

**Fundamental Study for the Improvement of Actuator Control Performance of a Rapid Prototyping Bogie,
Using a DSS Approach**

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A rapid prototyping bogie (RPB) has multiple actuators, which emulate the characteristics of missing components. Considering the frequent changing of components' characteristics when the RPB is used for finding optimal characteristics, in the original RPB control scheme, each actuator was independently controlled by its own controller with hybrid control technique. Through the running tests on the rolling stock test plant in RTRI, we observed the control deterioration due to dynamic coupling among actuators. To solve this issue, we have developed a new controller based upon the dynamically substructured systems (DSS) method, which ensures the accurate synchronisation of the numerical and the physical states at their common boundaries. To confirm the effectiveness of the new approach, we implemented a DSS-based controller in an existing proof-of-concept test rig. A simplified single wheel-set system was chosen as an example. Through random excitation tests with the DSS controller, we confirmed that the actuators were well synchronized with their numerical models and that the unexpected frequency components, which were previously observed, were removed.