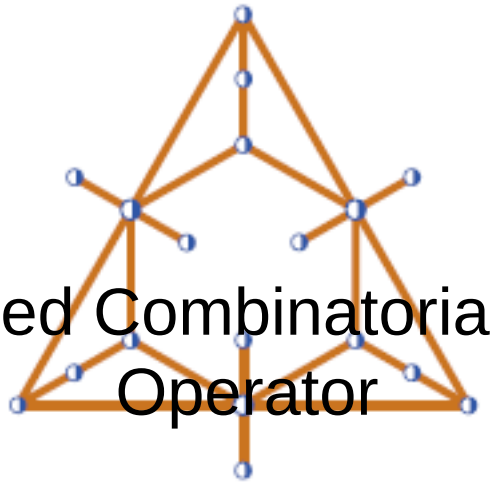
Bled'11 - 7th Slovenian International Conference on Graph Theory

Contribution ID : 27



Normalized Combinatorial Laplace Operator

Content :

Since the 19th century and the work of Kirchoff scientist have been studying Laplace operator on graphs. Up until now, there has been substantial amount of work on this topic and a lot of versions of Laplace operators emerged: combinatorial graph Laplacian, combinatorial Laplacian on simplicial complexes, weighted Laplacian, normalized graph Laplacian, etc. The mainstream approach was to study these Laplace operators independently of each other, with only a name as a reminder of the possible connection among them.

My talk will consist of two parts. In the first part I will present the general framework for the systematic study of all of the above mentioned Laplacians.

In the second part , I will define the analogue of normalized graph Laplacian in higher dimensions, Δ, and present its basic properties.

Furthermore, I will discuss the combinatorial features of a simplicial complex that are encoded in its spectrum. In particular, the connection of the colorability of the 1-skeleton of simplicial complex and spectrum of Δ will be emphasized. Lastly, I will show how normalized combinatorial Laplace operator can be used to distinguish among different ”types” of networks.

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Session classification : --not yet classified--

Track classification : Graph Spectra and its Applications

Type : Oral presentation