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Discussion about sliding mode algorithms, Zeno phenomena and observability

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Abstract :

This chapter is devoted to a discussion about the relations between first and high order sliding mode algorithms and both types of Zeno (Chattering and Genuinely) behaviors of switched dynamical systems. Firstly, the Henstock-Kurzweil integral is recalled in order to set up the problem of switched systems with Zeno phenomena, which enables to include Filippov solution and take into account some singularities. Then, observer designs based on the well-known super twisting algorithm are proposed. For this kind of problems, the importance of finite time convergence of the observation error is studied, and some simulations are given to highlight the discussion. Lastly, the two tanks example is given in order to point out the differences between both Zeno phenomena types, to show that there is life after Zeno and that a higher order sliding mode observer can be efficient before, during and after both Zeno phenomena types.

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