Michigan Ohio

University Transportation Center

Annual Report 2010-2011, Year Five

Grand Valley State University

Wayne State University

University of Detroit Mercy

The University of Toledo
1872
Intermodal Transportation Institute
UT-University Transportation Center

BGSU
Bowling Green State University

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I. Center Director's Message

Looking back with satisfaction . . . .
and looking ahead with hope and commitment.

This is the last annual report of the Michigan Ohio University Transportation Center. In 2011, the Department of Transportation terminated funding for all UTC's (over 60), and funded 22 new ones for two years. While MIOH has ceased to exist, the passion and commitment of the many transportation professionals at our five universities . . . faculty, staff and students . . . have continued. We have carried on our efforts to serve the nation with new transportation knowledge and insights, and excellent transportation education and graduates, all aimed at making our nation's transportation systems smarter, more efficient, more responsive and more affordable. Four of the five MIOH schools have joined the Mineta National Transit Research Consortium and are continuing our quests for transit excellence through that partnership.

During our five years in existence, the MIOH UTC completed twenty-eight research programs, many of which were a sequence of projects, plus four educational projects and five K12 outreach programs. The many results of these projects are posted on the MIOH UTC website, http://mioh-utc.udmercy.edu. The investment of the US DOT of $2,221,600 was highly leveraged with matching funds of over $3,083,750 from our university and corporate partners and the Michigan Department of Transportation. More importantly, the results of our research and the careers of the graduates of our educational programs have advanced, and will continue to advance, the nation's capabilities in alternative fuels, intelligent transportation, and transportation systems efficiency for many years to come. One very concrete example of that impact is that M-1 Rail will soon break ground on the modern streetcar system that was initially planned by project TS-19, The Woodward Transit Catalyst Project.

Dr. Leo E. Hanifin
Director, MIOH University Transportation Center

and

Dean, College of Engineering and Science, University of Detroit Mercy

II. Center Theme, Mission, and Focal Areas

MIOH UTC's Theme

Alternate energy and system mobility to stimulate economic development

MIOH'S Mission

MIOH will work to significantly improve transportation efficiency, safety, and security in Michigan and Ohio, as well as, across the nation by increasing the effective capacity of existing transportation infrastructure, reducing transportation energy dependence through alternative fuels, and enhancing supply chain performance.

This will be accomplished through:

1. the development and organization of new knowledge, technology and management systems;
2. the effective transfer of new and existing knowledge to commercial enterprises and educational communities; and
3. the development of a cadre of transportation professionals that is larger, more diverse, and better prepared to address the challenges and opportunities of 21st century transportation systems.

MIOH Focal Areas

Transportation System Efficiency and Utilization

MIOH will develop methods that meet future transportation system capacity requirements at minimum costs. To maximize the effectiveness/utilization of the current transportation infrastructure, and thereby minimize future expansion and related costs to taxpayers, MIOH will perform research, education and technology transfer to:

1. increase the utilization of existing assets through the application of technology and innovative management practices;
2. identify innovative design and operational/administrative solutions to bottlenecks and safety/security in transportation systems; and
3. improve the management and planning of maintenance and repair.

Supply Chains

MIOH will focus on the transportation, logistics and distribution aspects of the supply chain and the interactions between supply chain participants through improved inter-modal connectivity and system-wide efficiency. These efforts will enhance our region's competitive position in the global economy and expand job opportunities. Efforts will:

1. improve supply chain performance through the application of technology and innovative management practices;
2. identify innovative design and operational/administrative solutions to transportation system bottlenecks as they impact supply chains; and
3. improve the security and reliability of the supply chain.

Alternative Fuels

MIOH will develop affordable alternate sources of energy for vehicles and methods to distribute fuels throughout the transportation network, yielding improvements in both security and the efficiency of transportation.

III. Partner Universities

University of Detroit Mercy
Detroit, Michigan
(Lead Institution)
www.udmercy.edu

Bowling Green State University
Bowling Green, Ohio
www.bgsu.edu

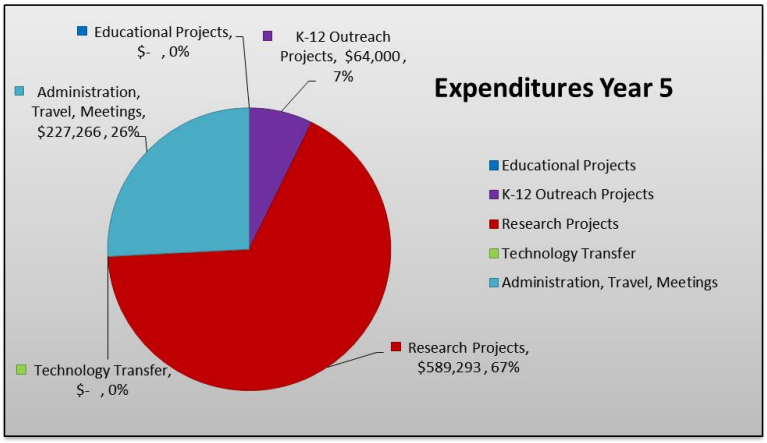
Grand Valley State University
Grand Rapids, Michigan
www.gvsu.edu

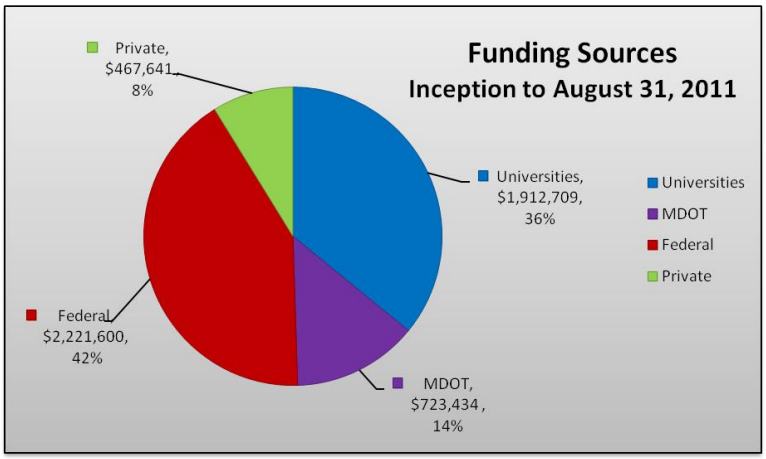
University of Toledo
Toledo, Ohio
www.utoledo.edu

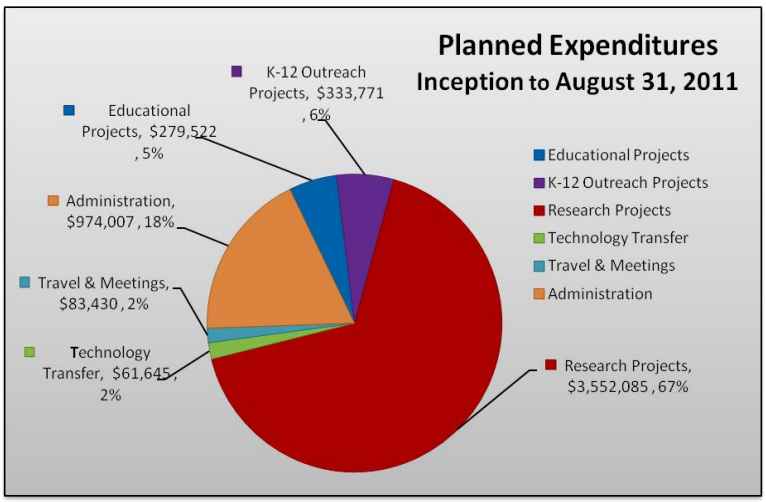
Intermodal Transportation Institute
UT-University Transportation Center

Wayne State University
Detroit, Michigan
www.wayne.edu

IV. Funding Summaries







V. Overview of Education, Research, and Technology Transfer Programs

A. MIOH Education Program

New 2010-2011 projects two at the pre-college level:

1. Transportation Summer Camp for High School Students (K12-3, project 5, Yr5)

TRANSIT, a one week summer camp, was conducted for the fifth year by Civil and Environmental Engineering faculty members from UDM.

TRANSIT Summer Camp engaged metropolitan Detroit area students in a week of innovative programming at the University of Detroit Mercy exploring Transportation Engineering as a field of study and career choice. This year's participants were a unique group -- all male, with the exception of one female, each from different high schools. There were two students from the Downriver community who participated through the generous support of the Colina Foundation. This year's camp introduced students to the field of Transportation and issues that will be faced in the near future. Safe, secure, and efficient transportation systems are essential to the economic viability, quality of life, and strength of our nation. Hands on projects, guest speakers from industry, field trip(s) and expert university input from Civil and Manufacturing Engineers provided information that opened up a whole new area of study and career path for participants.

