Proposal of Adaptive Computed Torque Controler for Manipulators under Payload Uncertainties

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The rapid development of modern industries requires robotisation that extends beyond simple tasks, driving a growing demand for control systems capable of adapting to dynamic changes in their environment and manipulated objects [1-3]. To address this, the proposed Adaptive Computed Torque Control (ACTC) architecture for a manipulator under payload uncertainties integrates a classical CTC with two parallel backpropagation neural networks. A BPNN Tuner dynamically adjusts the PD controller gains, while a BPNN Compensator counteracts unmodelled dynamics in real time. Compared to the classical CTC baseline, the ACTC significantly improves tracking precision under sudden payload variations, reduces the Joint 1 RMSE to 0.108 rad, and achieves a 10-fold reduction in the Joint 2 RMSE to 0.128 rad, while drastically dropping the Joint 2 IAE from 99.080 to 8.223 rad·s.

References

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