Exponential and Algebraical Stability of Traveling Wavefronts in Periodic Spatial-Temporal Environments

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Abstract

Global stability of traveling wavefronts in a periodic spatial-temporal environment in \( n \)-dimensions (\( n \geq 1 \)) are studied. We begin with the case where the spatial dimension is equal to one. A new and easy to follow method is provided. The wavefront is proved to be exponentially stable in the form of \( O(e^{-\mu t}) \) for some \( \mu > 0 \), when the wave speed is greater than the minimal one, and algebraically stable in the form of \( O(t^{-1/2}) \) in the critical case. These results are extended to the cases of multiple spatial dimensions and time-periodic media. Finally, we demonstrate how the stability result can be directly applied to show the uniqueness of the wavefront with a given speed.

Keywords: Traveling wave solutions, stability, uniqueness, periodic media

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