Volume 1 Issue 1 Spring, 2008

CCITT Newsletter

Center for the Commercialization of Innovative Transportation Technology

Moving Research to Realization for Surface Transportation

in this issue

Welcome to the inaugural newsletter for the Center for the Commercialization of Transportation Technology (CCITT or "see it") at Northwestern University. In the Fall of 2007, we officially launched CCITT and joined the well established transportation research community at Northwestern University.

NORTHWESTERN UNIVERSITY

Director's Welcome

At CCITT, our goal is to leverage the ingenuity of the faculty and students at Northwestern University to impact our nation's surface transportation system in the 21st century in a practical and meaningful way. Our vision is to enhance Northwestern's status as a role model for the transfer of transportation technology and innovation to public and private transportation practitioners. To achieve this vision, our Center selects and supports late-stage or translational research, product development or proof of concept projects. CCITT research projects aim to bridge the gap between the outcome of traditional academic research and the uptake of product or knowledge adoption by end-users. So at the end of the day, our mission is "moving research to realization" for the surface transportation system.

As the Director of CCITT, I am honored to provide an opportunity for Northwestern faculty and students to further advance their research innovations. As one of the new kids on the block at Northwestern, we operate in harmony with Northwestern's established and recently launched transportation centers and institutes. We also look forward to working with researchers from any department at Northwestern and with local, state and national transportation practitioners to drive innovation to the transportation network.

In this newsletter we will introduce you to our first year of funded research projects, highlight a doctoral candidate researcher, and introduce a new CCITT team member.

Truly yours,
Bret Johnson

Research Overview

CCITT expects to fund and provide technology on product transition support to three to six independent research projects per year. Participation and support from the local, state or national transportation practitioners, public or private, is expected to ensure the implementation of Center-funded research innovations.

To move "research to realization", we seek projects that have the following characteristics:

- impact a problem in the surface transportation network;
- novel, unique, and potentially disruptive technology;
- market or need driven projects as defined by transportation practitioners;
- supported by partnerships and data sources from the practitioner community;
- practical project deliverables, such as proof of concept or prototype development, feasibility demonstrations, research to product risk-reduction studies, etc;
- measurable technology transition or implementation outcomes, such as technology licensing or material transfer agreements, prototype implementation, industrial adoption, etc.

In January 2008, we selected three projects to support from our Year 1 funding cycle. CCITT selected three projects to support in its first cycle of awards in January 2008. Interestingly, all three projects have the potential to impact the resiliency of the surface transportation network. Research Professor Semyon Vaynman in The Materials Science Departments leads a team to develop a "super tough steel" for bridge and tank car applications. In the Electrical Engineering and Computer Science, Professor Aggelos Katsaggelos and team will explore the use of video for real time traffic analysis. And last, Assistant Professor Yu "Marco" Nie will investigate reliable route guidance using historical Chicagoan traffic data, with his group, in the Civil and Environmental Engineering Department.

Meet the Principal Investigators

Super Tough Steel

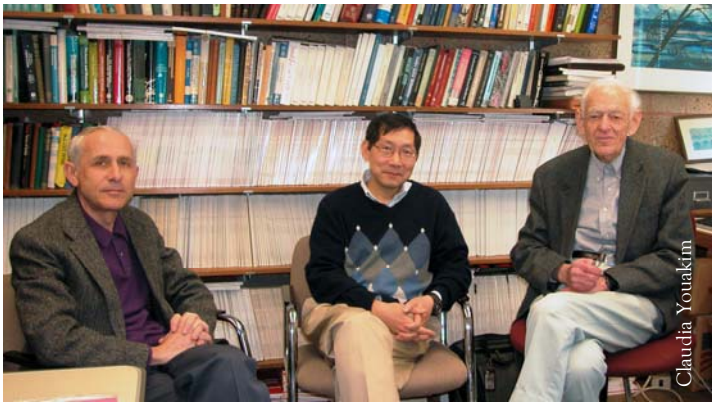
PI: Semyon Vaynman

Co-PIs: Morris E. Fine, Yip-Wah Chung

Current steel formulations become brittle at cryogenic temperatures. Therefore, a new steel is desirable for infrastructure applications such as bridges and tank cars for low temperature environments. A research team led by Semyon Vaynman seeks to develop an appropriate steel with high fracture toughness at low temperatures for these applications.