It included presentations and hands-on activities by professionals from the following organizations:

- Southeastern Michigan Council of Governments, Traffic Division
- The Road Commission for Oakland County
- The Detroit Collaborative Design Center (UDM, School of Architecture)
- Michigan Department of Transportation
- Ford Motor Company
- Spalding DeDecker

2. STEPS Camp (Science Technology and Engineering Preview Summer Camp for Girls) (K12-14, project 4, Yr5)

The STEPS Camp at UDM is a five-day residential program for high school girls designed to:

- Introduce young women to manufacturing, engineering, science, math, and robotics
- Increase their interest in a career in one of these areas
- Provide them with a positive university experience
- Provide exposure to college professors, college students, and professional engineers
- Improve their perception of engineering
- Inspire young women to consider a career in manufacturing, engineering or science

Activities included academic, social and personal reflection. The main project, included a *Robotics Challenge* based on the LEGO Mindstorm NXT system, which was revised in 2008 to include a transportation theme thanks to financial support from the UTC. The campers also participated in academic labs such as Batteries, Programming, Sensors, Circuits, Welding, Fuel Cells, Motors, and Engineering Math. STEPS 2011 was the camp's tenth year. It was the fourth camp to have a transportation theme integrated into its activities. The camp was conducted with a total of 22 girls participating.

Written by an anonymous camper:
STEPS allows us to learn and have fun. We've all made bonds with others and I'm sure we will remember this program into our adulthood. Although sometimes we want to go home, we will miss this program and our news friends when the program is over.

B. MIOH Research Program

During its fifth year, the MIOH UTC defined and launched eight new research projects. All focus on important national priorities including independence from foreign oil, efficient freight delivery, and congestion mitigation.

The new projects span all three focal areas: one in alternative fuels, one in supply chain, and five related to transportation systems.

Project reports can be accessed through the website at
http://mioh-utc.udmercy.edu/research/index.htm

1. From Phyto-Remediation to Phyto-Mining: A Means of Maximizing Value In Producing Bio-diesel From Pennycress led by Dr. Mark Benvenuto, UDM (AF42, Yr5)

This research uses penny cress as both a feedstock for the production of bio-diesel and as a soil remediator for lead and other heavy metals. The plant matter in which the heavy metals are taken up will be pyrolyzed and the metals extracted from the ashed materials with strong, oxidizing acids. This form of "phyto-mining" removes the metals from the plant remediators and allows the metal to be captured as a usable, commercial product. The goal of the project is to determine the feasibility of using penny cress on brown-field areas in Detroit, in order to determine whether or not such areas can be cleaned effectively, yet inexpensively. The ultimate end result would be an inexpensive feedstock for bio-diesel, a biological method to clean polluted soil, a second, marketable product that would add value to the bio-diesel production enterprise, and cleaner, environmentally safer areas in Detroit.

2. Developing TranslinkeD Corridor Investment Strategies and Assessing their Socio-Economic Impacts on the Detroit Metropolitan Area and the Northwest Ohio Regional Community led by Dr.Hokey Min, BGSU and Dr.Utpal Dutta, UDM (SC41,Yr5)

After reaching the peak population of 4.48 million in 2004, the Detroit Metropolitan Statistical Area (MSA) has been losing its population every year. Part of this decline is attributable to the gradual loss of the manufacturing jobs in the Detroit MSA. Between 2000 and 2005, the Detroit MSA lost more than 75,000 manufacturing jobs which were directly or indirectly tied to the "Big Three" automobile manufacturers. This job loss has continued up until today. Indeed, the manufacturing sector recorded the largest decline in employment in the Detroit MSA from a year ago. Additional losses of 19,500 manufacturing jobs in the Detroit MSA last year represented a 10% job decline which almost doubled the national manufacturing job decline of 5.2% (U.S. Bureau of Labor Statistics, 2010). To reverse this grim trend, the Detroit MSA has begun to shift its focus from a manufacturing to a technology-based knowledge economy. The future success of this priority shift often hinges on its infrastructure support. This infrastructure support includes an establishment of the fast communication and logistics links among the Detroit MSA, the Northwest Ohio region, and the Canadian borders. This establishment is called "TranslinkeD" by the Detroit Regional Chamber. The TranslinkeD aims to enhance multi-regional cooperation for technology development and multi-regional coordination of world-wide logistics activities by leveraging the regional logistics infrastructure and assets such as airports, river-ports, railroads, highways, bridges, terminals, and alternative fuels. To help the Detroit and Toledo Regional Chambers make the best use of their resources and revitalize the once depressed regional

economy, this project will design the optimal intermodal network that can best exploit TranslinkeD as the NAFTA trade corridor, the international gateway to emerging economy across the global, while assessing the socio-economic and business impacts (including spill-over effects, traffic congestion, environmental quality, transit services, land development, supply chain efficiency) of TranslinkeD on the Detroit MSA and the Northwest Ohio regional community. In addition, this project proposes a viable investment strategy which will determine the scope of investment at each stage of TranslinkeD, estimate the return-on-investment (ROI) of the detailed project plans, and identify various funding sources (e.g., taxes, bonds, stimulus money, government grants, transit fares).

3. Enhancing JIT Freight Logistics Impacted by Transportation System Projects Under ITS led by Dr. Ratna Chinnam, WSU **(SC42, Yr5)**

This research project addresses the effect of "non-recurrent congestion" due to "work zones" on the delivery reliability within JIT supply chain operations in Southeast Michigan. Many of the pavements on national highways have exceeded their design lives. To carry current and future high traffic volume of travel and freight, many highway segments in the urban areas including SE Michigan are undergoing "4-R" projects: restoration, resurfacing, rehabilitation and reconstruction. AASHTO6 reports that 10% of all traffic congestion in urban areas is directly related to work zones (not because of traffic volumes). The negative influence of work zones is even higher on urban areas roadways that are already near or above capacity flow.

The main goal of this project is to develop an analysis methodology to support effective planning of JIT freight logistics in transportation networks impacted by system improvement projects. Currently, shippers and carriers do not have the necessary tools to predict and account for the traffic congestion impact of construction projects. Existing models used by shippers/carriers rely on historical traffic flow/congestion data from ITS and other sources. There is need for predictive tools that can be used for assessing the congestion and traffic flow impact of construction projects. These predictive tools need to be integrated within route planning models of shippers/carriers. To achieve this goal, we design practical, scalable tools that use readily available and up to date traffic flow data from ITS operators such as Traffic.com and MITS Center (our collaborators). The flow data is then used to estimate Origin-Destination (OD) matrices at the source/sink nodes of the network under consideration. Given the transportation improvement project scope and extent/corridor, we use estimated OD matrices for estimation of the future state of network traffic flows through equilibrium / traffic assignment models. The methods are designed for seamless integration into existing JIT freight planning models/tools.

4. Traffic Simulation in Regional Modeling: Concepts and Demonstration led by Dr. Charles Standridge, GVSU **(TS41, Yr5)**

A team of university-based transportation system experts, simulation experts, optimization experts, and applied statisticians, having pursued the goals of describing, explaining, and predicting the flow of traffic in a corridor with respect to time and space as well as to apply these results in the routing of voluminous traffic, is well-positioned to apply the knowledge gained from these prior research efforts in other contexts such as regional transportation systems modeling in support of economic development. In this regard, the following research issues seem important: Assessing the impact of intermodal freight on the regional transportation infrastructure; developing the ability to model the detailed operations associated with intermodal freight as many large scale

planning models supported by much data already exist; and showing potential for dealing with issues that cross political boundaries such as the Michigan-Ohio border. The research team hypothesizes that traffic flow simulation techniques can be used to address these issues. The traffic simulation framework previously developed by the research team will be enhanced and employed. A traffic flow simulation of intermodal freight movement at the Toledo Sea Port is proposed to test the enhanced framework. This facility is of sufficient complexity and has the characteristics needed to demonstrate how the key issues are addressed.

5. Innovative Contracting Methods and Construction Traffic Congestion led by Dr. Utpal Dutta, UDM **(TS42, Yr5)**

Innovative contracting techniques are being used and increasingly reported in literature, particularly in studies related to mitigating the adverse effect of construction on traffic flow. State DOTs, such as Michigan Department of Transportation (MDOT) and California Department Transportation (CALTRAN), do use innovative techniques such as cost plus time (A+B) and Incentive/Disincentive (I/D) to address construction related traffic delay. However, neither of them has any standard guidelines to adopt innovative contracting techniques in any project. At the same time thousands of dollars have been spent as a part of construction incentives. According to the MDOT: "The impact of the use of incentive on the long term pavement performance has not been determined, nor has a determination been made concerning the cost effectiveness of the use of incentives……"

The purpose of this study is to develop a model to determine the functional relationship between project cost and duration where innovative contracting techniques are used. The model will be developed by using a construction related database of MDOT. The threshold value of Road Users Cost (RUC) that would justify the use of innovative contacting approach will be determined. A list of potential high, medium and low congestion causing projects, where I/D and A+B methods are appropriate will be prepared. A template will be designed to be used by the state DOTs to decide suitability of any project for innovative contracting technique.

