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Gegründet im Jahre 1869 von H. Hlasiwetz,
J. Loschmidt, J. Petzval und J. Stefan

EINLADUNG

zum Vortrag von

Prof. Dr. Janos Bergou

Hunter College of the City University of New York, USA

Measuring the state of a quantum system

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Dienstag, 27. November 2012, um 17:30 Uhr

Ort: Lise-Meitner-Hörsaal, Fakultät für Physik, Universität Wien,
1090 Wien, Strudlhofgasse 4 / Boltzmanngasse 5, 1. Stock

Barrierefreier Zugang: Boltzmanngasse 5, Lift, 1. Stock rechts über den Gang zum Hintereingang des Hörsaals

Abstract:

In quantum information and quantum computing the information carriers are quantum systems and information is encoded in their state. Read-out of the information requires determining the state of a system. It necessarily involves measurements since they are our only available tools to extract information from a quantum system. The state of a quantum system is, however, not an observable, therefore determining it by quantum measurements is a very challenging task.

Quantum state discrimination is employed for this purpose when we have perfect prior information about the possible states of the system we just don't know in which of these known states the system was actually prepared. Optimization with respect to some reasonable criteria leads to complex measurement strategies often involving generalized measurements. Finding the optimum measurement strategy is the subject of state discrimination. The two fundamental optimized strategies are the so-called minimum-error (ME) scheme and the unambiguous discrimination (UD) scheme and I'll briefly discuss them in the talk.

It is usually assumed that quantum measurements are destructive: they destroy the state the system was in prior to the measurement, so no information is left for subsequent observers. In this lecture we develop a theory of sequential quantum measurements when more than one user extracts information about the state of the same qubit by consecutive measurements. We assume that each sequential user performs UD or each user performs ME. The two scenarios are compared to cloning and it is shown that they all obey the same fundamental limit. The surprising aspect of the theory is that there is a nonzero probability that all users in the sequence successfully extract the full information about the state in which the qubit was initially prepared.