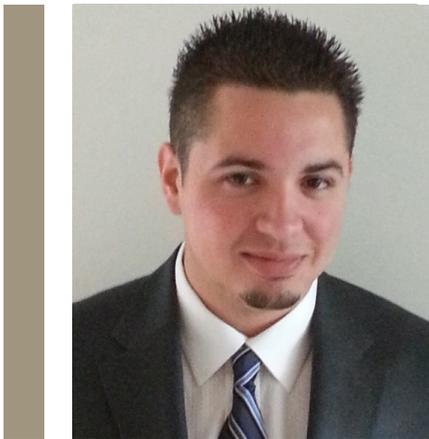




HUMAN-SWARM INTERACTIONS: CONTROLLING AN ARMY OF ROBOTS WITH THE TOUCH OF A FINGER



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ABSTRACT

One of the main challenges in human-swarm interactions is the construction of suitable abstractions that make an entire robot team amenable to human control. For such abstractions to be useful, they need to scale gracefully as the number of robots increases. In this presentation, we consider the use of time-varying density functions to externally influence a robot swarm. Density functions abstract away the size of the robot team and describe instead the concentration of agents over the domain of interest. This allows a human operator to design densities that manipulate the robot swarm as a whole, instead of at the individual robot level. We discuss coverage of time-varying density functions as a mechanism to translate densities into robotic motion, and provide a series of control laws that guarantee optimal coverage by the robot team. Distributed approximations allow the solutions to scale with the size of the robot team. This renders coverage a viable choice of method for influencing a robot swarm. We provide a framework for the design of density functions that shape the swarm to achieve specified geometric configurations within the domain of interest. Viability for human-swarm interactions is demonstrated through robotic implementation.

BIO

Yancy Diaz-Mercado is a Senior Professional Engineer at The Johns Hopkins University Applied Physics Laboratory where he works in the Advanced Concepts section for the Guidance, Navigation and Controls group. He obtained his Ph.D. in Electrical Engineering from the Georgia Institute of Technology in 2016. At Georgia Tech he was a member of the Georgia Robotics and Intelligent Systems Laboratory (GRITS Lab) where his research interests included multi-robot coordination and motion planning. Dr. Diaz is the recipient of numerous prestigious awards and fellowships, including a patent on control of swarming robots.

