

Tuesday Discussion Session

moderated by
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Quantum Control Themes

Control of open quantum systems without feedback – pulse sequences in NMR, coherent transfer, optimal control theory, explicit solvability and numerical aspects, liquid state vs solid state, sample rotation and the magic angle, state-to-state vs propagator-to-propagator and the problems of dispersion, ensembles and decoherence.

Quantum Control Themes

Control of open quantum systems using feedback synthesis

Master equations, conditional dynamics, exploitation of *classical* filtering and control methods in novel settings, attention to the measurement problem, model reduction and filter reduction.

Quantum Control Themes

Model-free methods to learn control laws

Control of chemical reactions

Quantum Control Themes

Mathematical Foundations

“model-free” [⌘] learning control	open-loop control of quantum models	real-time* feedback control of quantum systems	coherent quantum feedback [†] control
<ul style="list-style-type: none"> · optimization of chemical reactions · optimization of chemical analysis · nonlinear optical spectroscopy? <p>[⌘]<i>complexity</i></p>	<ul style="list-style-type: none"> · state-state transfer · propagator synthesis · time-fidelity-robustness tradeoffs · robust propagator synthesis (decoupling) · ensemble control · system-ID w/control 	<ul style="list-style-type: none"> · robust quantum state preparation · disturbance rejection · stabilization of a sub-system propagator · closed-loop quantum parameter estimation · synthesis of quantum operations · “transfer fn.” control <p>*<i>timescales</i></p>	<p>“coherent regulator”</p> <ul style="list-style-type: none"> · plant dynamics · transfer function · Belavkin · Wiseman-Milburn · Yanagisawa-Kimura · D’Helon-James · Lloyd et al. · Mølmer et al. · ... <p>[†]<i>controller realization</i></p>
<p>“offline” applications</p> <ul style="list-style-type: none"> · experiment design, <i>e.g.</i>, high-D NMR sampling · algorithm analysis/design (quantum circuits) · semi-definite programs in quantum info theory · ... 			

- new models and applications for ~existing control theory, model/filter reduction
- new mathematical foundations: non-commutative probability & stochastic processes