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Hidden exact symmetry in graphene

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The emergence of massless Dirac fermion in graphene has attracted attention in recent years due to the remarkable features. The tight-binding honeycomb lattice hamiltonian to explain this feature has a close analogy with “the staggered fermion” which is widely used in lattice gauge theory. Employing the position space formalism developed in lattice gauge theory, we reformulate the tight-binding honeycomb model. We show that there exists a hidden exact symmetry at finite lattice spacing, which protects the masslessness of the Dirac fermion.

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