

by Siriphong (Toi) Lawphongpanich, Ph.D.

# Pareto-Improving Congestion Tolls





# MESSAGE FROM THE Director

Dear Colleagues:

With the spring semester drawing to a close, the CMS has been busy at work tracking research projects, organizing events, managing the daily particulars of the Center and preparing for the activities of the next academic year.

In February of this year, we awarded seven research grants totaling \$633,012

and expect the first quarterly reports from those projects in June. The selected projects originated from the Departments of Civil Engineering (transportation), Industrial & Systems Engineering and Urban & Regional Planning, and they all show great potential for some fascinating research results. The studies range in subject from pricing approaches for mitigating congestion to multimodal solutions for large scale evacuations; a study from our urban planning researcher will look at developing general methods for measuring the transportation impact on land use and location using vehicle miles-of-travel and travel time.

March was very active with back-to-back events, as we held our first meeting of the Center's External Advisory Board (EAB) and the First Annual Student Conference. These two events were truly a success. Feedback from our EAB members during the meeting was very positive, and we received valuable guidance and suggestions. We have begun to implement one of the EAB's suggestions with the launching of our first live webcasted seminar, which took place on April 25 (Distinguished Lecturer in Transportation Seminar - speaker Chandra Bhat from the University of Texas at Austin). Additional information on our seminar series is provided in this issue of our newsletter and on our Web site.

Our student conference attracted over 40 students, faculty, staff and other transportation professionals, and also included our EAB members. Students from the Departments of Civil Engineering, Industrial & Systems Engineering, Occupational

Therapy and Urban & Regional Planning presented their graduate research on various topics, with a poster session held in the afternoon. Both the board meeting and the conference were held in the facilities of the Samuel P. Harn Museum of Art at UF. You can visit our Web site at <http://cms.ce.ufl.edu> (see Seminars and News links) to view PDF files of the various presentations.

Three interns were selected for this summer's Transportation Research Internship Program. This is a paid internship that will run from May to August each year. Interns will work with transportation faculty and contribute to on-going projects at the center. They will be required to prepare research reports on their projects and present their findings at the end of the summer session.

Back at the CMS home base, work is progressing quite nicely. Our Web site is replete with information and postings regarding our recent activities, and our staff is diligently gathering data for our first annual report, due out this summer.

The Center's Internal Steering Committee (ISC) continues to meet once a month. These meetings are valuable, as the ISC members provide guidance and input on various decisions affecting the Center. We have one addition to the ISC this year, Sherrilene Classen, an assistant professor in occupational therapy, and we are delighted to have her on board.

Looking further ahead this year, we will be issuing our second call for proposals in September and anticipate an increase in the number that will be submitted. In the fall, we plan to offer various information sessions to students regarding the transportation profession and graduate school opportunities. These sessions will take place at UF and one or two other schools.

As we are approaching the end of our first year, I am very pleased with what the CMS has been able to accomplish. Our success is the result of the combined effort from a group of highly motivated and dedicated individuals that have come together to address congestion problems. I look forward to another exciting year, with new opportunities and challenges ahead, and I am convinced that the human force powering the CMS will continue to drive it forward in the future.

Sincerely,

Lily Elefteriadou, Ph.D.  
CMS Director

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CMS Director Lily Elefteriadou delivers her opening remarks to the EAB during the Center's first meeting with the External Advisory Board.



CMS

# Holds First External Advisory Board Meeting

The CMS held its first External Advisory Board meeting on March 6 and 7 at the Samuel P. Harn Museum of Art in Gainesville. The objectives of the meeting were to provide an overview of the Center's current activities and plans for the future, and to solicit the EAB's input and guidance on how the CMS can best achieve its goals.

The CMS currently has 10 board members from academia, public agencies, and the private sector.

"The EAB membership covers a wide spectrum of the transportation profession, and they bring a huge

amount of expertise," Elefteriadou said.

"I believe they are a very crucial part of the CMS, and I hope we can keep them as engaged with the activities of our center as they were at this first meeting."

After welcoming remarks and a general overview by Elefteriadou, Pramod Khargonekar, Dean of the UF College of Engineering, addressed the board members and thanked them for their involvement with the new center.

The format of the meeting included presentations from the CMS's Internal Steering Committee and advisory board.

Bill Sampson, a member of the ISC and director of the McTrans Center, was thrilled with the board's concern for the success of the CMS.

"I felt a sincere buy-in from the external members showing a real interest in what the CMS wants to accomplish," Sampson said. "And on the other side, it was very apparent that the ISC was committed to following through on thoughts and suggestions from the external members."

Participating via conference call, EAB member Genevieve Giuliano, senior associate dean of research and technology at the University of Southern California School of Policy, Planning and Development, presented on "What Makes a UTC Successful."

Giuliano stressed the importance of balancing Center goals, adhering to the Center's strategic plan, partnering with the Florida Department of Transportation and other university transportation centers in Florida and nationally, and having a user-friendly Web site. She also reminded the CMS of the importance of adhering to the expectations and reporting requirements of the U. S. Department of Transportation Research and Innovative Technology Administration (RITA).

