PROJECT TITLE: Modeling and Simulation of Vehicle-Highway Automation Systems

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Project Description

Background
Connected and Automated Vehicle (CAV) technologies offer potentially transformative societal impacts including significant mobility, safety, and environmental benefits. The United States Department of Transportation (USDOT) has led the development, research, and standards making of these technologies and is currently developing deployment approaches and guidance. In order for CAV applications to be deployed, state and local transportation agencies must first be able to effectively and fully quantify the impacts of such deployments and identify which application best addresses their unique transportation problem. Traffic analysis, modeling, and simulation (AMS) tools provide an efficient means to evaluate transportation improvement projects prior to deployment. In fact, the FAST Act dictates utilizing AMS tools “to the fullest and most economically feasible extent practicable” to analyze highway and public transportation projects.

Current AMS tools are not well-suited for evaluating CAV applications due to their inability to incorporate vehicle connectivity/communication and automated features. Guidance on how these AMS tools can be extended to evaluate CAV applications is non-existent. Likewise, deployment concepts, strategies, and guidelines are needed to allow states to understand how and where CAV technologies may effectively be deployed.

Although several research projects, sponsored by FHWA and others, have modified available commercial models to include some connected automated features, there has not been a basis for validating their results, sharing the modified model with others, nor sharing “lessons learned” from detailed use cases - all of which are needed for deployment support.

Objective
The objectives of this task order are to: (1) develop AMS tools for the most prominent CAV applications; (2) incorporate these tools into existing AMS
commercial products, improving the state-of-the-practice; and (3) conduct real-world case studies (practical implementation scenarios and real-world transportation networks) for the most prominent CAV applications - to better understand their impacts and deployment strategies/methods.

The Next Mobility Lab at UC is dedicated to research on vehicle-highway automation and smart mobility. The students are expected to work on the following topics:
1. Automated vehicle system simulation and control algorithm development
2. Next generation mobility systems and application development
3. Human-machine interaction using an advanced driving simulator in the lab

1 - 3 vacancies are expected. Please refer to the Next Mobility Lab website for more information on the ongoing research:

Qualification
1. Required: Experienced in multiple of the following programming language: C++, Python, Java, C#, etc (you will need to prove your experiences).
2. Required: Active UC undergraduate student status.
3. Preferred: familiarity of the following: Matlab, and R.
4. Preferred: Linux systems
5. Preferred: Experience in data mining
6. Preferred: excellent writing capability