Li-Yorke and distributional chaos for linear operators

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We show the equivalence between Li-Yorke chaos and the existence of an irregular vector and the equivalence between distributional chaos and the existence of a distributionally irregular vector for a linear continuous operator in a Banach spaces.

Moreover we give sufficient conditions in order to obtain dense distributional chaos in Frechet spaces. As consecuence we obtain:

A)Let T be a linear and continuous operator on X. If there exists a dense set X_0 such that $\lim_{n\to\infty} T^n x = 0$, for all $x \in X_0$ and one of the following conditions is true:

a) X is a Fréchet space and there exists a eigenvalue λ with $|\lambda| > 1$.

b) X is a Banach space and $\sum \frac{1}{\|T^n\|} < \infty$ (in particular if $r(T) > 1$).

c) X is a Hilbert space and $\sum \frac{1}{\|T^n\|^2} < \infty$(in particular if $\sigma_p(T) \cap \mathbb{T}$ has positive Lebesgue measure).

then T is densely distributionally chaotic.

B) All operator that satisfies the Frequent Hypercyclic criterion is dense distributionally chaotic.

References

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