MP 7: Statistischer Zugang zur Quantentheorie

Zeit: Donnerstag 8:30–9:30 Raum: VMP6 HS B

MP 7.1 Do 8:30 VMP6 HS B

A Unified Lie Systems Theory for Closed and Open Markovian Dynamical Quantum Systems — •Thomas Schulte-Herbrüggen[1] and Gunther Dirr[2] — [1]Technical University of Munich (TUM) — [2]University of Würzburg

Lie groups and Lie semigroups with their symmetries provide a unified framework to pinpoint the dynamic behaviour of closed and open quantum systems under all kinds of controls.

Recently, we showed that all *Markovian quantum maps* can be represented by *Lie semigroups*. These semigroups come with the geometry of affine maps, whose translational parts determine the respective fixed points. We exploit this geometry for dissipative fixed-point engineering of unique target states be they pure or mixed.

We extend capabilities by combining coherent control with simplest noise controls. Particular light is shed on reachability and open-loop versus closed-loop control design.

MP 7.2 Do 8:50 VMP6 HS B

Stochastic optimal control, forward-backward stochastic differential equations and the Schrödinger equation — •Wolfgang Paul[1], Jeanette Köppe[1], and Wilfried Grecksch[2] — [1]Institut für Physik, Martin Luther Universität, 06099 Halle — [2]Institut für Mathematik, Martin Luther Universität, 06099 Halle

The standard approach to solve a non-relativistic quantum problem is through analytical or numerical solution of the Schrödinger equation. We show a way to go around it. This way is based on the derivation of the Schrödinger equation from conservative diffusion processes by E. Nelson [1] and the establishment of (several) stochastic variational principles leading to the Schrödinger equation under the assumption of a kinematics described by Nelsons diffusion processes, in particular by M. Pavon [2].

Mathematically, the variational principle can be considered as a stochastic optimal control problem linked to the forward-backward stochastic differential equations of Nelsons stochastic mechanics. The Hamilton-Jacobi-Bellmann equation of this control problem is the Schrödinger equation. We present the mathematical background and how to turn it into a numerical scheme for analyzing a quantum system without using the Schrödinger equation and exemplify the approach for a simple 1d problem.

[1] E. Nelson, Phys. Rev. 150, 1079 (1966)
[2] M. Pavon, J. Math. Phys. 36, 6774 (1995)

MP 7.3 Do 9:10 VMP6 HS B

Spikes and what they point out in the FRG flow equation — •Tobias Hellwig, Andreas Wipf, and Omar Zanusso — Theoretisch-Physikalisches Institut, Friedrich-Schiller-Universität Jena, Max-Wien-Platz 1, 07743 Jena, Germany

After a short introduction into the exact flow equation for the functional renormalization group (FRG) I will use spike plots to obtain the fixed point solutions of the exact flow equation within a local potential approximation. The technique will be applied to a two dimensional scalar field theory with $\mathbb{Z}_2$ symmetry and a two dimensional Wess-Zumino model giving the corresponding minimal (super-)conformal models. After obtaining the fixed point solutions the critical exponents are derived using the Slac-derivative for the linearized deformations.

This talk is based on the paper arXiv:1508.02547 .