FDITE16 Constrained dynamical systems

Introductory lecture on constrained dynamical systems.

Topics

1. Lagrangian theory of constrained dynamical systems
2. Hamiltonian theory of constrained dynamical systems
    - 2.1. Primary constraints, weak and strong equality
    - 2.2. Legendre transformation, secondary constraints
    - 2.3. New classification of constraints: first and second-class constraints
    - 2.4. The complete and extended Hamiltonian function, the Dirac bracket
3. Introduction to constrained dynamical systems on a simple example
4. Parametric description of point mechanics
5. The free relativistic particle
6. The Schrödinger system
7. Electrodynamics
    - 7.1. Covariant description
    - 7.2. Canonical description
    - 7.3. Generation of reduced phase space by adjusting the degrees of freedom
    - 7.4. Reduced phase space generation using gauge-type constraints

References:

L Á Gergely: Constrained Dynamical Systems I-II (1996)

L Á Gergely: Annals of Physics 298, 394–402 (2002)

P A M Dirac: Lectures on Quantum Mechanics Yeshiva University Press (1964)

E C G Sudarshan, N Mukunda: Classical Dynamics. A Modern Perspective, Wiley (1974)

A Hanson, T Regge, C. Teitelboim: Constrained Hamiltonian Systems, Academia Nationale dei Lincei (1976)

K Sundermayer: Constrained Dynamics, Springer (1982)