

NASA EPSCoR and Stennis Space Center Research Discussions



November 2022 NASA EPSCoR Virtual Caucus Meeting

Friday, November 18, 2022



Goal

- Establish connections between researchers at Stennis Space Center and EPSCoR Jurisdictions

Planning Committee Member

- T. Gregory Guzik, Director LA, Chair NASA EPSCoR Caucus
- Denise Thorsen, Director AK
- Caitlin Milera, Director ND
- Mitch Krell, NASA EPSCoR Deputy Project Manager
- Anne Peek, NASA SSC Chief Technologist
- Lauren Underwood, NASA SSC Technology Transfer Manager



List of Research Topics of Interest to SSC

- Intelligent Integrated System Health Management for Ground and Space Applications
- Autonomous Operations Capability for Ground and Space Applications
- Advanced Propulsion Test Technology Development
- Advanced Rocket Propulsion Test Instrumentation
- Advanced Manufacturing Techniques and Materials



Goal: Inform NASA SSC about EPSCoR Program and Showcase Research Capabilities at Jurisdictions

1. Modelled on Flash Talk session from January 2022
2. ~1.5-2 Hours in afternoon(Eastern) January 2023
3. Select ~20 speakers from submissions
4. Each speaker will be given ~2 minutes to cover their slide
5. Talks selected from submissions by planning committee
6. All submitted slides and biographies will be distributed to SSC in a researcher booklet

Format

- LSU Hosted Microsoft Teams Meeting



One submission per researcher, no limit per jurisdiction

Researcher Submissions

- 1 Standard 4:3 10 in. x 7.5 in. Slide
 - Should highlight research capabilities and 2-3 min worth of material
 - No video or animations
- Biography
 - Submit via Word Document
 - Includes:
 1. Contact information
 2. Topic Area
 3. Title for Flash Talk
 4. Headshot
 5. Brief biography/research interest summary



NASA EPSCoR
Caucus

Example Submission From January 2022

NASA EPSCoR Research for LaRC
January 27, 2021


Intelligent Flight Systems and Trusted
Autonomy: Smart cities, automation, robotics

Decentralized formation control of teams of autonomous agents

Dr. Marcio de Queiroz

Louisiana State University
Department of Mechanical & Industrial Engineering
Innovation in Control & Robotics Engineering (iCORE) Laboratory
mdeque1@lsu.edu; (225) 578-8770

Marcio de Queiroz is a Professor of Mechanical Engineering at LSU. He's the director of the iCORE Lab and coordinator for the Robotics Engineering minor. His research expertise is at the intersection of systems theory, control engineering, and robotics. Since 2011, Dr. Queiroz's primary area of activity has been coordination control of multiple autonomous robotic vehicles. Such systems are intrinsic to missions that involve air traffic management, search and rescue, area coverage, perimeter protection, or co-transportation of large objects. The iCORE Lab is home to TIGER Square, an experimental testbed for multi-agent systems, which uses small, low-cost, custom-built, differential-drive robots as the mobile robot platform. The testbed can be operated in both centralized and decentralized modes of sensing, communication, and control.




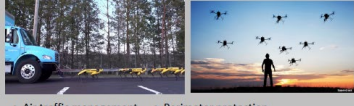
January 27, 2021

Topic 1: Intelligent Flight Systems & Trusted
Autonomy: Smart cities, automation, robotics

19

Decentralized Formation Control of Teams of Autonomous Agents

Motivation

Nature  **Inspiration** 

Engineered Systems

- Air traffic management
- Search and rescue
- Area coverage
- Perimeter protection
- Co-transportation of large objects

Autonomy Modes

Centralized

Agents (1, 2, 3, 4), Localization (L), Communication (C), Processing (P)

- Unified L/C/P
- Critical points-of-failure

Decentralized

Agents (1, 2, 3, 4)

- Distributed, onboard L/C/P
- Robust and versatile (e.g., GPS-denied environments)

Tools

- Rigid graph theory
- Nonlinear systems theory
- Distance-based control

Our Research

Applications

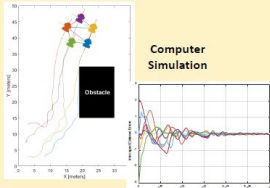
- Formation maneuvering
- Target interception
- Splitting and merging

Outcomes

- Switched autonomy
- Stability guarantees
- Collision/obstacle avoidance

Experimentation

Computer Simulation



Introduction

iCORE Innovation in Control and Robotics Engineering Lab

Dr. Marcio de Queiroz

LSU Louisiana State University
College of Engineering
Department of Mechanical & Industrial Engineering

20



Allow EPSCoR Researchers to meet with SSC Researchers

- ~1 week after the Flash Talks
- Open to all jurisdiction researchers who submitted Flash Talks
- Will again target ~2 Hours in the Afternoon Eastern Time

Format

- LSU Hosted Microsoft Teams with breakout rooms
- Breakout room for each research topic with multiple, but a small number of, jurisdiction participants
- Jurisdiction participants will be able to visit multiple breakout rooms during allotted time
- Will provide additional breakout rooms for researchers to break off for one on one discussions if needed



Following the RoundTable meeting Directors should meet with their researchers

- Determine potential for new collaborations with the Center
- Support travel (via RID funding) of jurisdiction researchers to meet with Center researchers and discuss collaborative research
- Keep in mind that the Center will require ~4 to 8 week, depending on citizen status for processing visitor passes

Post event assessment survey

- Later in Spring 2023 we will distribute a survey to NASA EPSCoR Directors to assess the outcomes and impact of this process



Research Topics Released
Flash Talk Submission Due
Presenters Selected
Virtual Flash Talks
Virtual Round Tables

November 30
December 21
Mid-January
End January
Early February