PROJECT NUMBER: 06202

PROJECT TITLE: Transportation Facilities Management under Emergencies

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PROJECT OBJECTIVE:
Dynamic Traffic Assignment (DTA) overcomes the limitations of static assignment models by capturing the dynamics of congestion formation and dissipation associated with traffic peak periods and incident conditions. The main objective of this project is to develop a dynamic traffic simulation and assignment tool to assist engineers and policy makers in decision-making and effective planning and design. The tool will be used to model emergencies in the Birmingham area for pre planning purposes and to evaluate alternative relief strategies.

PROJECT ABSTRACT:
Static Traffic Assignment (STA) has been traditionally used by planners to determine paths followed by transportation system users and thus estimate current and future use of traffic networks. One of the major limitations of this procedure is its inherent static analysis perspective that is unable to capture the true dynamics of real-time routing behavior. To address the limitations of the static planning methods, recent research focused on the development of DTA models. Such models compute the spatio-temporal path for every vehicle so that no user can switch path and improve either his departure or his arrival time while accounting for real-time routing behavior. In this context, DTA models provide transportation planners and engineers with modern tools to improve the accuracy of traditional transportation planning approaches and enable modeling of recently emerged technologies such as Intelligent Transportation Systems. This project proposes the development of a Dynamic Simulation/Assignment Model in the Birmingham, AL area. The Visual Interactive System for Transport Algorithms will be implemented and utilized to construct several case studies to demonstrate the potential use of the software for traffic management and emergency planning. Specifically an incident management case study will be developed as well as a case study for emergency analysis. The case studies will provide an opportunity for training of related emergency agencies, off-line evaluation of various emergency alternatives, and continuous calibration based on feedback from each event.
PROJECT TASK DESCRIPTIONS:

Task 1: Literature Review. Review technical literature to identify theories and applications of DTA for incident and emergency analyses. Moreover, an in-depth review of the Visual Interactive System for Transport Algorithms (VISTA) will take place to identify main features and capabilities and determine data requirements for modeling purposes.

Task 2: Simulation Testbed Development. This task will build on earlier efforts of the PI to develop a VISTA basic model of the Birmingham area. TRANPLAN, CORSIM and GIS will provide inputs to assist this effort. Additional data will be solicited by local agencies as needed and a comprehensive regional model will be developed and calibrated. The modeled network will be used in Task 4 to test emergency scenarios and response actions.

Task 3: Emergency Scenario Development. Detailed realistic incident and emergency scenarios and candidate response actions will be developed. Local transportation and emergency management agencies will be invited to offer input to the scenario development process. Incidents of varying scale and duration will be modeled in the study network, and the impacts of incidents and response actions will be measured on the basis of travel time and traffic delay as well as with respect of the spread of congestion to alternate routes around the incident.

Task 4: Modeling of Emergencies in VISTA. Using inputs from Tasks 2 and 3, VISTA will be used to analyze the impact of short and long term incidents. Since the pre-incident trajectories of all vehicles will be known, the RouteSim simulator within VISTA will be able to evaluate them collectively with and without the incident capacity reductions. Response actions will be also modeled including detours, ramp closures, evacuation routes, traffic signal control changes etc. so that the delays due to incident conditions can be minimized.

Task 5: Technology Transfer: Develop presentation materials and deliver a seminar to educate transportation professionals in Alabama on the opportunities for incorporation of DTA into emergency planning.

Task 6: Final Report: Document the findings from the previous tasks into a final report.

MILESTONES AND DATES:

Task 1: Jan 06
Task 2: Mar 06
Task 3: May 06
Task 4: May 06
Task 5: Jun 06
Task 6: Nov 06
Task 7: Dec 06

TOTAL BUDGET:
One-year project: UTCA $50,000; total budget $100,000.

STUDENT INVOLVEMENT:
The project will fund partially fund a full time graduate Civil Engineering student, preferably a minority.
RELATIONSHIP TO OTHER RESEARCH PROJECTS:
This project relates to a number of UTCA active and completed projects under the “Management” theme, including UTCA Projects 01101, 03226, 05231 and Technology Transfer Projects (UTCA 03217, UTCA 04213, and UTCA 05205) as it proposes the development and delivery of a short course.

TECHNOLOGY TRANSFER ACTIVITIES:
The main technology transfer activity of this project is the development of a short course on DTA and VISTA modeling opportunities for Alabama to be prepared and delivered to the Alabama transportation and emergency planning community. The PI will further pursue conference presentations and journal publications from the research conducted in this project to promote UTCA tech transfer activities beyond the state of Alabama.

POTENTIAL BENEFITS OF THE PROJECT:
This project will provide a bridge between the expertise recently developed at the national level on DTA and VISTA and current practices of transportation and planning agencies in the state of Alabama. Potential long term benefits include adoption of DTA in the statewide planning process with major anticipated benefits from the improvement of planning, engineering, and operational procedures used by transportation, planning and emergency management agencies in Alabama.

TRB KEYWORDS:
Dynamic Traffic Assignment, Traffic Simulation, Incident and Emergency Management