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Winter luncheon speaker highlights new paradigms in transportation



Hani Mahmassani

It is no longer possible to examine transportation issues without considering telecommunications, said CTS Winter Luncheon speaker [Hani Mahmassani](#). Rapid advances in communications technology are changing how transportation systems are used and managed, creating a new paradigm in which travel behavior, transportation systems management, and information access are interacting and changing each other.

Mahmassani, a leading intelligent transportation systems (ITS) researcher and director of the [Maryland Transportation Initiative](#) at the University of Maryland, delivered a wide-ranging presentation titled "In Real Time, Virtually: Evolving Paradigms and Methodologies for Intelligent Transportation Systems." The luncheon was sponsored by the Center's [ITS Institute](#); in his introduction, Institute director Max Donath praised Mahmassani as a leader in ITS research.

Although the virtual world of the Internet and other communications technologies was originally created to overcome limitations of the physical world, Mahmassani said, today the virtual and physical worlds are coming together in transportation technology.

Travelers use Web information services to plan trips and access real-time traffic information, or avoid travel entirely by taking advantage of new ways to communicate and share information. Meanwhile, transportation managers have access to a greater range of sensors and data analysis technologies to manage the transportation system more precisely than ever before. ITS technologies are therefore playing an ever-greater role in influencing traveler behavior and system operations.

Mahmassani outlined two stages in the deployment of ITS technologies. This process, he said, is characteristic of any application of computers and communications to complex systems. In the first stage, technology is applied to specific tasks, but without changing their character or the basic structure. In the second stage, however—as users become more comfortable and familiar with the new technology—entirely new approaches to solving problems begin to appear.

Currently, he continued, ITS deployment has reached the end of the first stage. He highlighted several notable accomplishments in stage one, including the establishment of traffic management centers in major metropolitan areas,

"tuning" of traffic signals and freeway ramp meters to optimize system performance, development of systems to provide real-time travel information to the public, and installation of electronic toll collection systems.

Conventional World

- Steady State
- Equilibrium
- Static
- Data poor
- Uncertainty about past/ current events
- Component Level
- Long lead time between solution and implementation
- Limited "accountability" of decisions
- "A priori" solutions

New Paradigm

- Time Varying
- Evolutionary paths
- Dynamic
- Data rich
- Known past/current events (to varying degrees)
- System Level
- Immediate action
- Performance monitoring and feedback
- Realtime adaptive strategies

The shift to real-time decision making will entail changes in transportation system management. (source: Hani Mahmassani)

A major question facing researchers now is how to move on to the second stage of deployment—implementing new ways of solving transportation problems. One example of the move to the second stage is the current shift toward using real-time information for operational decision making. This shift, he said, shows how advances in information and communications technology (ICT) can drive the adoption of new operational paradigms.

Mahmassani identified several characteristics of this new paradigm, including the use of a rich selection of data sources from new types of sensing systems; a system-level perspective that treats the entire traffic system as a unified whole rather than a set of individual components; and the use of performance monitoring and feedback to drive evolutionary improvements in performance.

In addition to real-time operational decision making, researchers also face new challenges in making ITS data usable for planning, and in understanding user behavior in the context of widely available real-time traveler information.

While real-time decision making offers the potential for increased system performance, Mahmassani continued, a number of issues need to be resolved in order for such methods to reach their full potential. For researchers and transportation managers, the coming years should be both challenging and rewarding, as our growing ability to monitor transportation systems and understand their operation in real time creates new opportunities for advancement.

The luncheon concluded with Mahmassani taking questions from audience members, including several University faculty and researchers.