Inverse problems for quantum graphs with cycles: dismantling graphs and Magnetic Boundary Control

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Schrödinger operators on metric graphs, also known as quantum graphs, are determined by the underlying metric graph, the electric and magnetic potentials and the vertex conditions. If the underlying graph is a tree, then the inverse problems can be effectively solved by a generalisation of the Boundary Control-method assuming mild restrictions on the vertex conditions. The Titchmarsh-Weyl M-function associated with the boundary points plays the role of spectral data. Our goal is to generalise these results for graphs with cycles. We are going to present two approaches leading to unique solution of the inverse problem:

- **dismantling graphs**: the original graph has sufficiently many contact points that dismantles it into a set of trees;
- **Magnetic Boundary Control**: dependence of the spectral data on the magnetic fluxes through the cycles is used to dissolve vertices and thus reconstruct so-called **infiltration domains**.

Optimal solution of the inverse problem is obtained by combining these two methods.