

Abstract Submitted
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Of Bulk and Boundaries: Generalized Transfer Matrices for Tight-Binding Models¹ VATSAL DWIVEDI, VICTOR CHUA, Univ of Illinois - Urbana — We construct a generalized transfer matrix corresponding to noninteracting tight-binding lattice models, which can subsequently be used to compute the bulk bands as well as the edge states. Crucially, our formalism works even in cases where the hopping matrix is non-invertible. Following Hatsugai [PRL 71, 3697 (1993)], we explicitly construct the energy Riemann surfaces associated with the band structure for a specific class of systems which includes systems like Chern insulator, Dirac semimetal and graphene. The edge states can then be interpreted as non-contractible loops, with the winding number equal to the bulk Chern number. For these systems, the transfer matrix is symplectic, and hence we also describe the windings associated with the edge states on $Sp(2, R)$ and interpret the corresponding winding number as a Maslov index. This work is discussed in arXiv preprint arXiv:1510.04279.

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