Abstract for GR-TR Conference on Statistical Mechanics and Dynamical Systems

Talk Invited Invited Talk

Spectral Renormalization Group Theory on Networks

A. Erzan*

Department of Physics, Faculty of Sciences and Letters, Istanbul Technical University, Maslak, Istanbul 34 469, Turkey
* Electronic Address: erzan@itu.edu.tr

We set up a renormalization group scheme by expanding an arbitrary scalar field living on the nodes of an arbitrary network, in terms of the eigenvectors of the normalized graph Laplacian [1]. The renormalization tranformation involves, as usual [2] the integration over the more "rapidly varying" components of the field, corresponding to eigenvectors with larger eigenvalues, and then rescaling. The critical exponents depend on the particular graph through the spectral density of the eigenvalues, as is also found for real space renormalization group schemes. [3]

---

[1] F.K.R. Cung, *Spectral Graph theory*, CBMS Regional Conference Series in Mathematics, vol.92, Conference Board of the Mathematical Sciences, Washington (1997).

[2] K.G. Wilson and J. Kogut, *Phys. Rep.* **83**, 75 (1974).

[3] S.N. Dorogovtsev, A.V. Goltsev, J.F.F. Mendes, *Rev. Mod. Phys.* **80**, 1275 (2008).