Board member Richard Long, director of research at the FDOT in Tallahassee, had a practical approach when addressing the CMS regarding FDOT research priorities and partnership with UF.

Long said that the CMS should share research needs and projects with other states, universities and centers as a means to fund a larger effort with a fraction of the money coming from each of the participating entities.

On the second day of the conference the EAB resumed its activities with attendance at the Center's First Annual Student Conference, where students from transportation engineering, industrial and systems engineering, occupational therapy and urban and regional planning showcased their work. After the half-day conference, the EAB resumed their meeting and concluded by providing an on-site evaluation, which was well-received by all members of the CMS.

Materials from the EAB meeting are posted on the CMS Web site at <http://cms.ce.ufl.edu/news>. 

## EAB members

**Laura Kelley**, Orlando-Orange County Expressway Authority

**Teresa Scott**, City of Gainesville

**Wayne Kittelson**, Kittelson & Associates, Inc.

**Max Crumit**, The PBS&J Corporation

**Genevieve Giuliano**, University of Southern California

School of Policy, Planning and Development

**Mark Hallenbeck**, TRAC at the University of Washington

**Tamara Christion**, Federal Highway Administration

**Ananth Prasad**, Florida Department of Transportation

**Richard Long**, Florida Department of Transportation

**Debora Rivera**, Florida Department of Transportation

# Pareto-Improving Congestion Tolls

by Siriphong (Toi) Lawphongpanich, Ph.D.



Siriphong Lawphongpanich joined the Department of Industrial & Systems Engineering at the University of Florida in December 2001. His main research interests are in transportation science, large-scale optimization, and logistics. He has published widely in these areas. Recently, he is a co-editor of a book titled *Mathematical and Computational Models for Congestion Charging* published by Springer.

Although the concept has been around for more than 80 years and many have recognized it as an efficient method for regulating congestion, congestion pricing has become practical only recently due to the advent of electronic tolling. When compared to the alternative of building more roads, congestion pricing, especially via electronic tolling, is more attractive and successful implementations (e.g., Singapore, Oslo, London and Stockholm) exist worldwide.

In the United States, Congress established the Congestion Pricing Pilot Program in 1991, which authorized Federal Highway Administration to enter into cooperative agreements with up to 15 state/local governments, or other public authorities, to establish, maintain and monitor congestion pricing projects. Later, Congress reauthorized the program with a slightly broader scope under the name Value Pricing Pilot Program. In August 2007, the U.S. Department of Transportation entered into urban partnership agreements with five cities (Miami, Minneapolis/St. Paul, New York, San Francisco and Seattle) under its new congestion initiative.

Despite the successes of congestion pricing projects in the United States and abroad, governmental supports such as the Value Pricing Pilot Program and U.S. Department of Transportation's Congestion Initiative, and the rapid increase in traffic congestion in areas of all sizes, getting the public to accept congestion pricing remains a major obstacle.

At the 2006 Transportation Research Board Summer Workshop on innovations in pricing, the former secretary of the Washington State Department of Transportation Douglas McDonald, observed that "despite our best efforts, opinion research shows we face a skeptical public" and offered a \$1,000 reward to an individual or group that proposes the most effective communication tool for promoting road pricing. Elsewhere, road pricing schemes proposed for Hong Kong, Cambridge, England and Edinburgh, Scotland were not implemented. Anthony May from the Institute for Transport Studies, University of Leeds, reported in 2005 that 10 or more pricing proposals were "largely abandoned" in United Kingdom.

To make congestion pricing more appealing the public, Toi Lawphongpanich and Yafeng Yin of the University of Florida Center for Multimodal Solutions for Congestion Mitigation recently received funding from the National Science Foundation to explore a new class of Pareto-improving congestion pricing schemes.

When compared to the situation without any pricing intervention, schemes in this class reduce congestion or improve social benefit while not making anyone worse off. At the fundamental level, the two researchers contend that Pareto-improving pricing schemes are more appealing to the public because these schemes make no one worse off or increase the travel cost beyond what the public has been paying in

	Without Pricing		Marginal Cost Pricing			
	Flow (UE)	Time	Flow	Time	Toll	Time + toll
Link						
(1, 3)	3.60	36.00	2.06	20.64	20.64	41.28
(1, 2)	0.00	50.00	1.54	51.54	1.54	53.07
(3, 2)	2.28	12.28	0.90	10.90	0.90	11.79
(3, 4)	1.32	35.06	1.17	31.21	29.21	60.43
(2, 4)	2.28	22.78	2.43	24.32	24.32	48.63
Path						
1-3-4	1.32	71.06	1.17	51.85	49.85	101.70
1-3-2-4	2.28	71.06	0.90	55.85	45.85	101.70
1-2-4	0	72.78	1.54	75.85	25.85	101.70
Costs to users		255.82		227.11	139.02	366.13

Table 1: Flow distributions with and without marginal cost pricing

	Without Pricing		Pareto-Improving Pricing			
	Flow (UE)	Time	Flow	Time	Toll	Time + toll
Link						
(1, 3)	3.60	36.00	2.24	22.40	0.00	22.40
(1, 2)	0.00	50.00	1.36	51.36	0.00	51.36
(3, 2)	2.28	12.28	0.61	10.61	18.35	28.96
(3, 4)	1.32	35.06	1.63	42.75	5.91	48.66
(2, 4)	2.28	22.78	1.97	19.70	0.00	19.70
Path						
1-3-4	1.32	71.06	1.63	65.15	5.91	71.06
1-3-2-4	2.28	71.06	0.61	52.71	18.35	71.06
1-2-4	0	72.78	1.36	71.06	0.00	71.06
Costs to users		255.82		234.99	20.83	255.82

Table 2: Flow distributions with and without Pareto-improving pricing

terms of travel time before any pricing intervention.

