2nd International Conference on

Robotics and Artificial Intelligence

May 23-24, 2019 | Vienna, Austria

Philip R Buskohl

Richard Vaia, Ben Treml *and* **Andrew Gillman**

Air Force Research Laboratory, USA

Local mechanologic operators for enhanced autonomy

Autonomous robotics and unmanned vehicles continue to revolutionize the operational model of various industries, ranging from transportation and manufacturing to defense. Autonomy however requires a platform with both local and global situational awareness. The associated control system, including sensors, actuators, computation, information transfer, and data storage, increases the complexity of the platform exponentially. A key challenge to this vision is disaggregating centralized control methodologies into a hierarchical network where some autonomy (spatial and temporal) is local, much like the autonomic versus the somatic nervous system. While much of the effort to address this challenge has focused on enhanced algorithms for synthesis of global sensor data, an alternative approach to local autonomy is to reframe how we consider engineering a material to behave in an environment. In this study, structure deformation and material responsiveness is re-interpreted into the language of logical operators, raising the level of decision functionality at the material/structure level. Thus, a desired response function based on environmental sensing, information processing, and deformation memory emerges from the synergism between the structure and material, which we will demonstrate in a humidity-responsive, origami structure. This paradigm shift provides a significant opportunity to rethink how autonomous functionality can be distributed across a robotics system to share and decentralize the information processing.

Speaker Biography

Philip R Buskohl is a Research Mechanical Engineer in the Functional Materials Division at the U.S. Air Force Research Laboratory (AFRL). The Division delivers materials and processing solutions to revolutionize AF capabilities in Survivability, Directed Energy, Reconnaissance, Integrated Energy and Human Performance. He has authored over 23 peer-reviewed papers ranging from the mechanical properties of embryonic heart value development, the chemical-mechanical feedback of self-oscillating gels, stimuli responsive polymers, and origami design. He is currently a member of the Flexible Electronics research team at AFRL, where he provides mechanical analysis and design concepts for conformal and deformable electronics packaging. He received his PhD degree in theoretical and applied mechanics from Cornell University in 2012.

e: philip.buskohl.1@us.af.mil

Notes: