Liu, Xinzhi

Stability results for impulsive differential systems with applications to population growth models. (English) Zbl 0808.34056

Dyn. Stab. Syst. 9, No. 2, 163-174 (1994).

The paper deals with impulsive differential systems, i.e. ordinary differential equations systems $dx/dt = f(t,x)$, $x(t_0) = x_0$ $(t \in \mathbb{R},\ x \in \mathbb{R}^n)$ subjected to (additive) impulses at fixed times $(t_0 <)t_1 < t_2 < \cdots$. The impulse at time t_k instantaneously changes $x(t_k)$ by an amount that may depend on $x(t_k)$ (but not on t_k), after which the state variable is again governed by the system $dx/dt = f(t,x)$. The paper uses a general concept of stability (and of asymptotic stability and also of instability) with respect to maps that includes several stability concepts found in the literature. Several theorems give sufficient conditions for stability, asymptotic stability, and instability of the impulsive system. Examples show that impulses can stabilize an otherwise unstable system and destablilize an otherwise stable system. A population growth model that allows for "impulsive" fishing is studied.

Reviewer: C.A.Braumann (Evora)

MSC:

34D20 Stability of solutions to ordinary differential equations
92D25 Population dynamics (general)
34A37 Ordinary differential equations with impulses

Keywords:

impulsive differential systems; stability; with respect to maps; population growth model; fishing

Full Text: DOI

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