Coupling interpolatory and non-interpolatory subdivision schemes; applications to kriging based subdivision schemes for non-regular data

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Statistical approaches such as Kriging methods ([3]) are of common use for data reconstruction. Their main advantages stand in an accurate interpolating prediction exploiting the correlation structure exhibited by the available data and the possibility to quantify the precision of a prediction thanks to the underlying probabilistic model. However, these methods usually assume that the quantity to predict is regular, which is not the case in practice and especially in many risk assessment studies conducted by the french Institut de Radioprotection et de Sûreté Nucléaire (IRSN).

Therefore, this paper is devoted to the design and analysis of new stochastic modeling methods that aim to improve the accuracy of the reconstruction of non-regular data. These methods are still kriging-based but their orginality rely on the introduction and the coupling of three main ingredients:

- A segmentation of the data leading to a splitting in different zones containing or not singularities,
- The construction of a local predictor integrating the information coming from the segmentation and defining a position-dependent subdivision schemes ([4], [2]),
- The adaptation of the characteristics of the position-depend scheme (interpolatory or non interpolatory) in order to increase the flexibility (and the accuracy) of the reconstruction near singularities.

Afer a short presentation of kriging methods and some of their different versions (ordinary kriging and nugget effect), we will show how these approaches can be plugged into Harten's subdivision framework ([1]). Then we will explain why non interpolatory schemes are generally suitable for modeling the regions where the data are discontinuous. Finally we will propose a new scheme and show some applications to simple situations.

Références

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