

# Adaptive Key Component Control and Inheritance of Almost Strict Passivity in Evolving Systems

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The inheritance of subsystem traits in Evolving Systems is an important area of study. Evolving Systems are autonomously controlled subsystems which self-assemble into a new Evolved System with a higher purpose. Evolving Systems of aerospace structures often require additional control when assembling to maintain stability during the entire evolution process. An adaptive key component controller has been shown to restore stability in Evolving Systems that would otherwise lose stability during evolution. The adaptive key component controller uses a direct adaptation control law to restore stability to the Evolving System through a subset of the input and output ports on one key component of the Evolving System.

The control laws used by the adaptive key component controller to restore stability in an Evolving System are guaranteed to have bounded gains and asymptotic tracking if the Evolved System is almost strictly passive. Hence, it is desirable to know when the passivity traits of the subsystem components, including the key component, are inherited in an Evolving System. We present results describing when an Evolving System will inherit the almost strict passivity traits of its subsystem components. Examples will be given of successful and failed inheritance of almost strict passivity.