Once a functional model is developed, its use in determining minimum contract time and maximum incentive for any project will be identified. The proposed study will be of great assistance to the MDOT and other DOTs when considering any innovative contracting project.

6. Pavement Distress Evaluation using 3D Depth Information from Stereo Vision led by Dr. Ezzatollah Salari, UT, and Dr. James Lynch, UDM **(TS43, Yr5)**

Countries such as the United States which have significant temperature changes are continually exposed to extreme heat and cold conditions throughout the year. This results in a high rate of expansion and contraction of pavement surfaces leading to extensive road surface anomalies such as cracking and potholes. In areas where there is an extremely high level of transport load traveling across roadways, the rapid destruction of road surfaces is inevitable. Therefore, pavement inspection and maintenance becomes a very important part of U.S. Department of Transportation (DOT) spending and the spending of states. Each state is spending millions of dollars annually to maintain and repair roadways. Poor road conditions are often the major sources of automobile damage claims, e.g. there were more than 7,500 pothole damage claims in the state of Michigan alone in 2005. Therefore, an automatic surface condition

evaluation system is a necessity for our extensive national roadway system. Given the complexity of pavement surface texture and outdoor lighting conditions, the development of an automated pavement inspection system possesses significant challenges.

The performance of most existing image processing based pavement inspection systems is heavily dependent on parameters that are affected by shadows and variations in outdoor lighting conditions among other factors. Recent advances in stereoscopic imaging offers the potential for road surface quality assessment in 3-Dimentional space. The proposed project extends the scope of our current MIOH-UTC project by using 3D depth information taken from road surfaces to complement the existing inspection algorithms. The 3D surface profile generated from stereo images can provide a depth map of a road surface which is viable information needed for the detection and measurement of the potholes and as well as other surface anomalies.

7. A Multi Dimensional Model for Vehicle Impact on Traffic Safety, Congestion, and Environment led by Dr. Nizar Al-Holou, UDM and Dr. Syed Mahmud, WSU **(TS45, Yr5)**

With the rapid advances in wireless technologies and the introduction of Dedicated Short-Range Communications (DSRC) as the standard protocol for Vehicular Ad hoc NETwork (VANET) communications, arrives promising opportunities for increased vehicle safety, mobility, efficiency and reduced energy and CO2 emission. With opportunities, however, come numerous technical challenges. In this proposal, the researchers address some of the ITS applications and challenges presented by U.S. DOT leaders during the ITS-Joint Program Office (ITS-JPO) Workshop in Washington DC, July 2010 [1]. The original vision of VII is to provide major improvement in safety and mobility. This vision was adapted by the new IntelliDrive initiative, which added a third goal; decreasing transportation impact on the environment.

In this research we attempt to address the question of how can we use technology to create a safe, efficient and greener environment. We will evaluate different traffic control strategies/protocols that are based on wireless communication between vehicles (OBU) and traffic light controllers (RSU) to enhance safety, increase efficiency and reduce CO2 emissions. In this system, vehicles communicate with other vehicles (V2V) in the vicinity and vehicles with traffic light controllers (V2I) using DSRC technology. The adaptive signal control application proposed in this research is targeted to achieve two main objectives: 1.) Enhancing traffic flow and decreasing traffic density, hence reducing fuel consumption and emissions. 2.) Improving traffic safety at intersections by developing a new protocol for MAC layer.

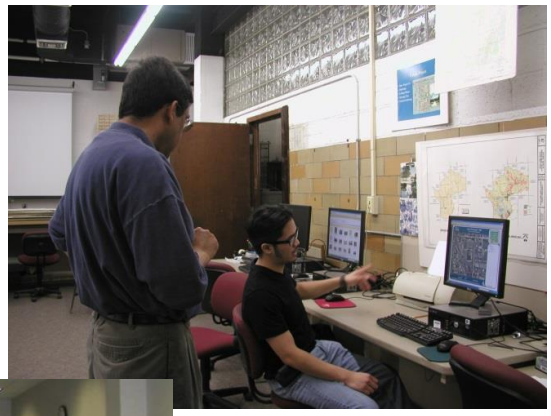
8. Impact of Energy Efficient Vehicles on Gas Tax (Highway Trust Fund) and Infrastructure Construction, Upgrade and Maintenance led by Dr. Utpal Dutta, UDM **(TS51, Yr5)**

The Federal Highway Trust Fund provides the funding for transportation improvements, including 100 percent Federal funding for infrastructure improvements and about 60 to 70 percent of funding for public transit improvement. The major funding for the Highway Trust Fund is the Federal tax on motor fuels which was 24.5 billion dollars during FY 2000. In recent years, usage of alternative fuels for transportation along with electric vehicles has been generally encouraged, also the current tax mechanism and other subsidies provides incentive for use. In addition, late changes to federal Corporate Average Fuel Economy (CAFÉ) standards, mandating significantly increased fuel economy in coming years will hasten this trend. This increase has created a significant

negative impact on revenue levels deposited in the Federal Highway Trust Fund. This results in the reduction of funds available for transportation improvement now and in years to come. Thus, it is essential that the impact of fuel efficient transportation systems on the transportation improvement funding should be quantified and avenues developed to come up with adequate funds for the nation's infrastructure/transportation improvement. It is to be noted that maintaining and upgrading of the transportation system is directly related to system efficiency. While most professionals in the field believe the short-term solution is to raise the unfair gas tax, many consider the long-term solution to be changing the way the revenues are generated, adapting a per-mile driven user fee, known as a Mileage-Based User Fee (MBUF). MBUF offers fair, flexible and higher yield than any other funding options including toll roads, raising taxes, congestion pricing etc.

The purpose of this research is to:

- Determine the impact of the use of energy efficient vehicles that resulted in the reduced consumption of petroleum-based motor fuel.
- Assess the extent of increased use of energy efficient vehicles and reasons for accelerated use where present.
- Develop/recommend means (including MBUF) to ensure a solid level of funding is provided for transportation improvement in relation to the use of the transportation system.
- Identify challenges for implementing the recommended means.
- Prepare a report presenting findings and recommendations for agency professionals and elected leaders.



C. MIOH Technology Transfer Program

The MIOH UTC has developed a three-tier strategy for technology transfer that involves direct transfer, UTC-wide activities, and partnering with established organizations.

Direct Transfer

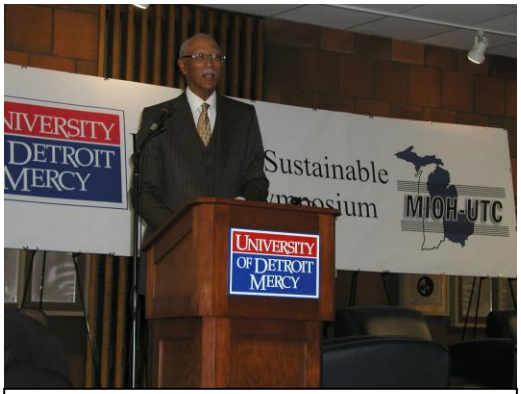
The MIOH UTC is engaged in technology transfer on a direct basis. That is, all projects involve direct participation of corporations and/or government agencies that can directly benefit from and employ the results of the project. Some of the participants are the Michigan Department of Transportation, Ford Motor Company, NextEnergy, UPS, Michigan Intelligent Transportation System (MITS) Center, Detroit Area Pre-College Engineering Program, the Road Commission for Oakland County, the Toledo Metropolitan Area Council of Governments, Ryder, Deloitte Consulting and the Southeast Michigan Council of Governments. Through direct participation in projects, these organizations not only influence the efforts but also prepare themselves to quickly transfer results into improved transportation systems and transportation education.

UTC Wide Activities / Partner Technology Transfer

The Michigan Ohio University Transportation Center joined the University of Detroit Mercy College of Engineering and Science and School of Architecture to conduct the Designing Sustainable Detroit Symposium on September 30, 2010 in the UDM Student Center. The keynote speaker, David Bing, City of Detroit Mayor, emphasized the importance of transportation as a catalyst for city growth.

