

Discrete breathers on symmetry-determined invariant manifolds for scalar models on the plane square lattice

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A group-theoretical approach for studying localized periodic and quasiperiodic vibrations in 2D and 3D lattice dynamical models is developed. This approach is demonstrated for the scalar models on the plane square lattice. The symmetry-determined invariant manifolds admitting existence of localized vibrations are found and some types of discrete breathers are constructed on these manifolds. A general method using the apparatus of matrix representations of symmetry groups to simplify the standard linear stability analysis is discussed. This method allows one to decompose the corresponding system of linear differential equations with time-dependent coefficients into a number of independent subsystems whose dimensions are less than the full dimension of the considered system.

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