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A generalized invariance principle for infectious disease models with switching and pulse control

Mathematical models for infectious disease are crucial in gaining knowledge of the underlying mechanism that drives an epidemic. They are often used for implementing and evaluating control schemes in order to eradicate a disease. This talk discusses some epidemic models with switching parameters and pulse control. Hybrid control schemes are examined, and, in doing so, we hope to gain insight into the effects of a time-varying contact rate on critical control levels required for eradication. By introducing the notions of persistent limit set and persistent mode, we extend the classical LaSalle's invariance principle to epidemic models with switching parameters and pulse control. A weak invariance principle is established for such systems, under a weak dwell-time condition on the impulsive and switching signals. This weak invariance principle is then applied to establish sufficient conditions for the global asymptotic stability of the disease-free solution, which may give some insight into the effects of a time-varying contact rate on critical control levels required for eradication of a disease.