Abstract

This report deals with the dynamics of a system governed by a multi-dimensional linear hyperbolic PDE. The dynamical behaviors of linear PDEs extremely depend on the selection of space, and a conventional way is to define a infinite-dimensional space with a tuning parameter. Thereby, the linear PDEs can exhibit chaos or stability in the different range of tuning parameter. In this work, the chaos of the C0-semigroup corresponding to the system is established on the Banach space of multivariate analytic functions when the tuning parameter exceeds some given positive number. Based on this, both Devaney and distributional chaos of the system are further obtained. Meanwhile, the C0-semigroup is proved to be uniformly exponentially stable when the tuning parameter is less than a certain positive number, which contributes to showing the global stability of the system. Finally, two examples are given to illustrate effectiveness of our results.