To illustrate the unappealing aspect of traditional congestion pricing schemes, marginal cost (MC) pricing in particular, and the potentials of the Pareto-improving (PI) approach, consider the network in Figure 1 in which there is only one origin-destination pair (1, 4) with a demand of 3.6 million travelers or users. (In practice, the demand can be measured in units of thousands or millions, e.g., 3.6 millions of travelers want to travel from node 1 to 4.) The function next to each link is the travel time or link performance function.

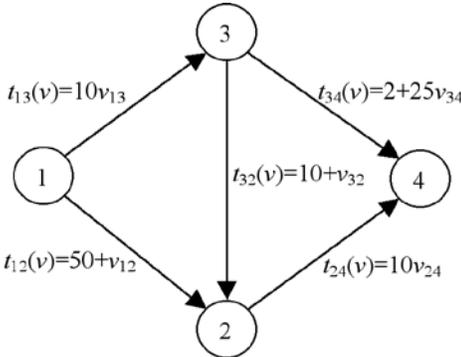


Figure 1: A five-link network

Table 1 displays the link and path flow distributions with and without MC pricing along with the associated costs. The flow distribution without any pricing is a user equilibrium traffic flow distribution. In the second and third columns, the table lists the amount of flow (or the number of users) on each link and path along with the travel time such flow induces. Without any pricing, travelers use only two routes 1 – 3 – 4 and 1 – 3 – 2 – 4. Both take 71.06 time units to arrive at node 4, the destination. As such, the users of these two routes have no incentive to switch to route, 1 – 2 – 4, a longer route with a travel time of 72.78. Thus, the total travel time or delay for the 3.6 users is  $3.6 \times 71.06 \sim 255.82$ , as reported at the bottom of the third column.

Under MC pricing, tolls are of the form  $t'_a(v_a)v_a$  where  $t'_a(v_a)$  is the derivative of the travel time function, and  $v_a$  is the flow on link  $a$ . As shown in Table 1, MC pricing

charges a toll on every link and the total travel cost (time + tolls) to each user increases to 101.70. When examining the path flows, MC pricing forces 1.54 travelers to use path 1 – 2 – 4. These travelers suffer twice, once for having to use a longer route (75.85 instead of 71.06) and the other for having to pay tolls (25.85 time units). Overall, the total cost to the 3.6 travelers under MC pricing is 366.13, which is more than the total cost (255.82) without any pricing, a cost consisting entirely of time or delay. However, MC pricing yields less total delay (227.11) and generates toll revenue (139.02) for the transportation authority. Thus, under MC pricing, every user is worse off and the only one better off is the transportation authority.

Table 2 compares the flow distributions with and without PI pricing. Under PI pricing, there are tolls on two links, (3, 2) and (3, 4), and the total cost (time + tolls) for every traveler is 71.06, the same as that without pricing. In addition, the total delay under PI is 234.99, an amount less than the one without pricing (255.82). When compared to the absolute minimum (227.11, as shown in Table 1 under MC pricing), the delay under Pareto-improving pricing is only 3.5 percent more. On the other hand, there is a toll revenue of 20.83 that can be used to, improve or subsidize the transit system to increase its ridership. Thus, PI pricing in this example is ideal—no user is worse off, there is less delay and the transportation authority can improve or subsidize its transit system with the toll revenue generated.

In two recent reports, Lawphongpanich and Yin formulated and developed a technique for solving the problem of finding PI tolls and provide results using transportation networks from Sioux Falls and Hull. In one of these reports, they indicate that PI tolls are relatively prevalent. When these tolls do not lead to the desired level of congestion reduction, approximate Pareto-improving tolls often do so without making anyone severely worse off.

# 1<sup>st</sup>

# ANNUAL STUDENT CONFERENCE



Some participants of the First Annual Student Conference gather for a break in the lobby of the Samuel P. Harn Museum of Art.

The rain did not stop 45 students, faculty, staff and other guests from attending the CMS's 1st Annual Student Conference held at the Samuel P. Harn Museum of Art on March 7, 2008, which showcased graduate student work related to transportation conducted at UF.

Students presented on topics ranging from optimal dynamic pricing strategies for high occupancy/toll lanes to Florida as a model state for older drivers, with representation from civil engineering, industrial and systems engineering, occupational therapy and urban and regional planning.

Abishek Komma, 23, a master's student in the civil engineering transportation program at UF, was one of the student presenters. His work was entitled "Modeling the Departure Traffic Assignment Model for Managed Lanes." He thought the conference was productive and believes the presence of the CMS's External Advisory Board was crucial.

