

Stochastic mechanics and the semiclassical Kepler/Coulomb problem

We consider the semiclassical behaviour of a family of coherent states for the Coulomb potential which are concentrated on an ellipse with the aim of deriving Keplerian motion on the ellipse in the semiclassical limit. This is done within the framework of Nelson's stochastic mechanics which associates a diffusion process to each quantum state. We are lead to a suitable semiclassical Nelson diffusion process which can be viewed as a solution for a stochastic perturbation of the Coulomb problem. We consider its relation to the classical constants of the motion (angular momentum, Lenz-Runge vector, energy) and consider the behaviour of an asymptotic series expansion for the semiclassical Nelson diffusion process.

This is joint work with Aubrey Truman.