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# State Dependent Generalized Inversion-Based Liapunov Equation for Spacecraft Attitude Control

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**Abstract:** Parametrization of nonunique linear equations solution via generalized inversion is utilized in nonlinear spacecraft control system design. A stable linear time-invariant ordinary differential equation in an attitude deviation norm measure is formed and is evaluated along the trajectories defined by the spacecraft mathematical model, yielding a linear relation in the control variables. Generalized inversion of the relation results in a control law that consists of auxiliary and particular parts. The *null-control vector* in the auxiliary part is designed by solving a state dependent Liapunov equation involving a *perturbed nullprojector* and by utilizing a *damped controls coefficient generalized inverse*, yielding globally uniformly ultimately bounded attitude trajectory tracking errors.

**Keywords:** *spacecraft attitude control; Moore–Penrose controls coefficient generalized inverse; null-control vector; damped controls coefficient generalized inverse; state dependent Liapunov equation; perturbed controls coefficient nullprojection.*

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