"The attendance of the board was important because this might translate into taking concepts from research and trying to implement them in practice," Komma said. "This, in fact, is one of the crucial and important factors of most research and how the research can help improve the state of practice. And, this complements the very reason why CMS was established, to help develop innovative solutions to the congestion problems."

The conference was held in conjunction with the first meeting of the CMS's External Advisory Board, whose members attended the conference and showed much interest in the various showcased projects.

Laura Kelley is deputy director of finance, administration and planning of the Orlando-Orange Expressway Authority, and a member of the Center's external advisory board. For her, the conference presented an excellent forum to discuss and learn about the research taking place at the CMS.

"The CMS Student Conference was a tremendous opportunity for leaders of the transportation industry to learn and comment on the important congestion mitigation research being conducted at the University," Kelley said. "The information made available through CMS research to our agency and other transportation agencies around the country enable us to better serve the future mobility needs of our country."

Kelley is extremely interested in the congestion pricing studies currently being researched at the Center. She said that as the central Florida region continues to grow, the Orlando-Orange County Expressway Authority will need to consider many congestion mitigation options, such as optimal dynamic pricing and discrete time priced managed lanes to continue to provide customers with predictable travel times, which also maximize throughput on expressways.



Grady Carrick, a Ph.D. student in transportation engineering, discusses his study on the data collection needs for work zone incidents at the Chandler Auditorium of the Samuel P. Harn Museum of Art during the student conference.

Scott Washburn, an associate professor of civil engineering at UF, believes that developing ties with the transportation community in Florida and in the United States is vital to the success of the CMS.

“The EAB members are all prominent figures in the transportation profession and bring a great deal of experience, knowledge, and insight to the table,” Washburn said. “Obtaining input from these individuals is invaluable to the mission of our center, and it is also a confirmation of our capabilities and potential, that these prominent individuals want to be involved in our center activities.”

The Departments of Urban and Regional Planning and Occupational Therapy were well represented at the conference. Kezia Awadzi of occupational therapy discussed why Florida is considered a model state for older drivers. Abdunaser Arafat, a doctoral student in urban and regional planning, presented on using network distances using spatial interpolation.

Awadzi admits that when the CMS was first created in the fall of 2007, she found it hard to envision how occupational therapy would fit together with the research mission of the Center.

“I saw the first call for proposals, which was specifically for congestion studies, and at the time, I did not see a tie with OT,” she said. “After attending the student conference, I kind of saw a tie because of some of the social factors that were in the studies presented an indirect way to influence the travel time. For example, if older drivers were to drive at a certain time of the day and regulate their driving it would impact the traffic patterns.”

Sandra Winter, a doctoral student in occupational therapy, agrees. She said that after listening to a couple of the presentations she was able to see ties with occupational therapy and their work with older drivers.

“For example, one person was going to look at focus groups to describe people merging and merging behaviors on ramps from the interstate,” Winter said. “And there was feedback from the audience, specifically to say ‘In your focus groups, are you recruiting one type of driver, are you going to look across the spectrum?’ and we generally have access to information that can help explain the percentage of older drivers and the characteristics of how they drive and influence things like merging behavior and congestion.”

Student presentations can be viewed by visiting the CMS Web site at <http://cms.ce.ufl.edu/seminars> 

## Featured RESEARCHER

# Ruth Steiner

Urban and Regional Planning



Ruth Steiner, associate professor of urban and regional planning at UF, talks about land use and planning at a joint CMS and Transportation Research Center seminar this spring.

After nearly two decades of research and practice in the area of urban and regional planning, Ruth Steiner, associate professor of urban and regional studies at UF, still maintains an active research program that is rapidly becoming an important part of the CMS.

Steiner specializes in the coordination of land use and transportation with an emphasis on alternative modes of transportation. She is a member of the CMS's Internal Steering Committee and is a real champion for collaborating with the Center.

"It's a natural fit and only logical," Steiner said. "We are all trying to solve the same problem, but we are seeing things from a very different perspective, and that meshing of perspectives is a really good way of thinking about how we can come up with creative solutions that neither side would have come to on its own."

Collaboration between urban and regional planning and transportation at UF is only recent, however. In the past, priorities were mostly placed on the engineering aspects of transportation, and little common ground existed with those researching urban planning, she said.

"The emphasis in transportation at that time was signal timing and traffic operations and the more engineering aspects of transportation, while I was doing research in pedestrian and bicycle planning, which is not exactly mainstream transportation planning either," Steiner said.

But the winds of change brought in a different perspective when the current CMS Director, Lily Eleftheriadou, was hired.

### The concurrent degree program

The collaboration between the two departments led to the creation of the Concurrent Degree Program in Transportation Engineering and Urban Planning. The program promises to prepare students for a successful career in the interdisciplinary field of planning, designing and operating urban infrastructure. Two students have already enrolled in the program, and Steiner expects it to grow.

"Planning students spend a lot of time working with engineers and vice-versa," Steiner said. "The real advantage is that the concurrent degree gives graduates a leg-up in the market. They are of value to their employer, as they understand both sides."

The building of the concurrent degree was a process that developed over time, she said. Her meetings with Siva Srinivasan, an assistant professor in the transportation engineering group, yielded the logistics and structure for the program. The two reviewed dual degree programs at other universities before determining UF's requirements.

