Request for Research Funding for FY 2019-2020			
Requesting Office	Or District	**Priority**	3 of 4
Proposed Title	Connected Vehicle Support of Freight Corridors with Application to I-STREET		
Justification	Interstate 75 (I-75) is a major interstate highway in the Great Lakes and Southeastern regions of the United States. It is one of the major cross-country roads with north–south route, from southern Florida to the northern tip of Michigan. The I-75 is considered the main corridor for facilitating the freight movements along the state of Florida, since it connects main areas around Florida with the northern part of the country. Along the I-75, the University of Florida (UF) and its Transportation Institute (UFTI), the Florida Department of Transportation (FDOT), and the City of Gainesville have partnered to create a "smart testbed" on the UF campus and surrounding highway network, called "I-STREET". The goal of this project is to deploy and evaluate emerging advanced technologies including connected and autonomous vehicles, smart devices, and sensors for enhancing mobility and safety. These technologies and their application will work within the existing network and will accommodate the presence of conventional vehicles. Due to the high level of traffic along I-75, crashes, other emergency situations, and construction activities often result in lane blockages, resulting in significant impacts on the mobility and safety of network operations. This in turn impacts the performance and impacts of freight traffic. The primary objective of the research project is to reduce the impacts on freight movements in the event of a lane closure, by assigning them with an alternative route. The study will focus on facilitating the trucks' operations during events that impact system performance and will provide to the truck drivers with optimal detours to avoid the congested roads without interfering from their original schedule. In addition, through the utilization of Intelligent Transportation Systems (ITS) technologies, the alternative routes will be able to accommodate the increased freight movements effectively and simultaneously without minimal impacts on other traffic. Specifically, the implementation of a Freight Signal Priority (FSP) strategy on the alternative route that the trucks will be assigned to follow, will provide them a reliable and quick way to overcome the congested conditions caused by lane closure in order to be on time on their delivery schedule. Finally, the study aims to research and assign the optimal truck route, without interfering and distracting the successful operations of the "I-STREET" project, but to collaborate efficiently. The project will be separated into four tasks. The first task will focus on conducting a literature review of current state of practice and recommend warrants and thresholds. The researchers will review transportation journals, articles, reports, and agency's publications to identify any detour strategy, the FSP strategy and the "I-Street" project. The second task will include the development of a concept of operations and conceptual design of the implementation and operations of the optimal truck routing and the FSP. The conceptual design will identify the ITS components including the infrastructure needed to detect and reroute trucks and communicate these detections to the signal controllers. The method of detection will be designed to have minimal impacts on the existing infrastructure. For the trucks to receive signal priority, integration into the existing signal system and Freight Advanced Traveler Information Systems is expected and this will be outlined as part of the concept of operations. Furthermore, the third task will utilize modeling for assessing the current traffic conditions on the network. The models will be calibrated for the current conditions and operation under lane blockage condition and will be used to evaluate the FSP implementation under normal and incident conditions. The model will evaluate different signal control priority scenarios and use cases that can be used to provide background information to support the implementation of FSP. An optimization approach will be developed to provide to the truck driver the optimal alternative routes. The modeling and optimization will be in accordance with the concept of operations and conceptual design identified in Task 2. The results of the modeling and optimization modeling will be used to assess the recommended strategies in concept of operations. Finally, the fourth task will focus on developing the final report and the final power point presentation of the project.		
Impact	The implementation of the proposed freight mobility study will have a significant impact for all its components. Specifically, the trucks movements through the simultaneous application of detour and Freight Signal Priority will be prioritized and avoid the congested traffic conditions. This will result on preserving the reliability and the successful operations of the freight movements. In addition, the provision of an alternative route for the truck drivers is going to decongest the traffic movements on I-75 after a sudden lane closure and the restoration of the normal operations will be accomplished in a shorter period of time and with less difficulties. There will a positive impact on the environment as well, since the reduced congestion will reduce the negative effects that the vehicle and truck movements on the environment.		

