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Topological recursion and uncoupled BPS structures. I: BPS spectrum and free energies.

(English) Zbl 07483898

This paper surveys the connection between BPS structures and free energies produced by the topological recursion. The main result of the paper is to express the free energies computed by the topological recursion applied to classical spectral curves of hypergeometric types in term a prefactor involving the Bernoulli numbers and a sum over BPS states that is computed explicitly in terms of the coefficients of the classical spectral curve. The term involving the Bernoulli numbers is not new and is directly connected to the normalization of the topological recursion partition function by contrast with the one corresponding to the BPS states. This result may be seen as a good example of applications of topological recursion regarding enumerative geometry. It is a first step towards rewriting dealing the Borel resumation of quantities produced by topological recursion producing Stokes phenomenon and very interesting analytic structures. The natural question left opened in the article is to wonder if the present results can be generalized to any classical spectral curves of genus 0 with or without additional properties. The methods presented in this article are definitely of interests and require attention for people interested in that perspective.

Reviewer: Olivier Marchal (Saint-Etienne)

MSC:

81T60 Supersymmetric field theories in quantum mechanics
82B20 Lattice systems (Ising, dimer, Potts, etc.) and systems on graphs arising in equilibrium statistical mechanics
34M60 Singular perturbation problems for ordinary differential equations in the complex domain (complex WKB, turning points, steepest descent)
18G40 Spectral sequences, hypercohomology
03D80 Applications of computability and recursion theory
11B68 Bernoulli and Euler numbers and polynomials

Keywords:
topological recursion; BPS structures; quadratic differentials; WKB spectral network

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