Steiner's involvement is very useful to the CMS because her expertise in transportation policy complements the civil and coastal engineering faculty's focus on the analysis, modeling and operation of transportation systems, Srinivasan said. He also pointed out that the relationship with urban and regional planning assists the Center in pursuing transportation research within the broader context of understanding and improving the overall urban system.

### Her research program

Steiner is finishing up a transportation concurrency project for multimodal transportation systems in Florida. The study is looking at ways to sustain the flow of automobile traffic while at the same time designing viable communities.

# New Concurrent Degree Program for Transportation Engineering and Urban and Regional Planning

The CMS is now offering a concurrent degree in transportation engineering and urban planning. The program already has two students and it is expected that its numbers will to grow as more and more students become aware of the benefits associated with acquiring this great blend of skills.

The concurrent degree program was created to prepare students for a career in the interdisciplinary field of planning, designing and operating urban infrastructure. Students in this program take courses in transportation engineering and urban planning and earn a Master of Engineering (M.E.) (or a Master of Science – M.S., if the student’s undergraduate degree was not in engineering), and a Master of Arts in urban and regional planning. Students take a total of 73 credit hours (30 in transportation engineering and 52 in urban planning, with nine credits shared between both degrees). The program takes three years to complete. Funding opportunities are available for students through the CMS or the Departments of Civil Engineering and Urban & Regional Planning.

For more specific information, including admission requirements and faculty contact information, visit <http://cms.ce.ufl.edu> 

“What we are trying to say is that we know we have to keep automobile traffic flowing because it is important to the economic future of the state,” Steiner said. “So we are trying to develop the right kinds of incentives to do the right kind of planning.”

She said the problem with concurrency is that redevelopment of a viably fit downtown, for example, might pose a problem if the roads are congested. With multimodal planned transportation, the idea is to design a community balanced for all modes of transportation, such as cars, buses and bicycles, including sidewalks and trails for pedestrians.

Another project Steiner is working on involves children’s travel to school. The project is funded through the Robert Wood Johnson Foundation, which is dedicated to reversing the increase in childhood obesity.

“What they are concerned with is travel to school as an active mode of transportation and as a mode of physical activity,” Steiner said. “The connection to obesity is that we see it as a function of activity because kids are spending more time in front of the TV or playing computer games and probably eating more junk food.”

In the 1960s, almost half of children walked or bicycled to school, and today less than 13 percent do, Steiner said.

“What I am trying to look at in the study is the role of location of schools and what effect that has on children’s ability to walk to school,” Steiner said. “We are measuring the specific use of land and the neighborhood surrounding it at three different levels: How many kids live close to the school (the relationship between residential density and the school), what happens when you adjust for policies of the school board (how attendance zones are drawn), how major roadways may affect that relationship, and how many kids are actually walking to a sampling of schools.”

With a grant recently funded by the CMS, Steiner is working on a vehicle-miles-traveled project. In this project, Steiner and co-investigator Srinivasan are looking at designing a system to decrease the amount of trips people take by automobile with the potential of reducing the distance traveled during these trips.

## Life before UF

The agricultural academics would love it. Steiner can talk milk, milk fat, Holsteins, Brown Swiss and mixed breeds. That’s what happens when you are born on a dairy farm in Wisconsin.

“I had to milk cows and had to do farm work since the age of 6 or so,” Steiner said. “There was a dairy cooperative that my father sold milk to called Lake-to-Lake, you know like the Land-o-Lakes brand, and my father also worked in a small engines factory in a small town called New Holstein, Wis.”

Her mother was a homemaker turned teacher’s aid after raising 16 children. Steiner is child number seven.

After graduating from high school, Steiner studied history at Lawrence University in Wisconsin and then received her MBA from the University of Wisconsin-Milwaukee. Her goal was to lead a corporate lifestyle and become a businesswoman. However, involvement in her local Milwaukee community and with the Sierra Club changed her path in life.

This active participation in community planning is what eventually led Steiner to the University of California at Berkeley where she finished a master’s degree in city planning. For the next few years, she worked for the Vermont Public Service Board and worked on energy utility regulation.

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# National Older Driver Research and Training Center — NODRTC

If you've ever had an aging loved one who refuses to give up driving, you know that it can be difficult to convince them to do so, especially when they have not realized that their driving days might be coming to an end. With Florida being a haven for retirees, anticipating the needs of older drivers is a pressing issue. In Florida, 18 percent of the population is 65 and older,

Research at the NODRTC draws its expertise from an interdisciplinary group of faculty and students, which use high-tech tools such as a high-fidelity driving simulator and various instrumented vehicles to conduct studies.

Older drivers, however, are not the only segment of Florida's population being researched by the NODRTC. Investigators are also studying driving in other age categories, especially in those with limited mobility, through the creation of the Institute for Community Mobility, the umbrella center housing the NODRTC. Co-director of the NODRTC, Dennis McCarthy, explains.

"A lot of the things that we discovered are applicable and beneficial not only to senior citizens but also to younger people and people with disabilities," McCarthy said. "In addition to that, we had a substantial number of people for whom we recommended that they stop driving. For a lot of these people, there are very few options to enable them to stay mobile once they have stopped driving, so, recognizing the importance of this, we decided to broaden our scope of work that we are looking at."

