

Title: Topics in computational geometry and approximation theory

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Abstract: The overwhelming majority of modern days computer graphics applications are based on discretization of surfaces into collections of triangles. This approach is simple to implement algorithmically and can also be accelerated by specialized hardware. At the same time this piecewise linear approximation requires a lot of triangles to represent smooth surfaces. Once the lighting calculations are taken into account, the overall complexity of rendering a scene increases significantly (e.g. polynomially) with respect to the number of the triangles involved. One way to deal with this issue is to go beyond piecewise linear approximation of surfaces and represent them as piecewise polynomial functions (splines). The currently existing methods, however, require a rather high degree of spline polynomials for such approximations, which has its own toll on computation complexity. I will discuss some prospects and challenges of low degree spline approximation of curves and surfaces and propose a few problems to get a taste of the mathematics involved in this field.