Above: At the 2010 Designing Sustainable Detroit Symposium, from left: Leo Hanifin, dean of the College of Engineering & Science; David Tyler, deputy director for Wayne County's Economic Development Growth Engine; Matt Cullen, president of the Board of the M1 Rail Project; and Melissa Roy, senior director of Transportation Policy and Government Relations, Detroit Regional Chamber.

Additional speakers were Matt Cullen, a UDM alumnus and president of the Board of the M1 Rail Project; David Tyler, deputy director for the Economic Development Growth Engine of Wayne County; and Melissa Roy, senior director of Transportation Policy and Government Relations, Detroit Regional Chamber. An audience composed of friends, alumni, students and faculty heard the presentations on how the opportunities for southeast Michigan could potentially be exploited to foster regional economic development. Presentations were followed by a



Above: City of Detroit Mayor,Dave Bing provided the keynote speech for the Designing Sustainable Detroit Symposium.

question and answer session which provided the panelists an opportunity to expand on regional employment and economic growth implications potentially resulting from light rail mass transit, the aerotropolis project, and TranslinkeD which is an initiative to develop a supply chain hub uniting southwest Ontario, southeast Michigan, and Northwest Ohio.

In summer and fall of 2010, MIOH UTC convened representatives from the Michigan Department of Transportation (MDOT), the Ohio Department of Transportation (ODOT), the Toledo Metropolitan Area Council of Governments (TMACOG), the Southeast Michigan Council of Governments (SEMCOG) and the partner universities to share information that would inform researchers of the scope of research needs around the general topic of "Predicting the Traffic and Economic Impact of Multiple Major Transportation Projects in the Detroit-Toledo-Windsor Region." During a fall Workshop MDOT, ODOT, TMACOG and SEMCOG presented models currently existing and also unmet modeling needs.

Subsequent to these meetings the following three projects were funded:

"**Developing TranslinkeD Corridor Investment Strategies and Assessing their Socio-Economic Impacts on the Detroit Metropolitan Area and the Northwest Ohio Regional Community"** led by Dr. Hokey Min, BGSU, and Dr. Utpal Dutta, UDM.

"Enhancing JIT Freight Logistics Impacted By Transportation System Projects Under ITS" led by Dr. Ratna Chinnam and Dr. Alper Murat, WSU.

"Traffic Simulation in Regional Modeling: Concepts and Demonstration" led by Dr. Charles Standridge, GVSU.

Right: representatives of Ohio DOT and Michigan DOT present issues related to modelling needs of their state DOTs.

Journal Publications

Salari,E. and Bao,G., “Pavement Distress Detection and Severity Analysis,” SPIE Electronic Imaging Conference, Image Processing: Machine Vision Applications IV, Vol. 78770C, pp. 1- 10, San Francisco, January 25-27, 2011.

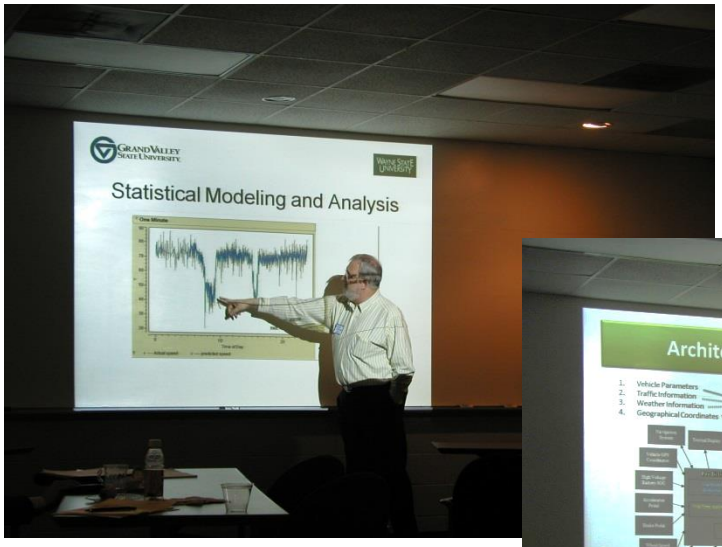
Salari,E. and Bao,G., “Automated Pavement Distress Inspection based on 2D and 3D Information,” E. Salari and G. Bao, IEEE Intl. Conf. on Elecro/Information Technology, Mankato, MN, 4 pages, May 15-17, 2011.

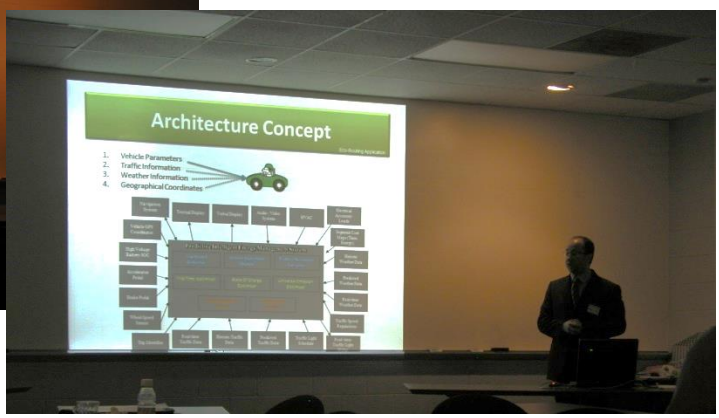
Kumar,A., Kadiyala,A., V. Kumar,V., Nerella,V., Shandilya,K.K., Velagapudi,S., and Somuri,D., *Characterization of Emissions and Indoor Air Quality of Public Transport Buses Using Alternative Fuels*, Chapter 9, Biodiesel: Blends, Properties and Applications, Editors: Jorge Mario Marchetti and Zhen Fang, ISBN: 978-1-61324-660-3, Nova Science Publishers, Inc., 2011. (invited).

Min, Hokey and Lambert, Thomas, “Benchmarking and Evaluating the Comparative Efficiency of Urban Para-transit Systems in the United States: A Data Envelopment Analysis.” *Journal of Transportation Management*, Vol. 21, 2A, (2010):48-62.

Min, Hokey, “Evaluating the Service Quality of Para-Transit Services: An Exploratory Study of the Toledo Area Regional Para-Transit Authority (TARPS),” *International Journal of Logistics Systems and Management*, Vol. 9, No. 3. (2011):315-327.

Shandilya,K.K. and Kumar,A., “Physical Characterization of Fine Particulate Matter Inside the Public Transit Buses Fueled by Biodiesel in Toledo, Ohio”, Journal of Hazardous Materials, 190, 508-514, 2011.





Presentations:
Left: Dr. Charles Standridge, GVSU
Below: Mohamad Abdul-Hak, UDM doctoral student

Conference Presentations

Dutta,U. and Tenazas,E., "Cost Estimation of the Proposed Detroit Light Rail Transit System Using a Fully Allocated Cost Approach," Transportation Research Forum, Long Beach, California, March, 2011.

Guner,A.R., Chinnam,R.B., and Murat,A., “Dynamic Routing in Stochastic Time-Dependent Networks for Milk-Run Tours with Time Windows,” INFORMS Annual Meeting. Austin, TX, November 2010.

Guner, A., Chinnam, R.B., Murat, A., “Dynamic Routing Policies in Stochastic Time-Dependent Networks Under ITS,” ITS Michigan Annual Meeting, Dearborn, MI, June 1-2, 2011.

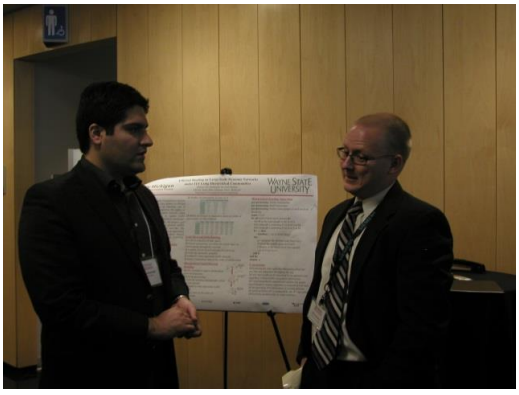
Guner, A., Chinnam, R.B., Murat, A., “Dynamic Vehicle Routing in Networks with Arc Interactions under ITS”, *INFORMS 2011 Annual Meeting*, Charlotte, North Carolina, Nov 13-16, 2011.