	Thus, the proposed solution aims to benefit the overall traffic operations around the area of study and rapidly return to providing a high level of service at the road network.		
Affected Offices	Identify any office that will need to be involved in the scoping or conduct of the research, will be affected by implementation of the results, or will need to participate in the implementation process—including OTIT, if enterprise data/network software application will be a deliverable, and district staff, as appropriate, e.g., through statewide meetings. **If the requesting office will not be the implementing office, please identify which office will have to serve in that capacity—has it been involved?**		
Existing Work	The review of the Transportation Research International Documentation (TRID) and the Research in Progress (RIP) online databases provided an extended overview of the various research projects related to rerouting, freight signal priority and the "I-Street' project. Firstly, the ongoing project on "Network Analysis of Freight Diversion and Capacity Issues in Tennessee" aims to identify all possible truck alternate routes, analyze all interstate segments of Tennessee and determine the shortest detour length, parallel routes (if applicable) and identify truck issues with some of the detours. The project on "Evaluation of Detour System for I-15 Freeway North Reconstruction Design Build Project" created strategies for traffic control and management of urban construction. The primary research objectives are to analyze data collected by FAST for the various detour strategies, compare simulation results with actual data, and develop guidelines for future major urban freeway detours. Another project on "Transportation Infrastructure Flooding: Sensing Water Levels and Clearing and Rerouting Traffic out of Danger" examines partially, possible ways for rerouting the traffic on a case of flooding. In addition, the project on "Improving Overweight/Over-Dimensional Logistics/Truck Routing Procedures" presented the importance of bridge, road, and construction data for routing purposes and investigated the improvements for Department of Vehicle Regulation's methods of collecting these data necessary for successful truck routing. Regarding the FSP review, an ongoing FDOT project on "Evaluation of Freight and Transit Signal Priority Strategies in Multi-Modal Corridor for Improving Transit Service Reliability and Efficiency" focused on evaluating the impact of freight and transit signal priorities in Florida. The goal of that project is to develop a strategy and guidelines to plan, design and implement a Freight Signal Priority, in order to improve Freight mobility, sustain good transit service, and minimize congestion on an arterial network with the consideration of the simultaneous application of FSP and TSP. An additional project concentrated on "The evaluation of impact of Traffic Light Priority for Trucks on Traffic Flow", aiming to eliminate the delays caused by trucks stopping and going, by providing priority to trucks. The "Multimodal Intelligent Traffic Signal System Engineering" project evaluated FSP as a possible solution for reducing congestion caused by freight movements. Finally, the "I-STREET" project is a collaboration among UF, FDOT, and the City of Gainesville. The primary objective is to create a "smart testbed" on the UF campus and surrounding highway network that is going to evaluate numerous advanced technologies including connected and autonomous vehicles, smart devices, and sensors. lt will also develop and apply novel applications to enhance mobility and safety. These technologies and their application will work within the existing network and will accommodate the presence of conventional vehicles.		
Keywords Used In Existing Work Search **(Cannot leave blank)**	Rerouting; Detour; Freight Signal Priority; I-street;		
Related Contracts (Give contract numbers)	BDV27		
Funding Request	$285.000	**Anticipated Duration**	12 months
Project Manager	Proposed technical manager to oversee research	**Contracting Method**	Anticipated procurement method (e.g., supplement to existing project, RFP to universities only, RFP to all registered vendors, direct contract with university)
Urgency	Score 1-5 1= highest , most immediate need	Comments* (elaborate as appropriate on justification/impact comments to explain the urgency of the need . . . is a solution needed immediately, needed within a certain period of time or by a known or anticipated deadline, desired for enhancement, etc.)	

Implementability	Score 1-5 1=greatest likelihood of and proximity to implementing results	Comments* (consider both the likelihood of implementation and the length of time and resources required to implement the results of the research.) Identify any prerequisites to, requirements for, or barriers to implementing the anticipated results of this research (e.g., new or change to existing specifications, development of production units of prototype device, legislative change); please indicate if multiple phases of work shall be required

Project Benefits (Succinct, complete explanation)

The freight mobility study aims to provide beneficial results for all the components of the traffic network of the study area. The proposed study focuses on detouring and prioritizing the truck movements in the case of a lane closure on I-75. So, certainly the freight movements will be benefited, since the alternative route will keep the truck drivers steady on their delivery schedule without interfering with the congestion on I-75. Thus, from the perspective of the freight, the reliability and success of freight operations will be preserved and flourished.

In addition, the proposed research study even though it is developed for benefiting the freight movements, will also have positive effects to the vehicle movements as well. The provision of an alternative route for the truck drivers is going to decongest the traffic movements on I-75 after a sudden lane closure. The decreased number of freight movements along a congested corridor will benefit the restoration of the normal traffic conditions will be completed in a shorter period of time and without many difficulties.

The impact at the environment will be positive well, since the reduced congestion will reduce the negative effects that the vehicle and truck movements cause to the environment. The mobility and safety around study area will be enhanced as well. However, the freight mobility study will be developed and implemented without interfering with the operations of the I-street project. Thus, the research study aims to benefit the overall traffic operations around the area of study and rapidly return to providing a high level of service at the road network.

Project Benefits **(Select all that apply and explain)**	**Quantifiable Benefits (units, dollars, etc…if applicable)**	**Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits**
o Materials Enhancement		
o Materials Savings		
o Time Savings		Travel Time measurements before and after the implementation of the project will provide the time savings benefits, the travel time reduction and the congestion relief.
o Lives Saved/Injuries Prevented		Safety impacts are anticipated due to truck rerouting and FSP.
o Other (Explain)		

*Comments should explain and support urgency, financial benefit, and implementability scores