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Instatons and Berry's connections on quantum graph

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We discuss topological properties of boundary conditions on a quantum graph from the viewpoint of the Berry's connections. The quantum graph is known as a quantum mechanical system on a one dimensional graph which consists of edges and vertices connected with each other, and boundary conditions are imposed on each vertex. This graph is applied to the various research areas, e.g., scattering theory, nanotechnology, and also an extra dimensional model which can qualitatively explain the fermion generations, mass hierarchy, CP phase in the standard model, and the boundary conditions play important roles in each case. In this talk, we will reveal the structure of the boundary conditions and show that configuration of the instantons appear as the Berry's connections on a parameter space of them.

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