Vaynman and Professor Emeritus Morris Fine previously developed a steel (ASTM A710 Grade B) at Northwestern University in partnership with the Illinois Department of Transportation (IDOT) for bridge and other infrastructure applications that achieved a minimum of 70-ksi-yield strength. This previous formulation significantly outperforms ASTM A36 and ASTM A588 bridge steels in strength, weldability and fracture toughness at low temperatures.

Building on their experience developing the high strength steel, the current research team of Vayman, Fine and Professor Yip-Wah Chung proposes to design a steel with even much higher fracture toughness than the A710 Grade B steel at cryogenic temperatures. Potential uses for the "super tough" steel include Northern State DOTs for structural applications and also for tank cars that transport cooled liquids such as chlorine.



Semyon Vaynman, Yip-Wah Chung, Morris E. Fine

The "super tough" steel research team will develop and test a cryogenic super-tough steel by composition modifications to its previously developed A710 Grade B steel. The team expects to collaborate with IDOT and the Union Tank Car Company to thoroughly investigate the mechanical, fracture, microstructural, welding and corrosion properties of two or three compositions.. The ultimate goal of the project is to select the optimal, composition and prepare documentation for inclusion of the steel into an appropriate standard and drive adoption through its collaborators.

Video Traffic Analysis for Abnormal Event Detection

PI: Aggelos K. Katsaggelos

Co-PIs: Sotirios A Tsaftaris, & Ying Wu

Sotirios Tsaftaris (seated), Ying Wu , Aggelos Katsaggelos

Traffic congestion in large urban areas causes adverse environmental impacts, wastes precious energy resources and disrupts the flow of commerce. These are only a few of the problems resulting from congestion, therefore, Professor Aggelos Katsaggelos and his research team intend to do something about it. As such, the team that includes Professor Ying Wu and Research Professor Sotirios Tsaftaris will apply previously developed statistical approaches for the detection of abnormal video events for surveillance applications to traffic congestion.

Katsaggelos, Wu and Tsaftaris propose to extend these statistical techniques toward the classification of vehicle trajectories in roadway video data for analysis and mitigation of traffic congestion. The effect of abnormal events impacting normal traffic patterns will be a central objective of their investigation as well.

The team's primary goal is to provide the foundations of a system that will allow the off-line analysis of video data. Katsaggelos and his team believe the results of the off-line analysis could be utilized in two fundamental ways.

Principal Investigators continued...

First, transportation officials may use the analytical findings to consider revising transportation rules and regulations. Second, the outcomes may drive the development of on-line technologies for tracking the most disruptive abnormal events and minimizing their effect in creating congestion via, for example, deployment of emergency vehicles, timely response of transportation agencies, and roadside information display systems.

Providing Reliable Route Guidance Using the Gary-Chicago-Milwaukee Travel

PI: Yu (Marco) Nie; Co-PI: Peter Nelson

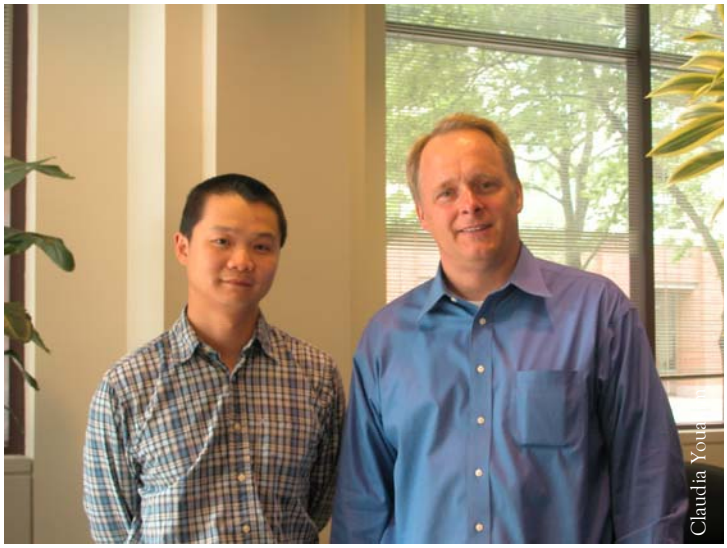
New techniques offer the potential to improve travel reliability for motorists, freight carriers and parcel delivery firms. Conceptually, the most reliable routes can be found by solving the Dynamic Shortest Path problem with On-Time (DSPOT) arrival reliability. Even so, practical challenges remain.

