

This is a notice on an article published by Taylor & Francis in Vehicle System Dynamics on 13 Sep 2021, available online:

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Lyapunov-based Fault Tolerant Control Allocation

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This work addresses the design of an active fault-tolerant motion controller for overactuated road vehicles. Our concept revolves around a control allocation framework, extended with Lyapunov-based stability constraints and costs. Besides the ability to cope with actuator constraints and optimal actuator reconfiguration, the proposed Lyapunov-based control allocation (LCA) allows the graceful degradation of control performance. Theoretical analysis and simulation results demonstrate that, in comparison with classical control allocation, the proposed LCA reduces tracking errors of the motion controller in the aftermath of actuator faults. Experimental tests carried out with the ROboMObil, a robotic electric vehicle prototype with wheel-based steering and traction actuation, demonstrate the effectiveness of the LCA

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Ricardo de Castro & Jonathan Brembeck (2021) Lyapunov-based fault tolerant control allocation, Vehicle System Dynamics, DOI: 10.1080/00423114.2021.1971265