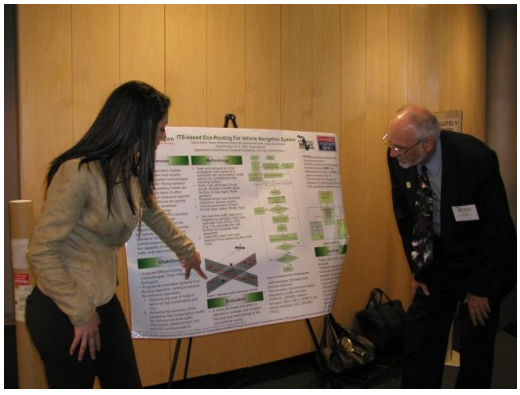
Guner, A., Murat, A., Chinnam, R.B., “Dynamic Routing in Stochastic Time-Dependent Networks for Milk-Run Tours with Time Windows under ITS”, 4th METRANS National Urban Freight Conference, Long Beach, CA, October 12-14, 2011.

Min, Hokey and Melachrinoudis, Emanuel, “An Intelligent Decision Support System for Paratransit Service Vehicle Routing and Scheduling”, 24th European Conference on Operational Research (EURO), Lisbon, Portugal July14, 2010.

Min, Hokey and Melachrinoudis, Emanuel, “Call-a-Ride Routing and Scheduling Problems for Para-transit Services”, 2011 Conference for the International Federation of Operational Research Society (IFORS), Melbourne, Australia July 14, 2011.

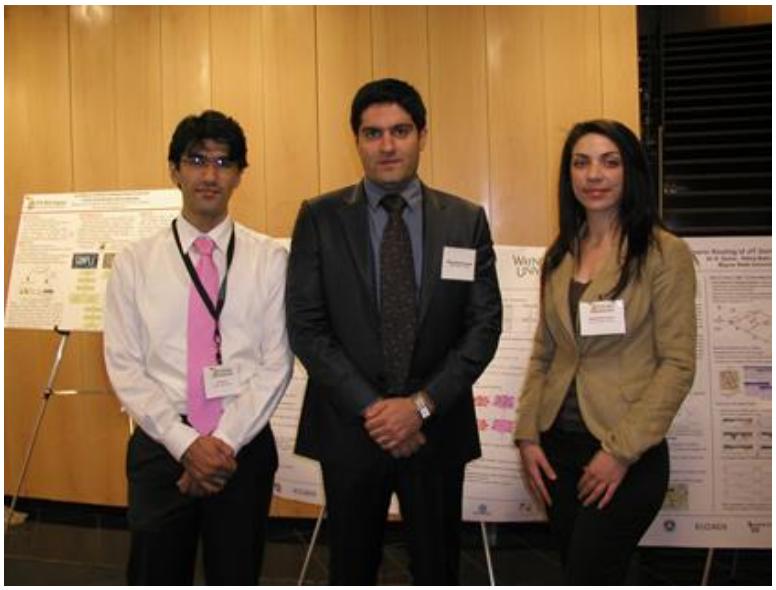
Salari,E. and Bao,G., “Pavement Distress Detection and Severity Analysis,” SPIE Electronic Imaging Conference, Image Processing: Machine Vision Applications IV, Vol. 78770C, pp. 1- 10, San Francisco, January 25-27, 2011.



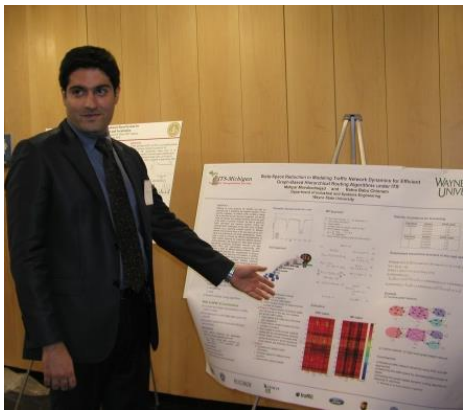


Student Presentations and Poster Sessions

Student researchers supported by MIOH UTC projects swept the Intelligent Transportation Society-Michigan 2011 **Gold, Silver, and Bronze Student Paper Awards** for submitting the top ranked abstracts. Below (left to right) are Bronze winner Ali Gunar, Wayne State University; Gold winner Mahyar Movahednejad, Wayne State University; and Silver winner Malok Alamir Tamer, University of Detroit Mercy. Additionally each Paper Award winner's poster was accepted for presentation as part of the poster session.

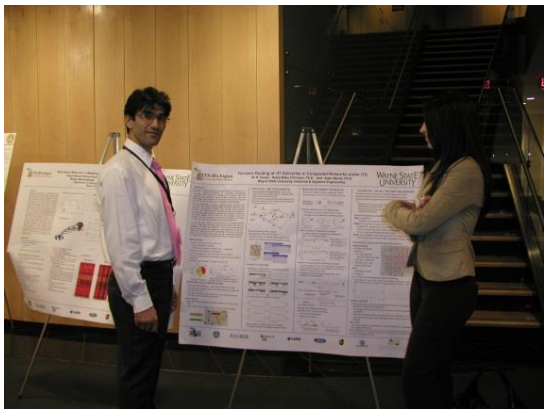


Below are pictures from the ITS Michigan poster session.



*Below: Silver Paper Award winner **Malok Alamir Tamer** (right), a UDM graduate student, with her research team and Dr. Nizar Al-Holou at their poster presentation of "ITS-based Eco-Routing for Car Navigation Systems."*

*Above: Gold Paper Award winner for top-ranked abstract, **Mahyar Movahednejad**, a WSU graduate student presents "State-Space Reduction in Modeling Traffic Network Dynamics for Efficient Graph-Based Hierarchical Routing Algorithms under ITS." Mahyar's research relates to MIOH UTC funded projects of Dr. Ratna Chinnam and Dr. Alper Murat.*



*Right: Bronze Paper Award winner, **Ali Riza Guner**, WSU graduate student presents "Dynamic Routing Policies in Stochastic Time-Dependent Networks Under ITS." This is the second consecutive year Ali has earned the Bronze Paper Award.*

2010 MIOH UTC Student of the Year

Eric John Tenazas
University of Detroit Mercy

Right: 2010 MIOH UTC Outstanding Student of the Year, Eric John Tenazas, receives a US DOT award at the annual Washington D.C. banquet. Left to right: John D. Pocari, Deputy Secretary of Transportation; Eric Tenazas, UDM student, Stephen Albert, President of the Council of University Transportation Centers; and Peter Appel, Administrator, Research and Innovative Technology Administration, US DOT.

Below: Eric Tenazas is congratulated by Dr. Utpal Dutta, UDM and Dean Leo E. Hanifin, Director MIOH UTC in Washington, DC.

Eric Tenazas is a graduate student in civil engineering at the University of Detroit Mercy (UDM) pursuing a Master of Engineering degree. Eric has been involved in three transportation projects funded by the Michigan Ohio University Transportation Center. As a graduate Research Assistant, Eric collected and analyzed key data for these projects. Eric's efforts have resulted in the completion of tasks instrumental to the objectives of the research.

One of the MIOH UTC funded projects Eric contributed to was a collaborative project with two team members from Wayne State University that studied the implementation of transit-oriented development at two selected station sites along a proposed light-rail transit system on Woodward Avenue; one station in the city of Detroit and one in a northern suburb. Eric was the project representative to both cities where the stations would be located. He enthusiastically embraced the opportunity for involvement in a project that has potential to foster some economic revitalization in Detroit.

As a result of his work on the Transit-Oriented Development study, Eric was invited to present the findings of this study during the Intelligent Transportation Society of Michigan's 2010 Annual Meeting. This project, as well as others that Eric worked on, received support from the U.S. Department of Transportation, the Michigan Department of Transportation, Wayne State University and the University of Detroit Mercy. Previously Eric has been employed as a co-op intern for Tyme Engineering based in Livonia, Michigan and for Charles Pankow Builders in Los Angeles, California.

VI. Recently Completed Research

The following are some examples of specific accomplishments that support the national strategy for surface transportation research and/or respond to DOT priorities.
Full reports are available via the MIOH UTC webpage:
http://mioh-utc.udmercy.edu/research/index.htm

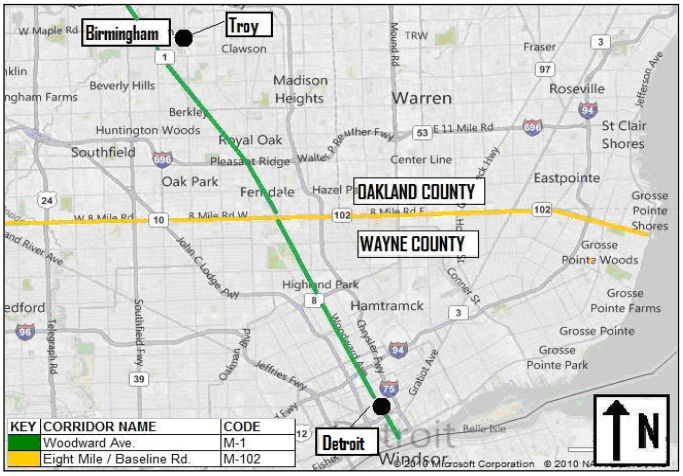
- **Developing TranslinkeD Corridor Investment Strategies and Assessing their Socio-Economic Impacts on the Detroit Metropolitan Area and the Northwest Ohio Regional Community** led by Dr.Hokey Min, BGSU and Dr.Utpal Dutta, UDM

Researchers at Bowling Green State University and the University of Detroit Mercy undertook a systematic study to examine and then evaluate road provision policies. They examined ways the state governments in the U.S. provide transportation infrastructure through road provision with the intent of helping policy makers develop transparent/wise road provision strategies and improve long-term road investment plans. Additionally this research identified factors that may significantly influence road provision and infrastructure investment decisions.

