

Dirac Manifolds and the Dirac Theory of Constraints

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The geometrically inspired Gotay–Nester algorithm for presymplectic manifolds was originally motivated by the Dirac theory of constraints. The algorithm itself is useful for dealing with Implicit Differential Equations arising in Classical Mechanics, such as the Euler–Lagrange Equations for degenerate Lagrangians, and is also important in quantum mechanics. In this lecture I will show how to generalize the algorithm developed by Dirac, Bergman and Gotay–Nester for the Dirac equation, a general equation which includes, for instance Lagrange–d’Alembert’s equations and Kirchoff equations in the theory of L-C circuits. This new algorithm unifies the study of nonholonomic mechanics and the Kirchoff equations for L-C circuits, from the Lagrangian point of view.