

## Chapter 7

# Conclusions and Future Study Directions

Control synthesis of switched systems is always a hot study topic in the control field for its significance of both theory aspect and practical application. In the past few years, some control problems of switched systems have been successfully solved, but there still are quite many interesting topics deserving further investigation; some of them have been considered in the book. This book has presented some stabilization approaches for both switched linear systems and switched nonlinear systems, and the considered systems can be composed of unstable subsystems. The adaptive control design methods for some classes of switched nonlinear systems have also been developed. In addition, the book also probes the tracking control problem of switched constrained switched nonlinear systems. Most contents of the book are extracted from Refs. [1–9].

Finally, we conclude the paper by providing some future study directions:

(1) Investigations on obtaining tighter bounds on time-dependent switching signals for switched systems. The time-dependent switching stabilization for switched systems has been studied in the book. For time-dependent switching stabilization design of switched systems, obtaining a tighter bound on the switching signal will give the designer additional flexibility. Therefore, proposing a new switching signal design method to achieve stabilization with a tighter bound deserves further investigations which is practically important but theoretically challenging.

(2) Investigations on asymptotic tracking control of switched systems with unknown uncertainties. This book has investigated the tracking control problem for some classes of switched systems with unknown uncertainties. However, it is noted that the obtained results can only achieve bounded tracking performance. Therefore, how to further extend the results to achieve asymptotic tracking performance is not only theoretically important but of practical significance.

(3) Investigations on intelligent switching control. The switching signal adopted in this book is piecewise constant, and thus the designed controllers are suddenly switched at the switching moments. Such a hard switching mechanism may dete-

riorate the system performance or even cause instability of the system. Therefore, proposing intelligent switching strategies has broad applications.

(4) Investigations on control of switched non-smooth systems. The dynamics of the subsystems considered in this book are assumed to be Lipschitz continuous or even smooth. However, there often exist many practical switched systems whose subsystem dynamics are not smooth. Some classical techniques developed for general switched systems will fail to be applied to switched non-smooth systems. It is reasonable to carry out studies on control synthesis of switched non-smooth systems.

## References

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