Many public services such as road provision can gain efficiencies from the economies of scale that urban areas often provide. In the researchers' experiments, the researchers **concluded** this potential efficiency gain was not sufficient enough to alleviate the potential efficiency loss caused by delayed commuting or shipping times. This finding is congruent with that of the earlier study conducted by Winston and Langer (2006) which showed that road infrastructure investment in highly urbanized areas tended to be inefficient, even when the investment was made for new road construction that intended to alleviate traffic congestion. According to Winston and Langer (2006), every dollar in urban road spending yields less than a dollar in benefits because the congestion relief is only temporary—as new roads are built to relieve traffic congestion in one part of an urban area, these new roads later become choke points themselves as drivers see them as good alternatives to old ways of traveling. Also, they believe that there will never be any way for road construction to keep up with annual increase in the total number of vehicles on the roadways. Instead, they recommended peak travel time or congestion pricing for major roadways during peak usage times, such as rush hour traffic. Such pricing could take the form of tolls with shippers probably willing to pay a little more to prevent delays. On the other hand, they suggested that exemptions to the peak load pricing or tolls should be granted to mass transit systems or to commuters that carpool in order to relieve traffic congestion in the urban settings.

Defying common sense, the researchers **discovered** that the climate of a state has no bearing on the road provision efficiency. The researchers also **discovered** that the land mass of a state has nothing to do with its road provision efficiency. Mega states, exceeding ten million populations, did not produce high efficiency scores for their road provisions in terms of both CRS and VRS efficiencies in individual commuting, mass transit, and truck shipping times. On the other hand, some smaller states were considered to be benchmarks for others to meet. Thus, the economies of scale alone did not seem to dictate road provision efficiency.

- **Transit Oriented Development at Selected LRT Stations in the Detroit Metropolitan Area (Incorporating Environmental Sustainability)** led by Dr. Snehamay Khasnabis, WSU and Dr.Utpal Dutta, UDM



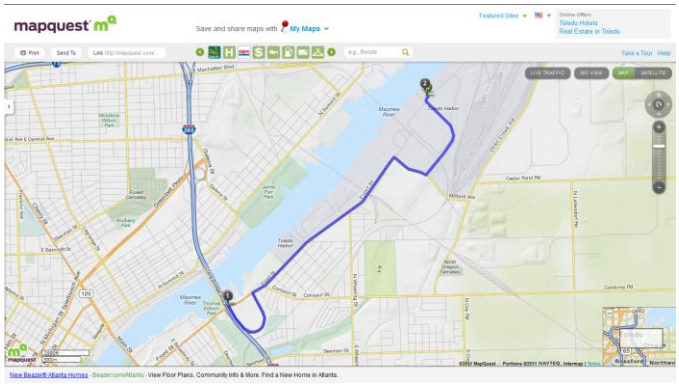
Researchers at Wayne State University and the University of Detroit Mercy sought to incorporate environmental sustainability into TOD packages that have been developed for two proposed rail-transit stations in the metropolitan Detroit area. The two sites are located in the cities of Detroit and Troy-Birmingham, representing typical urban and suburban development areas within the region. The proposed Detroit TOD is located at the intersection of Woodward Avenue and Temple St., east of the Masonic Temple Theater and just north of the Detroit CBD. The proposed Troy-Birmingham TOD is located approximately one-half mile east of the intersection of Woodward Avenue and 15 Mile / Maple Rd., along the Canadian National (CN) railroad tracks shared by both cities. The latter location is in Troy, proximate to an AMTRAK passenger boarding platform in Birmingham. Additionally, future plans call for a regional bus and para-transit services to be provided by the Suburban Mobility Authority for Regional Transportation (SMART) at this location.

The researchers developed environmentally sustainable design considerations for each of the TOD sites and planning, economic, and institutional mechanisms that may ease the implementation process are identified. Sustainable elements proposed at the two stations include among other things: (1) green roofing , (2) permeable pavements, (3) rain gardens, (4) greenspace, (5) special lighting, (6) streetscape, (7) energy efficient windows, (8) low-flow plumbing, (8) geothermal heating/cooling and (9) brownfield rehabilitation. Each of these treatments is discussed in the report along with any experience documented in the literature, and their applicability to the two sites. Following a general discussion of these elements, site-specific recommendations are made that can be integrated with the developments proposed at the two sites as a part of the original TOD program at the two sites. The researchers also recommend that LEED rating be pursued for both the stations to the extent possible. LEED is an emerging program that stresses energy savings, water efficiency, reduction of carbon dioxide emission, higher standards for indoor environmental quality, and the overall livability concept.

Mechanisms that are expected to expedite the implementation process are identified. Examples of environmentally-sustainable design, planning and construction, are discussed, with the objective of fulfilling a set of sustainability criteria.

- **Traffic Simulation in Regional Modeling: Concepts and Demonstration** led by Dr. Charles Standridge, GVSU

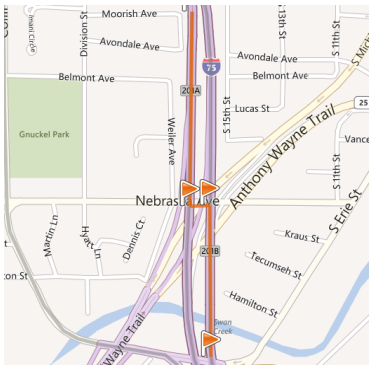
Transportation system experts and simulation experts from Grand Valley State University and Wayne State University developed, tested, and applied an approach to assessing road infrastructure capacity using micro traffic simulation supported by publically available data in partnership with personnel of the Toledo Sea Port, the Toledo Metropolitan Area Council of Governments, and the Ohio Department of Transportation in a two phase research project.



In the first phase, application activities focused on the arterial road infrastructure connecting the Toledo Sea Port to the interstate highway system via Interstate 280. Data was gathered from the Toledo Metropolitan Area Council of Governments and the Ohio Department of Transportation. A micro traffic simulation model was developed using the commercial software product AIMSUN. Multiple simulation experiments were conducted to find and propose relief for traffic bottlenecks. Simulation results showed that publicly available data was sufficient to support modeling and assessment activities.

The researchers **concluded** that the road infrastructure had sufficient capacity to support truck movement between Interstate 280 and the seaport. The primary bottleneck was identified as the single entrance lane at the seaport security post. Adding a second lane would relieve the entrance bottleneck but cause a new bottleneck at the exit security post. The latter could be relieved by a second lane as well. In addition, additional truck unloading and loading capacity could be required under small, approximately 30%, increases in volume.

In the second phase researchers expanded the focus to include capacity on Interstate 75 in Toledo near Anthony Wayne Trail and Nebraska Avenue. A micro traffic simulation model was developed again using AIMSUN. Simulation experiments were conducted to assess traffic bottlenecks caused by a construction project to add one additional lane in each direction to I-75.



The researchers **concluded** from the micro traffic simulation that the road infrastructure has sufficient capacity to support the construction activity without traffic delays and will not cause congestion on I-75.

The simulation results support proceeding with the construction project as planned.

- **Innovative Contracting Methods and Construction Traffic Congestion** led by Dr. Utpal Dutta, UDM

In this project researchers from the University of Detroit Mercy (UDM) examined the effectiveness of innovative contracting approaches for state DOT construction contracting relative to incentive and disincentive types of contracting. A model was developed to establish a functional relationship between construction duration and construction cost using Michigan Department of Transportation construction data. More than 10 years of project data were collected as a part of this effort. Two variables namely project Cost Incentive Index (CII) and project Time Crashes Incentive Index (TCI) were established to develop a relation between construction duration and construction cost.

In concluding their investigation, the researchers **developed** a set of tools based on the literature review and analyzing MDOT incentive contract data.

