OPTIMAL ANTI WINDUP COMPENSATOR DESIGNTO HANDLE A WIDE RANGE OF SETPOINTS

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Actuator saturation is a very commonly encountered controller Non-Linearity that gives rise to the so called Windup phenomena. This usually causes severe performance degradation in control systems, especially if the closed-loop is very fast and/or the open-loop is very slow or unstable. To reduce these undesirable consequences of windup, many techniques known as Anti Windup Compensators(AWC) have been proposed in the literature. They could generally be classified as either tunable parameter AWCs or fixed parameter AWCs.

It is generally felt that the applicability of fixed parameter methods are limited and that it is preferable to use tunable parameter methods in industrial controllers. However no proper guide lines are available yet for the tuning of them and there is also the problem of the range of operation being limited for even a properly tuned AWC.

The Conditioning Technique (CT) is a fixed parameter AWC based on the concept of a realizable setpoint and it exhibits a performance that is independent of the setpoint. However it suffers from the so called shortsightedness problem and results in a degraded performance. To overcome this problem an optimization based modification is proposed by Cheng & Perng(1996) for the AWCs that fit into the class of the CT. This scheme contains a single tuning parameter and we in this paper show that this parameter could easily be tuned with the aid of simulations to achieve optimal performance conditions for a particular setpoint. However this optimal setting would not perform optimally for other setpoints. Cheng & Perng(1996) have provided some guidelines as to the design of a time varying mechanism for this tunable parameter with respect to an example so that a wide range of setpoints may be handled effectively. An improved design criterion for the optimal tuning of this time varying parameter to handle a wide range of setpoints as well as unmeasured disturbances is proposed in this paper.