About the Center

Nevada Urban Transportation Center (NUTC) at the University of Nevada, Las Vegas is a Tier II center. It is envisioned that NUTC will complement and expand on the existing education, research, and outreach activities at the Transportation Research Center (TRC) at the University of Nevada, Las Vegas (UNLV). For NUTC, the first year local matching funds of $500,000 has been provided by the Regional Transportation Commission (RTC) of Southern Nevada (www.rtcnv.com), the local Metropolitan Planning Organization (MPO). The growth and development of NUTC will be based on the Center’s Vision, Mission, and Goals.

Vision
NUTC will strive to become a nationally recognized center of excellence for research in planning, operations and management of sustainable transportation systems in rapidly growing urban areas. The center will serve as a vital source of knowledge and training for leaders and professionals who are prepared to meet the nation’s need for the safe, secure, and efficient movement of people and goods.

Mission
• Perform research to advance expertise and application of technology in traffic operations and management in rapidly growing urban areas
• Assist national, state and local transportation agencies in meeting their needs to provide safe, efficient, and sustainable transportation systems
• Educate and train leaders and professionals prepared to meet the region’s and nation’s need for safe, efficient and sustainable transportation systems
• Seek collaborative research efforts with institutions and organizations with similar goals
• Provide extension and outreach services to public and private sector organizations

Goals
To perform research and educational activities in the following areas:
• Development of strategies to assist with the planning and management of sustainable transportation infrastructure in fast growing communities
• Enhanced mobility and improved traffic operations in metropolitan areas
• Mobility and safety issues to meet specific needs of increasing population groups such as the elderly, children, new drivers, and individuals with severe illnesses and disabilities
• Development of professionals and future leaders in the area of transportation systems
• Support of career growth and development of practitioners in transportation systems
• Continuing education/transfer of technology
Address from the Co-Directors

Pushkin Kachroo, Ph.D., P.E. - Co-Director
Welcome to the new semester! We hope to have a very productive and fun semester in which we take concrete steps forward in many areas. We at the UTC at UNLV are working on various aspects of our Center. We are working on our web site to make it more professional. We are working on making the web site informational so that visitors can get the information they want from the Center. We have Dr. Dangeti who, apart from being a researcher is also the I.T. director for the Center. Vinod Vasudevan, apart from being a researcher, is in charge of publications and our technical meeting planner.

We are working on consolidating the research that has been performed last year for UTC and are planning the research for next year. We are developing project areas that are closely associated with work that is important to our sponsors such as RTC and NDOT.

In the education side, we are developing a new online course called transportronics, that, like mechatronics, is a multi-disciplinary course and combines transportation and electronics. It will teach transportation students and engineers hands-on electronics skills that are needed in practice. They will learn to analyze circuits and build them. They will also learn how to program microcontrollers. They will also learn how to design and build interfaces for sensors, such as traffic sensors and actuators, such as dynamic message signs or traffic lights, with the microcontroller. This course will be taught in class and students will also be able to take it online. This course will be the first one of its kind in the country. This course will give us experience in building online courses which we can then use to develop an entire M.S. program in transportation online.

Ken Peck, Ph.D. - Co-Director
Welcome to Urban STEPS, the Nevada Urban Transportation Center’s newsletter. It has taken a while to get this newsletter venture off the ground and as you can tell the naming and graphics treatments are going to have to catch up. We welcome your creative input in this venture. Accomplishing what our lead article presents about the Center’s vision, mission and goals, as presented in our strategic plan, will be worthy challenge.

Organizationally the TRC/UTC management structure has been flattened to having two Co-Directors working in tandem. This has been done to expedite the many activities that are needed to bring the UTC more in alignment with our peer UTC programs in other Universities. Our website is undergoing a makeover and will continue to evolve. More will be said about this in a later newsletter. We are pleased that one of the primary focal points of the Center, the transportation research projects, are making progress, since commencing their activities this past September. Introducing the five research projects to our readers is one of the goals for this first newsletter. One area that the UTC could use some guidance from you is how to better work with the government agencies and our sponsors to beneficially align the Center’s research activities. Don’t hesitate in sharing your thoughts on this topic. The UTC Staff and research teams look forward to interacting with you and working together in our transportation endeavors to have Sustainable Transportation for Economic Progress and Safety.

Summary of Funded Projects for the First Fiscal Year

Defining the Digital Highway
*PI: Robert Abella, Ph.D.*

The “Digital Highway” is a static, dynamic, and real-time description of the physical and operational characteristics of our nation’s highways that positively impacts the performance, efficiency, safety, security and comfort of drivers. The Digital Highway is the backbone that will support the concept of the intelligent highway transportation system of the future. The information contained in the digital highway database will be used to support future research in a wide range of transportation areas. This project focuses on developing all of the parameters needed to define the “Digital Highway” on seven miles of urban highway in Nevada.

Develop Guidelines for Access Management in Las Vegas
*PI(s): Mohamed Kaseko, Ph.D. and Hualiang Teng, Ph.D.*

The objective of the study is to develop guidelines on access management for the Las Vegas area. Specially, the spacing between accesses including signal intersections, driveways, and opening in medians will be investigated. The benefit of corner clearance, circulations in commercial subdivisions, and frontage roads will also be evaluated.
The investigation and evaluation will be conducted based on (1) using statistics model analyzing field data and (2) developing microscopic simulation models. The findings from the study will be used as a foundation for developing guidelines on access management for the Las Vegas area.

