

Plant error compensation and jerk control for adaptive cruise control systems

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Abstract:

Some problems of complex systems are internal to the system whereas other problems exist peripherally; two such problems will be explored in this thesis. First, is the issue of excessive jerk from instantaneous velocity demand changes produced by an adaptive cruise control system. Calculations will be demonstrated and an example control solution will be proposed in Chapter 3. Second, is the issue of a non-perfect plant, called an uncertain or corrupted plant. In initial control analysis, the adaptive cruise control systems are assumed to have a perfect plant; that is to say, the plant always behaves

as commanded. In reality, this is seldom the case. Plant corruption may come from a variation in performance through use or misuse, or from noise or imperfections in the sensor signal data. A model for plant corruption is introduced and methods for analysis and compensation are explored in Chapter 4. To facilitate analysis, Chapter 2 discusses the concept of system identification, an order reduction tool which is employed herein. Adaptive cruise control systems are also discussed with special emphasis on the situations most likely to employ jerk limitation.

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