Watanabe, Kazuyoshi

Combinatorial Ricci curvature on cell-complex and Gauss-Bonnet theorem. (English)

Tohoku Math. J. (2) 71, No. 4, 533-547 (2019).

Summary: In this paper, we introduce a new definition of the Ricci curvature on cell-complexes and prove the Gauss-Bonnet type theorem for graphs and 2-complexes that decompose closed surfaces. The differential forms on a cell complex are defined as linear maps on the chain complex, and the Laplacian operates this differential forms. Our Ricci curvature is defined by the combinatorial Bochner-Weitzenböck formula. We prove some propositionerties of combinatorial vector fields on a cell complex.

MSC:

05E45 Combinatorial aspects of simplicial complexes
53B21 Methods of local Riemannian geometry

Keywords:
cell complex; Ricci curvature; Gauss-Bonnet theorem

Full Text: DOI arXiv Euclid

References:

[1] R. F. Arnord, The Discrete Hodge Star Operator and Poincaré Duality, Virginia Polytechnic Institute and State University, 2012.
[2] R. Forman, Bochner’s method for cell complexes and combinatorial Ricci curvature, Discrete Comput. Geom. 29 (2003), no.3, 323-374. · Zbl 1040.53040 · doi:10.1007/s00454-002-0743-x
[3] R. Forman, Combinatorial Novikov-Morse theory, Internat. J. Math. 13 (2002), no.4, 333-368. · Zbl 1052.57053 · doi:10.1142/S0129167X02001265
[4] R. Forman, Combinatorial vector fields and dynamical systems, Math. Z. 228 (1998), no.4, 629-681. · Zbl 0922.58063 · doi:10.1007/PL00004638
[5] R. Forman, Morse theory for cell complexes, Adv. Math. 134 (1998), no.1, 90-145. · Zbl 0896.57023 · doi:10.1006/aima.1997.1650
[6] A.T. Lundell and S. Weingram, The Topology of CW Complexes, The university series in higher mathematics, Springer New York, 2012. · Zbl 0207.21704
[7] P. M textsuperscriptCornick, Combinatorial Curvature of Cellular Complexes, The University of Melbourne, Department of Mathematics and Statistics, 2004.

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.