Improved model helps transit agencies predict more accurate staffing for bus routes

Free report, recommendations from Mineta National Transit Research Consortium

San Jose, Calif., July 29, 2014 –The Mineta National Transit Research Consortium's latest peer-reviewed study, *Understanding and Modeling Bus Transit Driver Availability*, has tested three models and provided a series of recommendations to help transit agencies plan for a sufficient number of drivers without over-scheduling. Principal investigator was Kaan Ozbay, PhD, working with Ender Faruk Morgul, MSc. The free report can be downloaded from http://transweb.sjsu.edu/project/1140.html

To accommodate unplanned employee absences (illness, emergencies, etc.), transit agencies must employ a sufficient number of transit vehicle operators to meet the demands of scheduled service. Therefore, agencies employ extraboard operators, or on-call backups. Overestimating the number of extraboard operators can be costly, and underestimating can cause service problems. This study proposes stochastic (i.e., random or probability) mathematical models so transit agencies can predict necessary staffing more accurately.

"Currently, decision makers estimate their staffing by using personal experience and intuition," said Dr. Ozbay. "However, our mathematical models account for measures of risk and reliability with probability distributions based on historical data. Implementing these models could allow agencies to realize meaningful cost reductions while maintaining proper staffing."

The proposed models could also improve policies for daily transit operations, allowing agencies to better determine the minimum extra driver run hours for different levels of reliability while better understanding the relationship between social costs and operational costs. Social costs are defined using clearly identified measures estimated for the case study area, such as the value of riding per hour and the average number of passengers.

Implementing these models in a user-friendly computer tool could lead to other improvements by creating various scenarios to increase the speed and efficiency of decision-making. The demand and supply data required for the model validation was obtained from historical data of the Tri-County Metropolitan Transportation District of Oregon (TriMet).

As seen in several US and European studies, average absenteeism among bus drivers is considerably higher than in other industry groups. In one US-based study, researchers found that an average transit operator misses approximately 12 percent of annual scheduled workdays, excluding vacations and holidays. Other studies have noted that absenteeism places a significant economic burden on an overall transportation budget.

In this study the researchers consider the tactical planning problem, in which extra workforce numbers are determined daily, depending on schedule requirements and garage assignments.

The report's figures and tables include a TriMet daily extraboard profile, stochastic model graphs, garage location map, model results for cost scenarios, and more. For a free PDF of the research report, go to http://transweb.sjsu.edu/project/1140.html

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ABOUT THE INVESTIGATORS

Kaan M.A. Ozbay, PhD, is professor at the Department of Civil and Urban Engineering at NYU-Poly and Center for Urban Science and Progress (CUSP). Prior NYU, Dr. Ozbay was a tenured full professor at the Rutgers University Department of Civil and Environmental Engineering. Since 1994, Dr. Ozbay, has been the Principal Investigator and Co-Principal Investigator of 77 projects funded at a level of more than $11,00,000 by National Science Foundation, NJDOT, NYMTC, NY State DOT, New Jersey Highway Authority, USDOT, FHWA, VDOT, CUNY University Transportation Research Center (UTRC), Department of Homeland Security, USDOT ITS Research Center of Excellence.

Ender F. Morgul, MSc, is a graduate research assistant at the Civil and Urban Engineering Department in Polytechnic Institute of New York University. He received his BS from Bogazici University and MSc in civil engineering from Rutgers University. His 2010 MSc thesis investigated dynamic congestion pricing using large scale traffic simulations.

ABOUT THE MINETA NATIONAL TRANSIT RESEARCH CONSORTIUM
The Mineta National Transit Research Consortium (MNTRC) is composed of nine university transportation centers led by the Mineta Transportation Institute at San Jose State University. The Consortium was organized in January 2012 after winning a competition sponsored by the US Department of Transportation (DOT) to create consortia tasked with "Delivering Solutions that Improve Public Transportation." Member universities include Bowling Green State University, Grand Valley State University, Howard University, Penn State University, Rutgers University, San Jose State University, University of Detroit Mercy, University of Nevada Las Vegas, and University of Toledo. Visit transweb.sjsu.edu/mntrc

ABOUT THE MINETA TRANSPORTATION INSTITUTE
The Mineta Transportation Institute (MTI) conducts research, education, and information transfer programs regarding surface transportation policy and management issues, especially related to transit. Congress established MTI in 1991 as part of the Intermodal Surface Transportation Efficiency Act. MTI won national re-designation competitions in 2002, 2006 and 2012. The Institute is funded through the US Secretary of Transportation's Research and Technology Office, US Department of Homeland Security's Transportation Security Administration, the California Department of Transportation's Division of Research, Innovation and Systems Development, and public and private grants. In 2006 the US Department of Homeland Security selected MTI as a National Transportation Security Center of Excellence. The internationally respected members of the MTI Board of Trustees represent all major surface transportation modes. MTI, the lead institute for the nine-university Mineta National Transit Research Consortium, is affiliated with San Jose (CA) State University's College of Business. Visit transweb.sjsu.edu

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