The findings of this study are summarized as follows:

- A non-linear regression model (power of 3) was developed considering CII as a dependent variable and TCI and TCI power of 3 as independent variables. A R^2 of 0.72 was achieved along with appearance of TCI and TCI power of 3 as significant variables at 95 percent confidence level.
- A utility tool was derived considering regression relationship, to compute probable actual cost for various incentive durations, given that bid duration and bid price were known.
- In order to assist state DOTs, a User-cost calculator was designed to compute user cost due to construction delay.
- Based on the literature review, a template was develop to assist DOTs, in determining the candidacy of a construction project to be considered as an incentive project by examining various related attributes of the project other than cost and time.

It is to be noted that model developed as a part of this effort is based on the Michigan DOT's construction data thus caution should be taken while using this model in other regions.

- **Pavement Distress Evaluation using 3D Depth Information from Stereo Vision** led by Dr. Ezzatollah Salari, UT, and Dr. James Lynch, UDM

Researchers at the University of Toledo undertook to provide a more robust image processing based pavement distress detection and classification system. One major issue with pure video based systems is their inability to discriminate dark areas not caused by pavement distress such as tire marks, oil spills, shadows, and recent fillings. To overcome the limitation of the conventional imaging based methods, a probabilistic relaxation technique based on 3-dimensional (3D) information was attempted. The researchers have enhanced previously developed algorithm to extract the pavement region from a road scene using a Support Vector Machine (SVM). Various types of cracks are then obtained from the pavement surface images and classified using a feed-forward neural network. The proposed algorithms are implemented in MATLAB and the results are presented.

Researchers **concluded** that a stereovision technique applied to guide the probabilistic relaxation process can provide accurate segmentation results for pavement image analysis. This method does not rely on the assumption that defects and pavement do

not share the same color and texture features, therefore it works very well in cases where the road has a noisy surface with shading and oil spills. A Support Vector Machine (SVM) can be used to extract the pavement segment from a road scene containing other objects, such as, trees, grass, and buildings.

- **A Multi Dimensional Model for Vehicle Impact on Traffic Safety, Congestion, and Environment** led by Dr. Nizar Al-Holou, UDM and Dr. Syed Mahmud, WSU

Researcher at the University of Detroit Mercy (UDM) and Wayne State University (WSU) sought to improve three main areas of Intelligent Transportation System (ITS): 1.) enhancing the traffic flow and mobility of vehicular transportation, 2.) improving the active and passive safety of vehicles through V2V and V2I communication, and 3.) providing a platform that can address the environmental challenges of transportation systems from a macroscopic perspective. To implement this vision the researchers conducted investigations on two layers: the communication layer and the application layer. The former is concerned with providing proper V2V and V2I communication at the physical, MAC, and network layers, while the latter is concerned with using the communicated data in V2V and V2I interactions to achieve the aforementioned three-point vision of ITS systems. This research targets special cases at both the communication and application layers.

"Adaptive Traffic Light Controlling Methodology under Connected Vehicles Concepts"
Researchers at UDM **developed** an adaptive traffic light application that improves mobility and safety. This application adopts Webster's equation as a basis to determine the red and green time cycles. It integrates the dynamic traffic information into Webster's calculations and extends the green time or shortens the red time of traffic lights at an intersection to maximize the traffic flow at the corresponding junction. The developed system is simulated and evaluated against the conventional pre-timed traffic lights and smart pre-timed traffic lights, and the results show great improvement in controlling delay times, travel times, and traffic flow volume.

"Evaluate Different Roadway Routing Algorithms"
Researchers at UDM **developed** an environment-friendly vehicle routing application. This application introduces a new methodology to collect traffic data through the ITS communication scheme, and utilize this data to route vehicles in the most collectively fuel-efficient way. The estimated fuel consumption over road segments is used as the main criteria to calculate the best route for a vehicle, and is updated continuously through ITS message exchanges. The new routing method is evaluated through simulation and is proven superior to the conventional static fastest path routing methods in terms of waiting times, travel times, fuel consumption, and CO_2 emissions.

"Development of an Efficient Media Access Protocol for Smart Intersections"
Researchers at WSU targeted the Medium Access Control at the communication layer of ITS. This research introduces an Intersection Warning Channel Access Priority (IWCAP) protocol that would guarantee warning drivers of possible collisions as they approach an intersection. This protocol utilizes one omni-directional antenna per vehicle and one DSRC channel for the intersection warning system. It provides priority and fairness for all vehicles approaching the intersection to transmit their conditions to other vehicles. The researchers at WSU **concluded** that the protocol analysis shows that drivers can avoid a collision if a warning message is received within 240 m from an intersection given a communication range of 500 m and a speed of 96 Km/h on a wet pavement, if the warning message is received within 0.2 s after joining the wireless network.

The following page provides excerpts from DOT strategic documents that are directly related to MIOH UTC focal areas and projects. This is followed by a table that maps the sponsored projects against these top priorities of the DOT.

VII. DOT Priorities

Mobility Strategic Objective:

"Advance accessible, efficient, intermodal transportation for the movement of people and goods."

Toward this end, DOT RD&T (e.g. Intelligent Transportation Systems) addresses the following priorities:

1. Exploiting web-enabled and other secure information technologies to share information on best practices in all modes
2. Examining ways to encourage cargo transport by water to improve the capacity of the intermodal transportation system
3. **In consultation with public and private sector partners, conducting research and expediting the deployment of technologies that improve system efficiency** and infrastructure durability
4. **Providing technical assistance and training to improve intermodal transportation planning and effective system management and operation**

Global Connectivity Strategic Objective:

"Facilitate a more efficient domestic and global transportation system that enables economic growth and development."

The increasingly global economy hinges on smooth supply chains and just-in-time manufacturing. Transportation is critical to both. An intermodal approach is central to DOT's role in promoting global connectivity. The following are the Department's RD&T (e.g. National Freight Action Agenda) priorities:

1. Encouraging and facilitating intermodal transportation planning worldwide
2. **Supporting and conducting research on issues concerning the intersection of passenger and freight transportation**
3. **Accelerating the use of ITS and other technologies that reduce delays at key intermodal transfer points, in significant freight corridors, and at international border crossings**

Environmental Stewardship Strategic Objective:

"Promote transportation solutions that enhance communities and protect the natural and built environment."

Transportation exerts pressure on environmental resources worldwide. The *DOT Strategic Plan* calls for a balance between environmental challenges and the need for a safe and efficient transportation network. Among the RD&T (e.g. Crossmodal Initiatives) priorities for achieving this vision are:

1. Supporting the President's Hydrogen Fuel Initiative through research on fuel distribution and delivery infrastructure, transportation of associated hazardous materials, and vehicle safety
2. **Supporting interdisciplinary research on connections among transportation, energy, and the environment**
3. Adopting transportation policies and promoting technologies that reduce or eliminate environmental degradation
4. Collaborating with Federal agencies, academic institutions, and the private sector to support and conduct **research on technologies that improve energy efficiency, foster the use of alternative fuels, and reduce vehicle emissions**

5. **Working with transportation partners to mitigate the adverse environmental effects of existing transportation systems**

Education and Workforce Development Strategic Objective:

