LINEARZATION FOR DIFFERENCE EQUATIONS WITH INFINITE DELAY

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Abstract

One of the most common technique to study a nonlinear dynamics is to find an equivalent linear dynamics. The process of constructing a map, which transforms nonlinear dynamics into linear dynamics is commonly known as **Linearization**.

In this talk, I am going to present a result on the Linearization of Difference equation with infinite delay,

$$x(m+1) = A_m x_m + f_m(x_m) \qquad \text{for all } m \in \mathbb{Z}^+, \tag{1}$$

in a Banach Space X. Here we assume that A_m's are bounded linear maps and the perturbation $(f_m)_{m\in\mathbb{Z}^+}$ is small and Lipschitz. In this result, a sequence of continuous and one-one maps, $(h^m)_{m\in\mathbb{Z}^+}$, is constructed which gives equivalency between the nonlinear dynamics (1) and its linear counterpart. We also showed that when $(A_m)_{m\in\mathbb{Z}^+}$ admits exponential dichotomy, our result is applicable. Here are some references.

References

[1] Palmer, K.: A generalization of Hartmans linearization theorem. J. Math. Anal. Appl. 41, pp. 753–758 (1973).

[2] Barreira, L., Valls, C.: Perturbations of delay equations. J. Differ. Equ. 269,pp. 7015-7041 (2020).