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Two ways to construct Hamiltonian dynamics in extended phase space

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I discuss two possible ways to construct Hamiltonian dynamics in extended phase space keeping in mind applications to the gravitational theory. The starting point for the first way is the Batalin – Fradkin –Vilkovisky effective action while in the second case a Lagrangian form of the action is used. In general, these two ways are not equivalent and lead to different definitions of BRST generator of transformations in extended phase space. Accordingly, one deals with two theories with different groups of gauge transformations. Equivalence with the Dirac approach is considered. I argue that these questions are directly relevant to construction quantum theory of gravity.

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