

Trace formulas for quantum graphs and the inverse spectral problem

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Differential operators on metric graphs (quantum graphs) form a special class of differential operators having features from both ordinary and partial differential operators. One of the best ways to illustrate this is to study the trace formula connecting the spectrum of such an operator to the set of periodic orbits and thus establishing a connection between quantum graphs and partial differential operators. Trace formulas of this sort have been suggested by U.Smilansky, but we provide rigorous mathematical consideration in a more general setting. These formulas provide a basis to study the inverse spectral problem for graphs with cycles (not only trees). In particular we prove that a quantum graph is uniquely determined by its spectrum in the case the lengths of the edges are rationally independent even if the graph is not simple (it may have loops or multiple edges). This is a joint work with M. Nowaczyk, possible ways to remove the condition of rational independence are presented in a separate poster.