Professor Yu "Marco" Nie and his research team, including University of Illinois (UIC) Professor Peter Nelson confront these challenges to the implementation of these techniques, and demonstrate their feasibility and benefits using real data from the Chicago metropolitan area, one of the largest transportation hubs in the US.

Even though new techniques have been formulated to solve the DSPOT problem, the research team has identified two important issues that currently preclude its practical implementation. For one, the current problem solving algorithms are not fast enough for real time Internet-based traffic planning applications. This research sets to demonstrate a new algorithm that addresses this challenge. Second, any proposed solution must be robustly tested with real data.

To validate their algorithm, the team will use historical traffic data from the Gary-Chicago-Milwaukee (GCM) traveler information system to prepare dynamic probability mass functions of travel times, which are the key imputs to DSPOT. The outcome of the project will be a prototype path search tool that will be made available to the public through the Artificial Intelligence Laboratory at the University of Illinois at Chicago. Using this tool, anyone driving in the Chicago area may investigate alternative routes, and the reliability thereof, before beginning a trip across town.

The ultimate goal of this project is to provide motorists and carriers with commercialized DSPOT products that will allow them to make tradeoffs between reliability and other costs and constraints. Potential commercial users include, but are not limited to, the manufacturers of in-vehicle navigation systems, web companies that provide internet-based driving directions, and software vendors that produce logistics tools for freight carriers.



Yu (Marco) Nie, Peter Nelson

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For questions or comments regarding the CCITT newsletter, please contact Claudia Youakim.

Student Researcher

Xing Wu is a PhD student in the Civil and Environmental Department at Northwestern. Prior to pursuing his PhD, Wu attained his BS and MS in Civil Engineering from Tsinghua University, Beijing, China. Wu is currently working with Professor Nie on a CCITT funded research project titled Providing Reliable Route Guidance Using the Gary-Chicago-Milwaukee (GCM) Traveler Information System. His interest in the optimal routing problem in stochastic transportation network led him to join Professor Nie's research team in 2006.

Professor Nie states that Xing "is actively working on the stochastic shortest path problems" and the research proposal is based on preliminary results in a paper co-authored by Professor Nie and Xing Wu. In addition, Professor Nie adds that Xing "is a hard-worker and good collaborator. He was quick in developing the capability to conduct independent research. I am very happy to have him on my team."

Under Professor Nie's supervision, Wu has focused on analyzing GCM data, designing and implementing efficient solution algorithms that address optimal routing policy in the stochastic network. Wu states that this particular problem captures his attention due to "its broad application in the real world, which is full of uncertainty". Wu hopes that his role in the research process can help improve travel time, cost and reliability.

New Staff Member

CCITT is pleased to announce that Claudia Youakim has joined our staff at Northwestern University. As the latest addition to the team, Claudia takes on the role of Project Coordinator and is excited about assisting with the Center and its development.

Claudia brings a variety of talents from her academic, volunteer and professional experience to CCITT. While working or interning at places such as Caremark Pharmaceuticals, Charter One Bank and Christopher House, Claudia developed research and data analysis, project management, customer relationship management, and written communications skills. Claudia states that she looks forward to her new position and believes her "prior supervisory, research and grant-writing familiarity will come in handy."

Claudia recently completed her MA in Sociology from DePaul University in Chicago, Illinois. Claudia's graduate school work focused on qualitative and quantitative research methods. In addition, she received a BA in Sociology from Loyola University, also in Chicago, Illinois.

Since joining CCITT, Claudia was introduced for the first time to a part of the Chicago area surface transportation system that she had never used before, the METRA North Line commuter train. About her experience Claudia said, "I'm impressed the METRA was on-time, convenient and user-friendly! I look forward to using and promoting this form of transportation in the future." With that kind of enthusiasm, CCITT looks forward to Claudia's contributions to the surface transportation research community at Northwestern University.

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Evanston, IL 60201

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Published by the Center for the Commercialization of Innovative Transportation Technology (CCITT) at Northwestern University