

Traveling Waves in Diffusive Random Media

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Abstract

The current paper is devoted to the study of traveling waves in diffusive random media, including time and/or space recurrent, almost periodic, quasiperiodic, periodic ones as special cases. It first introduces a notion of traveling waves in general random media, which is a natural extension of the classical notion of traveling waves. Roughly speaking, a solution to a diffusive random equation is a traveling wave solution if both its propagating profile and its propagating speed are random variables. Then by adopting such a point of view that traveling wave solutions are limits of certain wave-like solutions, a general existence theory of traveling waves is established. It shows that the existence of a wave-like solution implies the existence of a critical traveling wave solution, which is the traveling wave solution with minimal propagating speed in many cases. When the media is ergodic, some deterministic properties of average propagating profile and average propagating speed of a traveling wave solution are derived. When the media is compact, certain continuity of the propagating profile of a critical traveling wave solution is obtained. Moreover, if the media is almost periodic, then a critical traveling wave solution is almost automorphic and if the media is periodic, then so is a critical traveling wave solution. Applications of the general theory to a bistable media are discussed. The results obtained in the paper generalize many existing ones on traveling waves.

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