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Memory effects in noninteracting isolated systems from dynamical geometry transformations in ultracold quantum gases CHEN-YEN LAI, CHIN-CHUN CHIEN, Univ of California - Merced — Memory effects have been of broad interest and particularly relevant in condensate matter systems where dynamical properties depend on history. Here we explore possibilities of observing memory effects in simple isolated quantum systems undergoing geometry transformations. By transforming into lattices supporting flat-bands consisting of localized states, memory effects could be observed in ultracold atoms in optical lattices due to different time scales of localized and mobile atoms. As an optical lattice is continuously transformed from a triangular lattice into a kagome or square lattice, the system reach a non-thermal quasi-steady state. In the absence of interactions and dissipations, the emergence of steady states are highly nontrivial and crucial in identifying memory effects unambiguously. Moreover, when the lattices transform from a triangular lattice into a kagome lattice with a flat band, history-dependent density distributions even in noninteracting systems can be observed in fermionic as well as bosonic systems. Rapid growth of cold atom technology and possibilities of various mechanisms for inducing memory effect promise interesting applications of novel quantum devices utilizing memory effect, especially in the thriving field of atomtronics. (arXiv:1510.08978)

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