DWIGHT DAVID EISENHOWER TRANSPORTATION FELLOWSHIP PROGRAM
2015 EISENHOWER GRANTS FOR RESEARCH/INTERN FELLOWSHIPS
Grant for Research Fellow (GRF)

TITLE OF PROJECT:	Evaluate and Improve the Cooperative Adaptive Cruise Control (CACC) Algorithm
SPONSOR:	Federal Highway Administration
LENGTH OF ASSIGNMENT:	12 months
DISCIPLINE:	Computer Science, Electrical Engineering, Mechanical Engineering, or Civil Engineering
PREREQUISITES:	Enrolled in an accredited university Ph.D. program

DESCRIPTION OF ASSIGNMENT:
The Federal Highway Administration (FHWA) Office of Operations sponsored a research project to develop a platform technology to support automated vehicle research. Cooperative Adaptive Cruise Control (CACC) is the first operational concept/application developed and tested on the new platform technology. CACC is an application that allows vehicles to communicate with each other and enable safe and precise platooning on a freeway. It will supplement the existing sensors on the vehicle such as radar, LIDAR, and camera with image processing.

SCOPE:
The scope of the project is to evaluate the current CACC algorithm used by FHWA and develop improvements that take into consideration vehicle dynamics (mass of vehicle, drivetrain, brake system, transmission, steering, tire characteristics, etc.) which are needed to ensure better performance of the vehicle fleet. This algorithm uses Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications to gather data from nearby vehicles or roadway specific information. The initial focus is the application on freeways, specifically in managed lane use.

FHWA is planning to conduct experimentation of this CACC algorithm with the five vehicle fleet located at Tuner-Fairbank Highway Research Center in McLean, VA. This project will assist FHWA in evaluating the current CACC algorithm through vehicle experimentation data and this provides an opportunity to test improvements to the CACC algorithm. Tasks are as follows:

TASKS:
- Task 1: Evaluate the current performance of the CACC algorithm and identify weaknesses in the design and propose improvements
- Task 2: Improve the CACC algorithm taking into consideration vehicle dynamics and other factors
- Task 3: Test the new CACC algorithm in a simulation environment (i.e. CarSIM, MathLAB , etc.) and compare performance to existing CACC algorithm
- Task 4: Develop a plan to conduct an experiment with the five vehicle fleet to test new CACC algorithm designed in MatLAB/Simulink
- Task 5: Evaluate the results; compare simulation results with and without vehicle dynamics

SKILLS: Model based languages (specifically MathLAB), developing simulation models (specifically in Simulink) and use of existing models, application development with dSpace/AutoBox, object oriented languages (specifically C and C++)

EVALUATION:
The DDETFP GRF will be awarded on the basis of merit. Merit includes (in descending order of importance with the top three criteria being equal in importance):
- Experience in identified research area
- Unique qualifications for the project
- Proposed Plan of Study and Research Plan
- Potential for Outstanding Career in Transportation