The ICM includes all age groups without disabilities, which spans the spectrum from driving to riding in other vehicles, he added.

Regardless of age, congestion certainly exists in most communities, and the CMS believes that by collaborating with the ICM/NODRTC, they can arrive at some very important conclusions regarding the impacts of driver characteristics on congestion.

"There are three major components in the transportation system: the infrastructure, the vehicle and the driver," said CMS Director Lily Elefteriadou. "What research has shown is that individual driver behavior, such as lane changing decisions, greatly affects traffic. The NODRTC is greatly positioned to help us understand the impact of the driver on traffic operations and congestion initiation."

The ICM/NODRTC also has a notable academic program. It offers doctoral studies in rehabilitation science and research opportunities for post-doctoral fellowships, among other programs. Kezia Awadzi, a post-doctoral researcher, is a product of the NODRTC. She said she became fascinated with older driver research, while working as a graduate assistant on a Centers for Disease Control and Prevention project with Sherrilene Classen, an assistant professor in occupational therapy at the NODRTC. Awadzi likes the dynamic nature of older driver research.



Kezia Awadzi, Ph.D. (front) and doctoral student Sandy Winter, both of occupational therapy at UF.

and it is estimated that one in four residents will be older than 65 by the year 2020. That age group will take 80 percent of their trips by car.

But for seniors in the state, the National Older Driver Research and Training Center at the University of Florida offers valuable resources such as driving assessments, strategies for safe driving and counseling for those who can no longer drive but want to preserve a sense of mobility in their community.

The Center was established in 2000 under the name of Seniors Institute on Transportation and Communities but became the NODRTC in 2003 to reflect a national focus after receiving grants from the Centers for Disease Control and Prevention and the Federal Highway Administration. The NODRTC is also funded by the Florida Department of Transportation and the National Highway Traffic Safety Administration.

“The main component of older driver research is that you move in different directions, like you do something on medication, something on injury and driving, so in the end you begin to see a bigger picture,” Awadzi said. “There is a lot of opportunity to expand, and because people are working on different projects, you get to know what is going on outside your own, and you get to find ways to use what you’ve learned to make yourself a better researcher.”

Sandy Winter, a doctoral student in the rehabilitation science program at the NODRTC, agrees. She said that older driver research is a complex public health issue because it involves many factors, including medical conditions as they relate to crashes and the behaviors that lead to them such as personal, social and psychological factors. Winter is working with Classen on her dissertation and will use these qualitative factors to contribute to the development of a measure for safe driving behavior for older adults. Winter believes the strength of her program also comes from the skilled faculty at the NODRTC.

Classen’s research focuses on creating a public health model for promoting and predicting safe driving among older adults and on investigating the differences between younger and older drivers on varying road conditions. She believes her association with the CMS will help her learn

about congestion and its effects on older drivers, so that she may offer useful and safer driving strategies to the older population.

“Better understanding congestion and associated traffic factors will help us to conceptualize the ever increasing environmental demands,” Classen said.

With Classen’s participation in the ISC, Elefteriadou hopes to join forces with her and others from the ICM/ NODRTC on future projects.

“We are very excited about collaborating with the ICM/ NODTRC because we see an excellent opportunity to shed some light on the impacts of driver behavior on traffic and congestion, as well as on the contribution of specific driver actions on congestion initiation,” Elefteriadou said.

As the aging population in the state of Florida continues to grow, the presence of senior citizens on its roads will likely increase. But with the NODRTC comfortably established, this segment of the population will continue to benefit from the valuable information available to them when driving will no longer be an option.

For more information on the NODRTC, visit <http://driving.php.ufl.edu> 

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## Ruth Steiner Urban and Regional Planning

Climbing further along the academic ladder, Steiner went back to UC-Berkeley to begin her Ph.D. studies. She worked with a researcher at the Lawrence-Berkeley National Laboratory who wanted someone with land use, air quality, energy and transportation experience.

She admits that at the time transportation was her weakest link, but she began to explore the relationship between transportation and planning, asking herself questions and merging the two areas in her study.

“Questions came up on how to create communities where people have choices about transportation and are not dependent on automobile use,” Steiner said. “I did my dissertation on neighborhood shopping centers and looked at what mode of transportation people used to get there.”

### Hard work pays off

Steiner is the first woman to be tenured in the Department of Urban and Regional Planning at UF, an accomplishment she is quite proud of.

“I got my tenure in 2002,” Steiner said. “A lot of the planning departments were created in the 60s and 70s when there weren’t that many women. But now, out of a faculty of 10 here at UF, there are four female faculty. I am a trail blazer.”

But Steiner doesn’t rest on her laurels. She continues to train students and involves them in various data collection projects such as the Robert Wood Johnson Foundation-funded project. For the past two months, graduate assistants and student assistants traveled with her to various locations in Florida to collect data throughout the spring semester.

But seeing her students complete their programs, graduate and become part of the transportation community is the greatest satisfaction for an educator, Steiner said.

