

ISRCS 2011

Hosted in Boise, Idaho
August 9-11, 2011

4th International Symposium on Resilient Control Systems

The major purpose of this symposium is to extend and endorse particular concepts that will generate novel research and codify resilience in next generation control system designs.



University of Idaho



Contact Information

Organizing Chair

Michelle Blacker
(208) 526-6184
michelle.blacker@inl.gov

Symposium Logistics

Jodi Grgich
(208) 526-9439
jodi.grgich@inl.gov

Symposium Chair

Craig Rieger
(208) 526-4136
craig.rieger@inl.gov

Special/Invited Session Announcement and Call for Papers

Session S/I-10:

Building Resilience through the Art of Maneuver: Architectures for Polycentric Governance

Session Abstract:

Investigations into complex adaptive systems (CAS) have identified multiple trade-offs that place hard limits on the behavior of adaptive systems of any type (Alderson and Doyle, 2010). Resilience Engineering (RE) also arose from the recognition that basic trade-offs placed hard limits on the safety performance of teams and organizations in the context of pressures for these systems to be "faster, better, cheaper" (Woods, 2006; Hollnagel, 2009). The question to be answered is: what kinds of control architectures allow multi-scale interdependent networks dynamically balance the conflicts, risks and pressures that arise from the fundamental trade-offs--the problem of what are resilient control strategies?

- The workshop will present the current state of the search for answers based on:
A potential unification that consists of five basic trade-offs that bound the performance of all human adaptive systems (Hoffman and Woods, 2011).
- The three basic patterns in how adaptive systems fail (Woods and Branlat, 2011). The three basic patterns are (1) decompensation – when the system exhausts its capacity to adapt as disturbances / challenges cascade; (2) working at cross-purposes – when roles exhibit behaviour that is locally adaptive but globally mal-adaptive; and (3) getting stuck in outdated behaviours – when the system over-relies on past successes.
- Use the stress-strain model of (Woods and Wreathall, 2008) to generalize and define the resilient control problem.
- How the concept of Margin of Maneuver (MoM) provides the key control parameter needed to build the desired resilient control systems. To remain resilient in the face of shifting demands, systems act to create and sustain their Margins of Maneuver--cushions of potential actions and additional resources that allows the system to continue functioning despite unexpected demands.
- Introduce Polycentric Governance as a target for the desired control architecture (Ostrom, 2003).
- Since systems are comprised of multiple units or centers, each of which have partial authority and autonomy to manage their individual Margins of Maneuver, actions to sustain one center's Margin of Maneuver will interact with how other centers can act to create or sustain their margin (a critical aspect of interdependence relationships). There are 3 basic patterns of how centers adapt in the face of these cross-center constraints on Margins of Maneuver and these patterns of adaptation explain how systems inadvertently become brittle (Stephens et al., 2011).
- Illustrate the power of Margin of Maneuver from studies of urban fire-fighting, cybersecurity, critical care and emergency medicine, and crisis management.
- Assess the progress toward working architectures for Polycentric Governance based on regulating Margin of Maneuver within and across the multiple centers of adaptive behavior (CABs) that make up modern systems.

Chair:

- David Woods, Ohio State University, woods.2@osu.edu