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A new way of describing the Dirac bands in graphene GREGORY KISSINGER, SASHI SATPATHY, University of Missouri-Columbia — We develop a new way of describing the electronic structure of graphene, by treating the honeycomb lattice as a network of one-dimensional quantum wires. The electrons travel as free particles along these quantum wires and interfere at the three-way junctions formed by the carbon atoms. The model generates the linearly dispersive Dirac cone band structure as well as the chiral nature of the pseudo-spin sublattice wave functions. When vacancies are incorporated, we find that it also reproduces the well known zero mode states. This simple approach might have advantages over other methods for some applications, such as in analyzing electronic transport through graphene nanoribbons. In addition, this finding suggests new ways of constructing Dirac band materials in the laboratory by nano-patterning for investigating Dirac fermions.

Gregory Kissinger
University of Missouri-Columbia

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