“I’ve had about 60 research assistants, and they are all over the country doing transportation planning,” Steiner said. “I am proud to have trained the next generation of transportation planners.”

# Seminars IN BRIEF

Twice a year, the CMS invites a distinguished lecturer to present on issues related to congestion mitigation strategies. Since its inception, three distinguished speakers have been invited to the Center — Samer Madanat of the University of California at Berkeley, Fred Mannering of Purdue University and Chandra Bhat of the University of Texas at Austin.

As of April 2008, the Distinguished Lecturer Seminar Series is offered as a live webcast. For additional information, or to participate in upcoming webcasted seminars, please contact Ines Aviles-Spadoni at [iaviles@ce.ufl.edu](mailto:iaviles@ce.ufl.edu) or at 352-392-9537 Ext. 1409.

More detailed information on these presentations can be found on the CMS Web site at <http://cms.ce.ufl.edu/seminars>

## Distinguished Lecturer Seminar Series



### Chandra Bhat, Ph.D.

*Adnan Abou-Ayyash Centennial Professor in Transportation Engineering  
University of Texas at Austin*

This spring Chandra Bhat gave a presentation entitled *Incorporating Residential Self-Selection Effects in Activity Time-use Behavior: Formulation and Application of a Joint Mixed Multinomial Logit - Multiple Discrete-Continuous Extreme Value Model*. The study used a joint model system of residential location and activity time-use choices that considered a comprehensive set of activity-travel environment (ATE) variables, including socio-demographic variables, as determinants of individual weekday activity time-use choices. A sample of 2,793 households and individuals residing in Alameda County in the San Francisco Bay Area

were used for the joint model system estimations. The study found that modifying the activity-travel environment can lead to small changes in individual activity time-use patterns, even after controlling for residential sorting effects. These changes, however, were relatively small compared to the influence of demographics on individual time-use patterns.



### Fred Mannering, Ph.D.

*Professor of Civil Engineering  
Purdue University*

In fall 2007 Fred Mannering traveled to UF to give a talk on the analysis of drivers' risk compensation response to vehicle safety features. Mannering's talk focused on research he conducted in response to virtually constant fatality rates despite the introduction of many new safety features in vehicles such as front and side airbag systems, antilock braking systems, traction control and electronic stability control. A possible explanation is that fatality rates are not decreasing because drivers are using the safety features to drive in a more aggressive manner, which is offsetting the impact of new safety features. In Mannering's research, he and his colleagues used disaggregate data from the 1990s to analyze the effect of airbags and antilock brakes on automobile safety and found that both of these features had no statistically significant effect on the likelihood of an accident or injury severity. The research suggests that drivers are trading off enhanced safety for speedier trips.



### Samer Madanat, Ph.D.

*Xenel Professor of Civil and Environmental Engineering  
Director, Institute of Transportation Studies  
University of California, Berkeley*

In spring 2007, Samer Madanat presented a lecture entitled "Optimization of Maintenance and Replacement Policies for a System of Heterogeneous Infrastructure Facilities." The talk addressed the determination of optimal maintenance and replacement policies for a system of heterogeneous facilities. At the system level, the policies were obtained using a reliability-based framework, based on policies that are optimal at the facility level. The facility-level policies were determined by using a finite-state, finite-horizon Markov decision process in which the state of the Markov chain

contained information on the history of maintenance and deterioration. Optimal conditions for the continuous-case system-level problem were derived and explained intuitively. A numerical study also showed that the results obtained in the discrete-case implementation of the solution were valid approximations of the continuous-case results. The system-level formation can be efficiently solved, which makes it suitable for systems of realistic sizes.

# CMS Visits Rose-Hulman Institute of Technology

CMS Director Lily Elefteriadou and CMS Coordinator Ines Aviles-Spadoni spoke to students at Rose-Hulman Institute of Technology in Terre Haute, Ind., about transportation research and graduate opportunities at UF.

Rose-Hulman is a four-year, private college that specializes in teaching engineering, science and mathematics. The 2008 *U.S. News & World Report's* survey of higher education listed Rose-Hulman as the No.1 engineering institution whose highest degree is a bachelor's and No. 1 in five engineering departments: mechanical, electrical, civil, computer and chemical.

"We chose to visit Rose-Hulman because of its excellent reputation in engineering education, coupled by the limited exposure of their students to the transportation profession and its challenges" Elefteriadou said.

She indicated this activity was organized to partly fulfill one of the CMS's most important goals: to attract highly competent students into transportation.

According to Sue Niezgoda, an assistant professor of civil engineering at Rose-Hulman, students in the department are bright and motivated self-learners that were at the top of their class in high school when they came in as freshmen.

"Students really like to be challenged with their work and are extremely focused on problem solving," Niezgoda said. "This is one of the first places that I have taught in which I received evaluation comments from students suggesting that I make homework assignments harder. Yes, harder."

Intellect aside, these students really struck a chord with Elefteriadou and Aviles-Spadoni when they visited with students at the school.

"First of all, interacting with Andrew Pinkstaff, the Rose-Hulman ASCE student chapter president, was a real pleasure



CMS Director Lily Elefteriadou delivers a technical presentation to a room full of students as part of the recruitment activities during the Center's visit to Rose-Hulman Institute of Technology.

because he was always ahead of the game while coordinating things on his end," Aviles-Spadoni said. "And when we got there, it was just our general interactions with the students during the presentation and during lunch which made the trip worthwhile."

