The local tangential lifting method for solving PDEs on regular surfaces

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Abstract

We shall introduce the local tangential lifting method that we developed in 2013-2022 for solving some partial differential equations and approximating geometric invariants on regular surfaces. Our algorithm has two main steps: first, we lift the neighbourhood points to the approximating tangent space and obtain a local tangential polygon. Second, we use the Taylor's expansion to locally approximate the local parametrization of the underlying surface. We also try to solve the diffusion equations, the Cahn-Hilliard equations and to estimate the mean curvatures on regular surfaces by the LTL method in this talk. Some convergence problems will also be discussed. Numerical simulations are given to support theses results.