NTC Program Progress Performance Report (PPPR) Information Form

For P.I.'s Use

On a semi-annual basis the NTC sponsored P.I. must report Program Progress Performance Report (PPPR) using the format specified in this PPPR Information Form. The form must be submitted electronically to the corresponding NTC Associate Director by 9/15/2014.

Cover Period: 4/1/2014 – 9/15/2014

NTC Funded Project Information (Round/Year 1, 2013-2014)	
University Name	University of Maryland, College Park
Project Title	HOV Lane Performance Monitoring System
Principal Investigator	Dr. Ali Haghani
PI Contact Information	Phone: 301-405-2350 Email:haghani@umd.edu

The form includes the following six parts:

- Part I – Performance Indicators
- Part II – Accomplishments: What was done? What was learned?
- Part III – Products: What has the program produced?
- Part IV – Participants & Collaborating Organizations: Who has been involved?
- Part V – Impact: What is the impact of the program? How has it contributed to transportation education, research and technology transfer?
- Part VI – Changes/Problems

Supplementary documents/materials can be attached to this form with the submission.

Part I – Performance Indicators	
Reporting Period	**4/1/2014 – 9/15/2014**
1. Transportation-related courses offered during the reporting period that were taught by faculty and/or teaching assistants who are associated with the UTC	N/A
Undergraduate courses	[Course Number] [Course Name]
Graduate courses	[Course Number] [Course Name]
2. Students supported by this grant	N/A
Undergraduate students	[Student Name]
Masters students	[Student Name]
Doctoral students	Yanru Zhang
3. Students participating in transportation research projects funded by this grant (but not supported by this grant)	N/A
Undergraduate students	[Student Name] [Supervisor]
Graduate students	[Student Name] [Supervisor]
4. Students supported by this grant who received degrees	N/A
Undergraduate degrees	[Student Name]
Masters degrees	[Student Name]
Doctoral degrees	[Student Name]

Part II – Accomplishments: What was done? What was learned?	
The information provided in this section allows the OST-R grants official to assess whether satisfactory progress has been made during the reporting period.	
Reporting Period	**4/1/2014 – 9/15/2014**
1. What are the major goals of the program?	The National UTC aims to promote strategic transportation policies, investment, and decisions that bring lasting and equitable economic benefits to the U.S. and its citizens. The Center is concerned with the integrated operations and planning of all modes serving the nation's passenger and freight transportation system, including the institutional issues associated with their management and investments. A balanced multi-modal approach will be used that considers freight and passenger travel mobility, reliability, and sustainability, as well as system operations during periods of both recurring and non-recurring incidents, including response to major emergencies. The modes in this theme include highway, transit, rail, and inter-modal interfaces including ports, terminals and airports. In particular, the center focuses on research, education, and technology transfer activities that can lead to (1) Freight efficiency for domestic shipping and for our international land, air, and sea ports; (2) Highway congestion mitigation with multi-modal strategies; and (3) Smart investments in intercity passenger travel facilities such as high speed rail. Major center activities are as following: • **Advanced & Applied Research Promoting Economic Competitiveness:** Our research activities are multimodal/intermodal and multidisciplinary in scope, with the aims of addressing nationally and regionally significant transportation issues pertinent to economic competitiveness and providing practice-ready solutions. • **Education, Workforce Development, Technology Transfer, & Diversity** The consortium is committed to providing high-quality transportation education and workforce development programs for a broad and diverse audience. Center's efforts will support the development of a critical transportation knowledge base and a transportation workforce that is prepared to design, deploy, operate, and maintain the complex transportation systems of the future.

