A Multifunctional Hamiltonian Mechanics Simulator and Some of Its Application Examples

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In order to conveniently simulate hamiltonian systems, I have developed online software that can simulate hamiltonian mechanics. Users can see the motion of a system as long as he tells the simulator the hamiltonian of the system and the initial conditions of it. The simulator can be customized to draw the graph of generalized coordinates and generalized momenta w.r.t. time, the shape of the motion (if the generalized coordinates have any geometric meaning), and the phase path. The simulator can also analyze the oscillation pattern of an oscillator by using FFT to derive the frequency domain of the motion, presenting a graph of the spectrum. Not limited to classical mechanics, because of the extendibility of hamiltonian mechanics, the simulator can also simulate special relativity. The simulator is small and fast and is convenient and easy to operate and customize. The user interface is simple (a graphics interface for simple basic operations and a console interface for other operations). The simulator can also output data of the simulated system to create datasets for other potential usages. There are a lot of applications that can be done with it: it can simulate typical models like parametric resonance, non-linear oscillators, Kepler's 2-body problem, adiabatic invariants, scattered beam of particles, and special relativity.

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