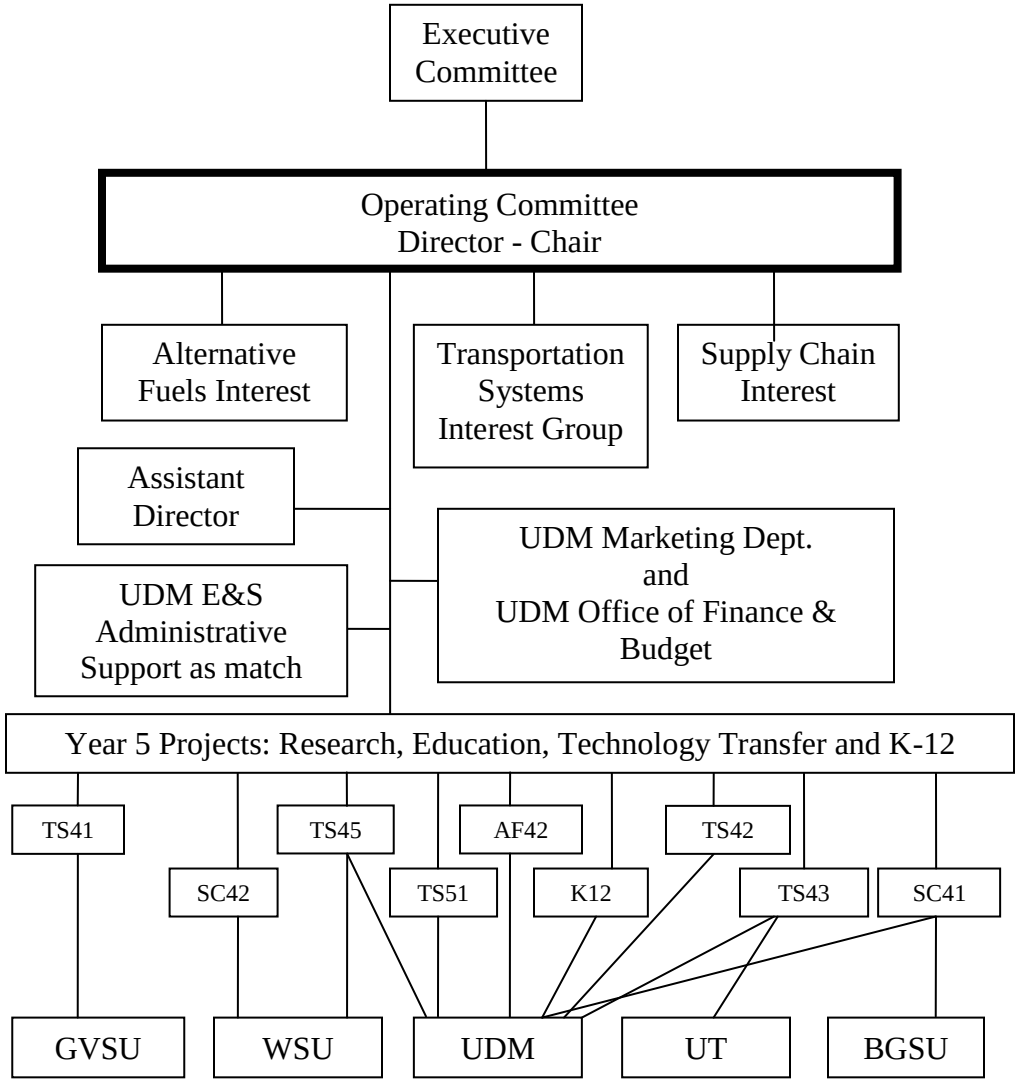
RITA will work with **partners in academia and industry to build the professional capacity of the transportation workforce.** RITA's activities will complement the efforts of DOT's operating administrations by reaching out to the broader transportation and education communities. In addition, the Administration's proposal for reauthorization of surface transportation programs—the Safe, Accountable, Flexible, and Efficient Transportation Equity Act—includes a provision for a new Transportation Scholarship Opportunities Program that RITA will administer.

DOT Strategic Objectives								
	Mobility		Global Connectivity		Environmental Stewardship			Education & Workforce Develop-ment
Funded Projects	**Improve System Efficiency**	**Technical Assistance & Training**	**Intersection of passenger & freight transport'n**	**Accelerating Technologies reducing delays**	**Interdiscipl. research transport'n energy & environm't**	**Improve energy alt. fuels**	**Mitigate adverse environ. Impacts**	
AF1, series 1-3					x	x	x	x
AF3, series 1-2					x	x	x	
AF4, series 1-5					x	x	x	
AF12,series1-2					x	x	x	
AF21, project 1					x		x	
AF31, project 1					x		x	x
AF42						x	x	
SC1, series 1-2	x	x	x					x
SC2, series 1-5	x		x	x				
SC41	x		x	x				
SC42	x		x	x				
TS1, series 1-3	x		x	x				
TS2, project 1	x							
TS4, series 1-2	x		x	x				
TS13, project 1	x							
TS14, project 1	x							
TS15 series1-2	x			x				
TS18 series1-3	x							
TS19, project 1	x							
TS21,series1-2	x		x	x				
TS22,series1-2	x		x	x				
TS23,series1-2	x		x					
TS33, project 1	x							
TS41	x		x	x				
TS42	x			x				
TS43	x			x				
TS45	x			x			x	
TS51	x			x				
K12-1,series1-4					x			x
K12-2,series1-4					x			x
K12-3,series1-5					x			x
K12-14,proj.1-5								x
K12-35,proj. 1					x			x

VIII. Management Structure

The MIOH UTC's management approach is one that is open and inclusive of all partners, both at the five MIOH universities and its partner corporations and government agencies. The MIOH organization, summarized in the graphic below, reflects that approach. It does not have an "advisory committee" that is separate from the decision-making groups of the UTC. Rather, all university, corporate, and government representatives serve on interest groups and/or the MIOH Operating Committee to stimulate, identify, and review project proposals in addition to developing and approving the MIOH annual program plan and budget.

A. Organizational Chart



B. Principal Center Staff

Dr. Leo E. Hanifin is Director of the MIOH UTC and Dean of the College of Engineering and Science at UDM. In addition to considerable industrial experience, Dr. Hanifin has extensive experience leading research centers, research and educational coalitions and engineering education.
Contact: hanifinl@udmercy.edu, Ph: 313-993-1216, Fax: 313-993-1187.

Patricia Martinico joined the UTC in the fall of 2006 as Assistant Director. Ms. Martinico's background includes administrative experience as Assistant Dean of Architecture at UDM, as well as corporate event planning for a Michigan destination management company. In addition, she holds graduate degrees in business and economics.
Contact: martinpa@udmercy.edu, Ph: 313-993-1510, Fax: 313-993-1187.

C. Executive Committee, Operating Committee, and Interest Groups

Executive Committee, **Year 5** as of August 31, 2011

University	Member
BGSU	**Michael Ogawa**, Vice President for Research and Economic Development
GVSU	**Paul Plotkowski**, Dean of Engineering and Computing
UDM	**Pamela Zarkowski**, Academic Vice President
UT	**Frank Calzonetti**, Vice President for Research Development
WSU	**Mumtaz Usmen**, Dean of Engineering
MIOH UTC	**Leo Hanifin,** UTC Director and Dean of Engineering and Science, UDM (ex officio)

Operating Committee, **Year 5** as of August 31, 2011

Leo Hanifin	UTC Director
Hokey Min	Faculty Representative BGSU
Charles Standridge	Faculty Representative GVSU
Utpal Dutta	Faculty Representative UDM
Richard Martinko	Faculty Representative UT
Peter Savolainen	Faculty Representative WSU
James Merritt	US DOT – R & D Program Mgr, Pipeline Safety
Kirk Steudle, alt. Niles Annelin	MDOT – Director
Jim Saber, alt. Roland Kibler	NextEnergy – Director, Program Development
Carmine Palombo	SEMCOG -- Director, Transportation
Warren Henry	TMACOG -- Vice President for Transportation

Interest Groups, Year 5 as of August 31, 2011 (7-12 members each)
Operating Committee Members may also participate in interest group(s).

Alternative Energy

Roland Kibler	Manager, Technology Development, NextEnergy
Mark Schumack	Faculty, Mechanical Engineering, UDM
Snehamay Khasnabis	Faculty, Civil Engineering, WSU
Barry Piersol	Assistant to the Dean, College of Technology, BGSU
John Wilson	Energy Tech Consultant, TMG / Energy
Scott Staley	Director, Hybrid and Fuel Cell, Ford Motor Company
Eric Sattler	Assured Fuels Initiative U.S. Army TARDEC, National Automotive Center
Steve Salley	Faculty, Chemical Engineering, WSU

Transportation Systems

Carmine Palombo	Director of Transportation, SEMCOG
Ralph Robinson	Co-Lead UMTRI's Transportation Systems Group
Charlie Standridge	Professor, College of Engineering and Computing, GVSU
Utpal Dutta	Professor, Dept. of Civil Engineering, UDM
Mumtaz Usmen	Dean, College of Engineering, WSU
Barry Piersol	Asst. to the Dean, College of Technology, BGSU
Pete Lindquist	Chair, Dept. of Geography & Planning, UT
Lee Nederveld	Operations Engineer, MDOT
Lou Lambert	Consultant
Steve Underwood	Center for Automotive Research
Richard Beaubien	Associate, Hubbell, Roth & Clark, Inc.
Colleen Hill	Transportation Engineer, Hubbell, Roth & Clark, Inc.

Supply Chain

Thomas Madden	Supply Chain Management, General Motors
John Drury	Leader – Supply Chain Network Optimization Team, IBM
John Taylor	Faculty, Business, WSU
Hokey Min	Faculty, BGSU
Ratna Chinnam	Faculty, WSU
Paul Hong	Faculty, UT
Tim Buckel	Metro Detroit Engineering Manager, UPS
Lee Nederveld	Operations Engineer, MDOT
Gene Robinson	Director of Automotive Glass Technology, Libby-Owens-Ford
S. Manivannan	Sourcing & Lean Manager - GE Transportation
Terry Onica	Director, Automotive Marketing, QAD
John Daly	Manager – Director, Genesee County Road Commission