Build A Mobile Vehicle for In-situ Measurement of Dust of UFP and PM1
PI(s): Shizhi Qian, Ph.D. and Hualiang Teng, Ph.D.
A multidisciplinary group of engineers from the Department of Mechanical Engineering and the Department of Civil and Environmental Engineering, propose to develop a mobile vehicle equipped with particle size analyzers for in-situ measurement of traffic-generated Ultrafine Particles (UFP, particles with a diameter of 0.1 micrometers or less) and PM1 (particles with a diameter of 1.0 micrometers or less). The existing systems could not determine UFP and PM1 because of the variable composition and the ability of these particles to penetrate deeply into the respiratory tract. The proposed vehicle can measure both particle number concentration and particle size distribution, while the existing systems can only measure the particle number concentration. When the proposed vehicle travels on a predetermined route in urban areas such as Las Vegas, the obtained particle size distribution data would help to develop fine particle emission inventories. This would be the first system of its kind with these capabilities, and may help develop understanding of the emissions of ultrafine particles.

Dust Suppression through Active Control of Vehicle Surfaces
PI(s): William Culbreth, Ph.D. and Trevor Wilcox
Fugitive dust presents a significant health problem in southern Nevada where off-road recreational and construction vehicles can generate large plumes of caliches and surface soils high into the air. In addition to producing a visibility hazard, settling dust with small diameter (PM 10) can settle in human lungs producing health problems and evading the body’s ability to remove them. We propose to combine novel control surfaces with the associated software to reduce the size of vehicle wakes and the subsequent injection of fugitive dust into the atmosphere. If successful, vehicle wake management will reduce the production of dust in the Las Vegas Valley with the collateral benefit of reducing vehicle drag and fuel costs.

Analysis of Alternatives for Accommodating Trucks on Urban Freeways in Southern Nevada
PI(s): Hualiang Teng, Ph.D. and Mohamed Kaseko, Ph.D.
Traffic engineers and planners are increasingly becoming aware of the safety and traffic operations implications brought by the differences in operating characteristics of trucks and autos in mixed traffic lanes. The current system that mixes large trucks and autos in traffic lanes, leads to frequent conflicts between these vehicle types. The truck operators generally believe the mixed lanes unduly limit the potential productivity of long-haul trucking. On the contrary, most passenger vehicle drivers are intimidated when squeezed-in or tailgated by large trucks, which is sufficient enough to consider excluding trucks from some lanes. Furthermore, safety groups are increasingly pressuring transportation agencies to implement various truck strategies that would keep the general motoring public free from exposure to big rigs in the mixed traffic lanes, thus, alleviate traffic congestion and improve safety.

Tutorial: Feedback Control in Intelligent Transportation Systems
by Pushkin Kachroo, Ph.D., P.E.
Feedback control theory has been traditionally used for controlling the speed of motors, vehicles, and many mechatronic systems. It has also been used in process control in manufacturing. The theory has wide applicability to dynamic (i.e. time-dependent) systems, where the state of the system is being monitored in real-time using sensors and where we can then process this information in order to control the state of the system using actuators in real time. Hence, a dynamic system must have sensors, a processor, and actuators in order to for it to have a feedback control. As an example, a ramp metering system has all these three components. It has sensors such as loop detectors on the highway section for estimating traffic speed or occupancy, a processor that gets the information from the sensors, and the actuator is the ramp signal that controls the inflow rate into the highway. This is shown in Figure. Feedback control theory allows us to design the inflow rate at the ramp to be dependent on the current sensed traffic conditions. The details of how the formula for the inflow-rate is derived will be shown in the next part of this tutorial.
News from the Center

Dr. Eric Sandgren, the Dean of the college of Engineering appointed Dr. Pushkin Kachroo and Dr. Ken Peck as the Co-Directors of the NUTC.

Dr. Mukund Dangeti and Mr. Vinod Vasudevan of NUTC, along with Mr. Jerry Duke of Regional Transportation Commission of Southern Nevada co-hosted a workshop on “Innovative Countermeasures for Pedestrian Safety” in April 2008 during APA 100th National Planning Conference.

Safe Community Partnership and RTC of Southern Nevada hosted two pedestrian safety workshops for engineers and planners in May offered free of charge through the generosity of FHWA and NHTSA.

Ms. Vidhya Kumaresan, a graduate student of NUTC received “Best Student Presentation” competition organized by ITE Nevada Chapter for her presentation titled “Development of a GIS-Based Safety Analysis System”.

Mr. Vinod Vasudevan was elected as the Vice-President of Institute of Transportation Engineers (ITE) Nevada Chapter.

NUTC Staff
Pushkin Kachroo, Ph.D., P.E........... Co-Director
Ken Peck, Ph.D. .........................Co-Director
Erin Breen, Director, Safe Community Partnership
Mukund Dangeti, Ph.D............Asst. Research Prof.
Marin DuBois.......................Grants Coordinator

Newsletter
Vinod Vasudevan, P.E ..............Editor-in-Chief

Ms. Erin Breen, Dr. Ken Peck, and Mr. Vinod Vasudevan participated in Nevada Safety Summit in Henderson, NV in April.

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www.trc.unlv.edu