Technical Subject:

Contributions to the Security and Reliability of Complex Systems
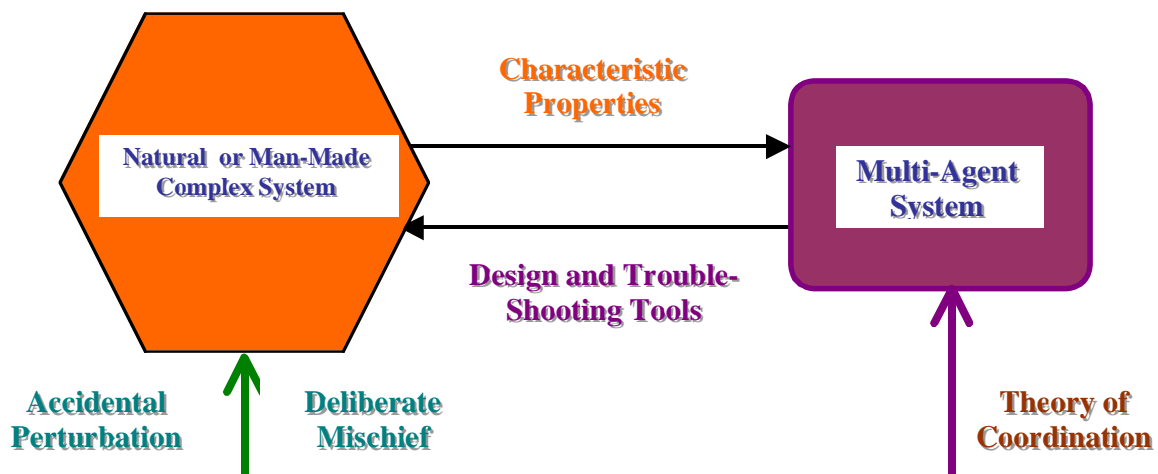
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DEVELOPMENT OF THE TOTAL SYSTEM

Goal and Contribution to the Well-Being of All Humanity: Complex Systems are ubiquitous in our environment, ranging from micro- and macro-level natural entities to diverse man-made arrangements. These important systems can be perturbed accidentally by natural or man-made causes or by deliberate mischief. The security and reliability of such systems are extremely important and can be enhanced by computational techniques.

Objective: We intend to develop computational methodologies that disable or, at least, reduce the chances of accidental or deliberate events that would perturb or destroy the normal operation of Complex Systems. We also wish to establish commercially available programming aids that would help in designing new Complex Systems and in trouble-shooting tools that can diagnose problems with existing deficient systems and support their elimination.

Method/Approach: (1) We will develop techniques that can transform Complex Systems into realistic Multi-Agent Systems which enable causal explanations of the interactions between the constituents;
(2) We will develop an automatically-generated and empirically-based Theory of Coordination for a large class of Multi-Agent Systems representing critical Complex Systems;
(3) Relying on the Theory of Coordination, we will create trouble-shooting and rectifying tools for erroneously and suboptimally functioning Multi-Agent Systems as well as design principles for new Multi-Agent Systems that are error-resistant.