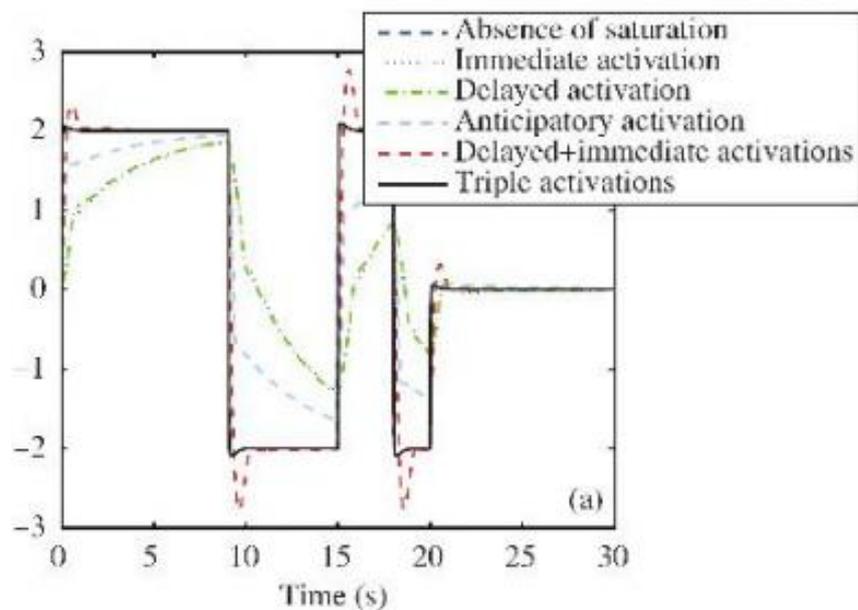


A new anti-windup design paradigm for control systems

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Subsequently, Professor Lin and his student Xiongjun Wu examined the idea of activating the anti-windup mechanism in anticipation of actuator saturation and showed that the anti-windup compensators, both static and dynamic ones, designed for anticipatory activation, will lead to significantly better closed-loop transient performance than with the designs for delayed activation. In their current SCIENCE CHINA Information Sciences paper, they report their development of a new anti-windup design paradigm, referred to as the triple loop anti-windup design that includes three anti-windup loops, simultaneously designed for immediate, delayed and anticipatory activations (see Figure 1 below).

This new design paradigm results in a closed-loop system that outperforms closed-loop systems resulting from other design methods mentioned above. Shown in Figure 2 below is a comparison of the tracking ability of the closed-loop system under the triple loop anti-windup design with those of the closed-loop systems under an anti-windup loop designed for immediate activation, delayed activation or anticipatory activation, and under two anti-windup loops, simultaneously designed for delayed and immediate activations. Also shown in the figure for reference is the response of the nominal closed-loop in the absence of actuator saturation. It is clear from this comparison that the closed-loop system with the triple loop anti-windup design demonstrates significantly stronger ability to recover the nominal closed-loop performance in the absence of actuator saturation.

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