2. What was accomplished under these goals?	Making more efficient use of existing system through HOV lanes is a cost-effective solution to improve mobility. Effective management of such facilities calls for continuous and reliable monitoring of their performance. This research focuses on developing an evaluation framework that combines traffic data from several sources to estimate key HOV indicators. Motivated by advancements in travel time measurement technologies, a pattern recognition algorithm for separating travel time on HOV and regular lanes collected by Bluetooth sensors is developed.
3. How have the results been disseminated?	• The results have been presented in IFORS Conference in Barcelona, Spain • Findings of the project are being incorporated into 2014 Maryland SHA Annual Mobility Report
4. What do you plan to do during the next reporting period to accomplish the goals? (10/1/2014 – 3/31/2015)	We will finish producing the software for automating the tasks related to the project

Part III – Products: What has the program produced?	
Publications are the characteristic product of research projects funded by the UTC Program. OST-R may evaluate what the publications demonstrate about the excellence and significance of the research and the efficacy with which the results are being communicated to colleagues, potential users, and the public, not the number of publications. Many research projects (though not all) develop significant products other than publications. OST-R may assess and report both publications and other products to Congress, communities of interest, and the public.	
Reporting Period	**4/1/2014 – 9/15/2014**
1. Journal publications:	N/A
2. Books or other non-periodical, one-time publications	N/A
3. Other publications, conference papers and presentations	Masoud Hamedi, Ali Haghani, Yanru Zhang "Methodology for Measuring Performance of High Occupancy Vehicle Lanes", 20th Conference of the International Federation of Operational Research Societies (IFORS 2014), Barcelona, Spain, July 2014.
4. Website(s) or other Internet site(s)	N/A
5. Technologies or techniques	N/A
6. Outreach activities	

7. Courses and workshops	
8. Inventions, patent applications, and/or licenses	N/A
9. Other products	• A data warehouse for hosting HOV related traffic data such as travel time, volume, ridership and etc. • A software system for processing, compiling and visualizing HOV performance measures

Part IV – Participants & Collaborating Organizations: Who has been involved?	
OST-R needs to know who has worked on the project to gauge and report performance in promoting partnerships and collaborations.	
Reporting Period	**4/1/2014 – 9/15/2014**
1. What organizations have been involved as partners?	Maryland State Highway Administration
2. Have other collaborators or contacts been involved?	N/A

Part V – Impact: What is the impact of the program? How has it contributed to transportation education, research and technology transfer?	
DOT uses this information to assess how the research and education programs: • **increase the body of knowledge and techniques;** • **enlarge the pool of people trained to develop that knowledge and techniques or** • **put it to use; and,** • **improve the physical, institutional, and information resources that enable those people to get their training and perform their functions.**	
Reporting Period	**4/1/2014 – 9/15/2014**
1. What is the impact on the development of the principal discipline(s) of the program?	This project has introduced a unique an innovative approach for separating travel time data on HOV and general purpose lanes using a pattern recognition and clustering algorithm. Results show that the solution algorithm is robust and reliable. By merging travel time data with volume, occupancy and ridership data accurate performance measures for HOV facilities are calculated. Economic impact of HOV lanes are also estimated by accounting for value of time and wasted fuel factors.
2. What is the impact on other disciplines?	Given that many artificial intelligence techniques are used to develop clustering algorithms, this project also improves the implementation of computer science techniques to solve transportation problems.
3. What is the impact on the development of transportation workforce development?	N/A
4. What is the impact on physical, institutional, and information resources	N/A

at the university or other partner institutions?	
5. What is the impact on technology transfer?	The developed travel time separation algorithm may make impacts on the existing public facility (e.g. display travel time information on the variable message sign) and other commercial services (e.g. Google Map provides travel time information) by making it possible to show travel time for HOV and other lanes separately.
6. What is the impact on society beyond science and technology?	From the perspective of travelers, the predicted travel time information can result in better traveler route choice and departure time decisions. From the transportation agency perspective, such information enables them to manage and control the transportation system to reduce congestion, enhance safety, and reduce the carbon footprint of the transportation system.
7. Additional impacts	N/A

Part VI – Changes/Problems	
If not previously reported in writing to OST-R through other mechanisms, provide the following additional information or state, "Nothing to Report, if applicable:	
Reporting Period	**4/1/2014 – 9/15/2014**
1. Changes in approach and reasons for change	N/A
2. Actual or anticipated problems or delays and actions or plans to resolve them	N/A
3. Changes that have a significant impact on expenditures	N/A
4. Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards	N/A
5. Change of primary performance site location from that originally proposed	N/A