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Introduction: Self Stabilization

SELF-STABILIZATION is a property that ensures automatic recovery from an arbitrarily perturbed state. Self-stabilization is useful because a system state can become unsuitable to the system mission, or unsuitable for its current environment, either by some transient failure or by an expected change in the system's environment. To engineer self-stabilization, the system design should not rely on "induction" for consistency, namely assuming initial consistency as a base case and validating that allowed steps preserve consistency. Instead, self-stabilizing systems are designed to establish consistency from an arbitrary state, and thereafter to preserve consistency so long as legitimate steps are executed.

The importance of the self-stabilization paradigm for aircraft, space-shuttles and satellites cannot be exaggerated. One would like to ensure that if a soft-error, or in fact any unexpected cause for state corruption takes place, and even if the system environment drastically and spontaneously changes, the system is not lost. A self-stabilizing system will regain its desired behavior by its own actions.

The goal of the special issue is to expose scientists and engineers in the AIAA community, and beyond, to the self-stabilization concept and the great opportunity it offers.

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