An annihilator-based strategy for the automatic detection of exponential polynomial spaces in subdivision

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Abstract

Exponential polynomials are essentials in subdivision for the reconstruction of some important families of curves and surfaces, such as conic sections and quadrics. It is well known that, in order to reproduce a family of exponential polynomials defined by a set of frequences and multiplicities, a specific set of level-dependent subdivision rules depending on the underlying frequences and multiplicities is needed. Due to this fact, it is possible in general to reconstruct an exponential polynomial from its sampling on a regular grid only knowing a priori the family it belongs to. To overcome this restriction,

we propose an annihilating operator strategy that, given a set of data on a regular grid, it allows to locally detect if the data are the samples of an exponential polynomial and therefore to choose the correct subdivision rules in order to reproduce it. This strategy is the first step towards the construction of adaptive subvidision schemes able to reconstruct piecewise surfaces parametrized by exponential polynomials. A first example of such a scheme has been obtained as a modification of the classical interpolatory "butterfly"scheme.

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