HIGH-ORDER APPROXIMATIONS OF CURVATURE

JAY GOPALAKRISHNAN

Abstract. We show how useful approximations of covariant curl, incompatibility, connection, and curvature on Riemannian manifolds can be computed even when the metric tensor of the manifold is only known approximately. In two-dimensional Riemannian manifolds, intrinsic curvature is captured by the Gauss curvature, which can be computed solely using the manifold's metric. However, in applications, we often only know the metric approximately, e.g., the metric may be obtained by numerically solving a partial differential equation using finite elements. When such a metric approximation is only piecewise smooth, classical formulas for computing the Gauss curvature cannot be applied. The goal of this talk is to present the correct generalization of classical formulas and explain how their correctness can be proved by numerical analysis. This is joint work with M. Neunteufel, J. Schöberl, and M. Wardetzky.

Keywords:

Mathematics Subject Classifications (2010):

References

[1] J. Gopalakrishnan, M. Neunteufel, J. Schöberl, and M. Wardetzky, *Analysis of curvature approximations via covariant curl and incompatibility for regge metrics*, The SMAI Journal of computational mathematics, 9 (2023), pp. 151–195.

Portland State University
Email address: gjay@pdx.edu