
TECHLAV

| TOPIC | Modeling and analyzing the effects of delay-consensus of networks of multi-agent systems |
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| ORGANIZERS | Student Leadership Council and Faculty of ACIT Institute and TECHLAV Center |
| AREA | Control Systems, Mechanical Engineering |
| SPEAKER | Myrielle Allen-Prince (Master's) |
| DATE | Friday April 4, 2016 |
| TIME | 3:00 – 3:30 p.m. (EST) |
| VENUE | Fort IRC 410, North Carolina A&T State University,<br>UTSA and SIPI will be joining through video-conferencing |
| FEES | No Charge |

## SYNOPSIS

Achieving cooperation and coordination in a network of multi-agents systems is key to solving the consensus problem. Synchronization of these systems requires consistent communication between agents to reach a consensus. This is not a simple task, especially when taking into account the inherent delays, data loss, disturbances, and other unpredictable factors. These delays alone may not have substantial effects on the system, but environmental uncertainties can cause these delays to increase and negatively change the behavior of the system, preventing synchronization. Further analysis of delay systems requires a mathematical model using delay differential equations. Solving these equations is difficult because of the infinite number of solutions introduced by the delay operator. The Lambert W function has the capability of solving delay differential equations. The objective of this research is to quantify and analyze the stability of delayed systems. The communication between the agents is modeled using graph theory and the Laplacian matrix. The stability analysis was performed by incorporating the Laplacian matrix into the lambert with function, which provides the eigenvalues of the system as delay changes. Modifying the topology of the network, allows for comparison of the sensitivities and convergence speed with respect to delay. The numerical results were validated by the development and application of a testbed using Simulink.

## ABOUT THE SPEAKER

Myrielle Allen-Prince received a Bachelor's in Mathematics from Bennett College in 2013. Since the spring of 2014, she has been pursuing a Master's degree in Mechanical Engineering at North Carolina A&T State University. Her research focuses on developing a control system for networks of multi-agent systems and analyzing the effects of delay, disturbances, and uncertainties. She is a fellow of Testing, Evaluation, and Control of Heterogeneous Large-Scale Systems of Autonomous Vehicles (TECHLAV).