U.S.Department of Transportation
Federal Highway Administration

Office of Operations
Research and Development

FEDERAL HIGHWAY ADMINISTRATION (FHWA) WORK ZONE DRIVER MODEL SOFTWARE

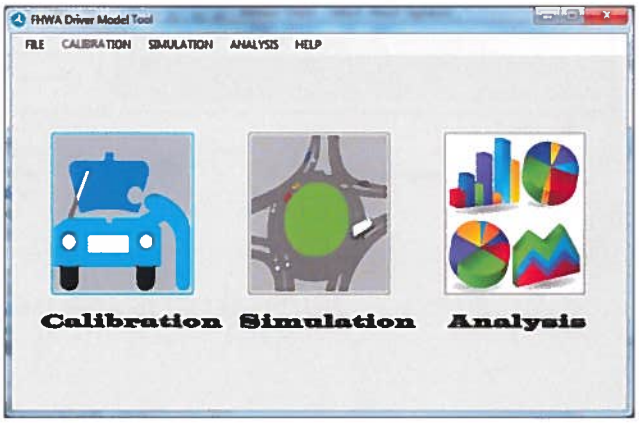
Freeway work zones can have significant operational impacts, accounting for nearly 24 percent of the annual non-recurring delay in the United States. Many freeway segments require major rehabilitation or replacement in the near future as they reach (and surpass) their 50 year design lives. The number of freeway work zones in the United States is projected to increase. Planners at transportation agencies need accurate simulation tools to predict the operational impacts of mitigation strategies and/or alternative setups at these work zones.

Microsimulation has the potential to accurately predict work zone impacts because it models individual vehicle movements on a per time step level. Existing microsimulations, however, are not equipped to simulate freeway work zones because they do not account for changes in driver behavior (e.g., car-following and lane-changing) as a driver approaches and traverses a freeway work zone. Microsimulation software packages require a work zone driver behavior model.

WORK ZONE DRIVER MODEL

FHWA and the U.S. Department of Transportation (USDOT) Volpe Center are developing a work zone car-following model and simulation software that interfaces with existing microsimulation tools, enabling more accurate simulation of car-following through freeway work zones. The purpose of this project is to provide engineers and planners at transportation agencies and in private industry with a tool that can better predict the operational impacts of freeway work zones.

The work zone car-following model uses a multi-dimensional psycho-physical framework and acceleration/deceleration algorithms from modified field theory.[1,2] The model was developed and calibrated using work zone car-following data collected with an instrumented research vehicle through freeway work zones on I–95 near Washington, DC, and freeway work zones in Massachusetts, including a Smarter Work Zone along I–91 in Springfield. Tools were developed to identify and classify car-following instances in these data, filtering and processing data so it could be used for model calibration. These processed datasets will be published to FHWA's Research Data Exchange website.[3] FHWA Work Zone Driver Model software and model calibration tools are currently under development.



FHWA Driver Model Platform (Source: FHWA).

The Turner-Fairbank Highway Research Center (TFHRC) has more than 24 laboratories for research in the following areas: safety operations, including intelligent transportation systems; materials technology; pavements; structures; and human centered systems. The expertise of TFHRC scientists and engineers covers more than 20 transportation-related disciplines. These laboratories are a vital resource for advancing this body of knowledge created and nurtured by our Researchers. The Federal Highway Administration's Research, Development, and Technology Service Business Unit operates and manages TFHRC to conduct innovative research to provide solutions to transportation problems both nationwide and internationally. TFHRC is located at 6300 Georgetown Pike, McLean, VA. Information on TFHRC is available on the Web at www.tfhrc.gov.

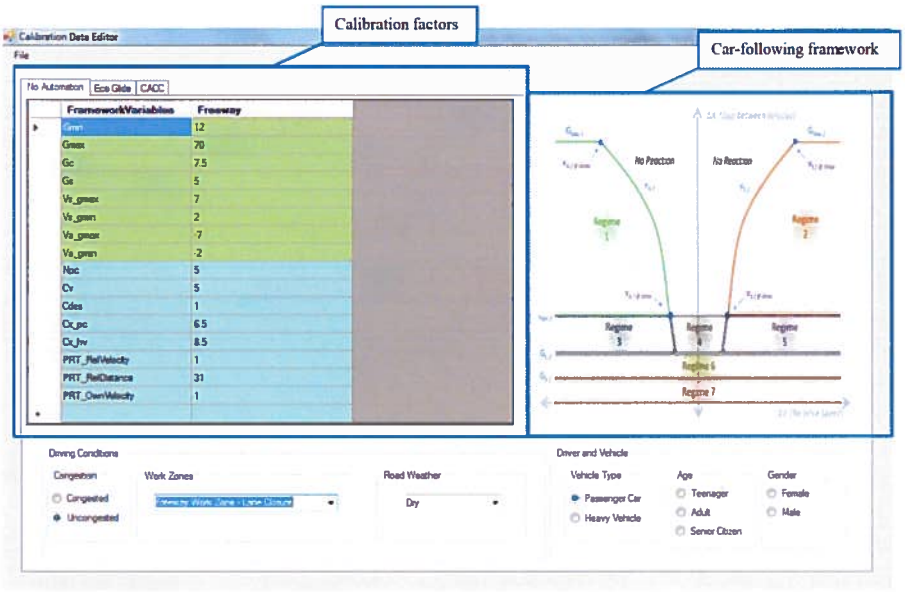
FUTURE WORK

Work zones are not the only scenarios that exhibit unique driver behavior. Others include adverse weather events, narrow lanes, and road segments with connected automated vehicle applications enabled. Planners and engineers could also benefit from a single modeling tool that includes tools to calibrate models from field data sets and tools that perform standard post-simulation analyses using simulation output files.

The FHWA Work Zone Driver Model software will be developed into a robust software platform—the FHWA Driver Model Platform—capable of incorporating other specialized driver models, model calibration tools, and model analytical tools. The goal is to provide planners and engineers with a single consolidated tool for specialized microsimulation modeling and analysis. The FHWA Driver Model Platform is currently under development. The figures below show the home screen of the software, and the main components of the platform: driver models and their calibration tools, in-simulation diagnostic tools, and analytical tools that provide streamlined simulation output analytics.

The FHWA Driver Model Platform is for fully practice-ready models. The first version of the FHWA Driver Model Platform will contain only the FHWA Work Zone Model, however, FHWA will update the platform with additional models—including those for connected and automated vehicle applications. The figure on the next page shows the user interface for calibrating the FHWA Work Zone Driver Model.

Researchers are also working to model adverse weather conditions using and enhancing the driver model framework developed for work zones and the Strategic Highway Research Program (SHRP2) Naturalistic Driving Study dataset.[4]



FHWA Work Zone Model User Interface (Source: FHWA).

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