Constrained systems and Lie algebroids, their BV and BFV formalisms

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We observe that a system of irreducible, fiber-linear, first class constraints on T^*M is equivalent to the definition of a foliation Lie algebroid over M. The BFV formulation of the constrained system is given by the Hamiltonian lift of the Vaintrob description $(E[1], Q)$ of the Lie algebroid to its cotangent bundle $T^*E[1]$. Adding a Hamiltonian to the system corresponds to a metric g on M. Evolution invariance of the constraint surface introduces a connection ∇ on E and one obtains the compatibility of g with (E, ρ, ∇). We discuss a relation of a BFV-Hamiltonian to a Cartan-Lie algebroid. The BV formulation of the system is obtained from BFV by a (time-dependent) AKSZ procedure. This observation can be applied to field theories and string theories with Lie algebroid structurues.