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Quantization of the O(N) Nonlinear Sigma Model

S.I. Muslih

Department of Physics, Al-Azhar University, Gaza, Palestine
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Abstract: The Hamilton-Jacobi method of quantizing singular systems is discussed. The equations of motion are obtained as total differential equations in many variables. It is shown that if the system is integrable, one can obtain the canonical phase space coordinates and set of canonical Hamilton-Jacobi partial differential equations without any need to introduce unphysical auxiliary fields. As an example we quantize the O(2) nonlinear sigma model using two different approaches: the functional Schrödinger method to obtain the wave functionals for the ground and the exited state and then we quantize the same model using the canonical path integral quantization as an integration over the canonical phase-space coordinates.

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Key words: Hamiltonian and Lagrangian approach, Hamilton-Jacobi method, nonlinear sigma model, quantization of field systems

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