Pinkstaff believes the CMS's visit to Rose-Hulman was a great success, and that students benefited from the information provided to them on the various opportunities within the CMS, especially with respect to graduate school.

Tapping into this pool of highly qualified students will have its challenges for the CMS. Because Rose-Hulman is primarily an undergraduate institution, most students are not exposed to research and do not consider graduate school, and they end up being heavily recruited by industry. Although the faculty at Rose-Hulman encourages students to consider graduate school, a large percentage of them enter the professional world.

Niezgoda thought that the event as a whole was well planned and hopes the CMS returns in fall 2008 to encourage the great, young minds at Rose-Hulman to consider graduate studies in transportation at UF.

"In a small number of students, I saw a spark of interest in graduate school generated, particularly when they discovered that there were funding opportunities to pursue a graduate education," Niezgoda said. "I think the more presentations like this that we can offer our students, the better. It will expose them to the graduate school experience, and more will become interested over time."

# Genesis Harrod



Genesis Harrod likes to drive, and while cruising south from Gainesville to her native Orlando along Interstate 75, the idea of becoming a transportation engineer and urban planner materialized.

“I had a conversation with my martial arts teacher, who had just finished a degree in urban planning at UF,” said Harrod, 23, a first year master’s student at UF. “That conversation sparked an interest for me in the field. And from the transportation engineering perspective, I liked the more practical side of using my mathematical skills since my bachelor’s degree is in mathematics.”

She set out to find a way to combine all of her interests, and became an original in doing so. Harrod is the first student at UF to be in the concurrent master’s degree program in transportation engineering and urban planning.

Harrod is also the first student from the Center for Multimodal Solutions for Congestion Mitigation (CMS) to win the Annual Student of the Year Award sponsored by the U.S. Department of Transportation, which was awarded to her in January during the 87th Annual Transportation Research Board Meeting in Washington, D.C.

## The ‘Genesis’ of the Concurrent Program

With the initial idea born out of a casual conversation with her karate instructor, Harrod decided to apply to the master’s program in both urban planning and civil engineering.

“I essentially did everything you are not supposed to do when applying to graduate school,” Harrod said. “I took the GRE late, and I applied late. I spent all summer on my toes waiting for an answer, and in the meantime, all my friends were getting into other graduate schools, so it was a very tense summer.”

But never did she think she would be accepted into both departments.

“My thoughts were to start out in one program and prove myself academically, but it was by chance that I got into both, so I thought I would just go full force at that point,” Harrod said.

That summer, while working at the Jurassic Park River Adventure in Universal Studios Islands of Adventure in Orlando to earn money for graduate school, she received a call from her mother telling her that a letter from the University of Florida had arrived. She was hesitant, however, to have her mother open it.

“I work with tourists, so the nature of my job requires me to be happy,” Harrod said. “I have to be all nice and friendly to people, you know, it’s my job, I have to be nice. So, I did not want her to open it and give me the news until I got home. But then I went ‘yeah, let’s open it anyway.’ And so she opened it, and I was like screaming in the office and my mother was screaming on the other side.”

That was in late July 2007, and after hearing from both departments, she began to prepare for meetings with Ruth Steiner, an associate professor in urban planning, and with Lily Elefteriadou, the director of the CMS.

“I went through the catalog and started coming up with classes to see how the two programs would match, so I made my own preliminary plan and then contacted Dr. Steiner and Dr. Lily,” Harrod said.

Little did Harrod know that while she had been formulating the idea of a concurrent program in urban planning and transportation engineering, Steiner, along with Siva Srinivasan, an assistant professor in civil engineering, had already discussed the possibility of creating such a program at UF earlier that summer.

“Within a few weeks, before we could even finalize the curriculum, I learned that Genesis had applied to both programs and wanted to complete them as concurrent degrees,” Steiner said. “She had even figured out which paperwork she needed to fill out to make this happen. Thus, she can be seen as the ‘genesis’ of the concurrent degree program.”

## Plans for the Future

Although she’s still “trying to figure it out,” Harrod says she is drawn more to the research aspect of academia but is exploring every opportunity that comes her way. This summer, Harrod will be working as an intern at HDR, a national architectural and engineering firm with an office located in Gainesville.

## The Genesis File

- Genesis Harrod is a Student Government Senator at UF
- Her first time going to both Washington, D.C. and TRB was during the January 2008 meeting
- Did not receive her driver's license until she was 21
- Is a member of the Butokukan Karate Club at UF
- Was born on February 17, 1984 in Asheville, North Carolina.
- Her mother is a teacher at Chain of Lakes Middle School in Orlando
- Likes to eat lemons
- Has never been out of the U.S. but wants to visit Africa and Japan



A group photo of the 2008 Student of the Year Award Recipients at a banquet sponsored by the Council of University Transportation Centers at the Omni Shoreham Hotel in Washington, D.C., in January of this year.



Rod Diridon, Paul Brubaker, Genesis Harrod and Norman Minetea

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