MP 2: Quanteninformation

Time: Tuesday 10:55–11:55 Location: HFT-FT 101

MP 2.1 Tue 10:55 HFT-FT 101

From discrete to continuous: finite dimensional approximations of continuous variables — •Michael Keyl — TU München, Fakultät Mathematik

Small fluctuations of a finite ensemble of qubits behave in the infinite particle limit like a continuous quantum system. This behavior is usually studied in terms of expectation values: Expectation values of certain fluctuation operators Q_N, P_N of a finite system converge for $N \to \infty$ against corresponding expectation values of canonical position and momentum Q and P. In this talk we will show that the finite dimensional quantities are related to the continuous variables in a much stronger sense, namely that the spectral measures of Q_N and P_N converge weakly against the spectral measures of Q, P. To derive this result we use the recently studied Schwartz operators, i.e. trace class operators which stay in the trace class after products with arbitrary polynomials in P and Q. They are a perfect framework for the discussion of operator moment problems, and provide in addition powerful methods to study quadratic forms in terms of distributions.

MP 2.2 Tue 11:15 HFT-FT 101

Tensor square representations of Lie algebras and quantum control theory — •Zoltán Zimborás[1], Robert Zeier[2], Thomas Schulte-Herbrüggen[2], and Daniel Burgarth[3] — [1]University College London, UK — [2]Technische Universität München, Germany — [3]Aberystwyth University, UK

We study how tensor products of representations decompose when restricted from a compact Lie algebra to one of its subalgebras. In particular, we are interested in tensor squares which are tensor products of a representation with itself. We show in a classification-free manner that the sum of multiplicites and the sum of squares of multiplicities in the corresponding decomposition of a tensor square into irreducible representations has to strictly grow when restricted from a compact semisimple Lie algebra to a proper subalgebra. The sum of squares of multiplicities is equal to the dimension of the commutant of all complex matrices commuting with the tensor square representation. Hence, our results offer a test whether a subalgebra of a compact semisimple Lie algebra is a proper one, which uses only linear-algebra computations on sets of generators without calculating the relevant Lie closures. At the end of the talk, we show that this test can be naturally applied in the control theory of quantum systems.

MP 2.3 Tue 11:35 HFT-FT 101

Fixpoint engineering and reachability in open Markovian quantum systems — •Thomas Schulte-Herbrüggen[1], Corey O'Meara[1], Gunther Dirr[2], and Luca Arceci[1,3] — [1]Dept. Chem., TU-München — [2]Math. Inst., University of Würzburg — [3]Dept. Mathematics, TU-München

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. We extend our results from pure to mixed target states.

Finally, we elucidate the findings by their relation to control problems: particular light is shed on reachability and open-loop versus closed-loop control design.