 22 bicycle trips were used to develop a dynamics-based cycling acceleration model that captures cyclist aggressiveness, i.e., how they accelerate, for how long and what is their maximum power. Since riding a bike to a train makes sense, researchers also developed a continuous rail transit simulator (RailSIM) intended for multi-modal energy-efficient routing applications. RailSIM integrates sophisticated train dynamics and energy models to replicate train motion and energy consumption behavior, respectively.

How can I implement this?

This research will further the work of planners in developing multi-modal routes that reduce dependency on single-occupant gas-powered cars.

Learn more:

https://www.morgan.edu/school_of_engineering/research_centers/urban_mobility_and_equity_center/research/completed_research/energy_efficient_transportation_modeling.html

Read the complete report:

The Urban Mobility & Equity Center is a federally funded research consortium led by Morgan State University and includes the University of Maryland and Virginia Tech. www.morgan.edu/umec