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Strongly Correlated Electron Systems: an operatorial perspective ANDREA DI CIOLO, ADOLFO AVELLA, Dipartimento di Fisica "E.R. Caianiello", Universita' degli Studi di Salerno, I-84084 Fisciano (SA), Italy — We show the potentialities of an operatorial approach based on the equations of motion and the Green's function formalisms to study strongly correlated systems. We give the general characterization of the exact solution of a generic interacting Hamiltonian and discuss how such an analysis performed on small clusters can suggest approximation schemes for the bulk. As a paradigmatic example, we consider the exact solution of the 2-site Hubbard model, identify the contributions of operators embodying charge, spin and pair degrees of freedom to the relevant physical quantities of the system and clarify the crucial role played by spin fluctuations. Correspondingly, according to the given general prescription, we devise a 3-pole approximation for the 2D Hubbard model in the framework of the Composite Operator Method (COM) with a basis given by the Hubbard operators plus an operator describing electronic transitions dressed by nearest-neighbor spin fluctuations. As well as the 3-pole approximate solution is in remarkable agreement with the exact one on the 2-site system, the one proposed for the 2D system performs very well once compared to advanced (semi-)numerical methods, being by far less computational-resource demanding and more accurate in frequency and momentum resolution.

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