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图形、图像、模式识别

Loop细分小波框架对图形传输与去噪的应用

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摘要 基于细分小波的多分辨率分析是近年来三维图形处理的重要方法，该方法在图形的压缩，去噪，渐近显示和传输，多分辨率绘制和编辑等领域已有很多研究与应用。最近Maria Charina等人提出了一种新的基于细分小波紧框架的多分辨率分析理论，使得细分小波框架在三维图形处理领域的应用成为值得研究的新课题。在深入学习和研究这种全新的多分辨率分析理论的基础上，详细推导了Loop细分小波紧框架的分解和重构公式，应用这些公式实现了多分辨率曲面的构造并将其应用到三维网格图形的渐进传输和去噪中。通过与M.Bertram的双正交Loop细分小波算法的对比，表明基于Loop细分小波紧框架的多分辨率分析算法具有较好的渐进传输和去噪效果。由于通常的输入网格不具有细分连通性，而基于细分曲面的多分辨率分析算法要求它所处理的网格具有这种连通性，所以还特别提出了一种构造既能逼近输入网格又具有细分连通性的网格的简捷算法。

关键词 多分辨率分析 细分小波 细分小波紧框架 渐进传输 去噪

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Applications of Loop subdivision wavelet frames to transmission and denoising of graphics

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Abstract

Multiresolution analysis based on subdivision wavelets is an important method of 3D graphics processing.Many applications of this method including compression，denoising，progressive transmission，and multiresolution editing have been studied and developed.Recently Maria Charina et al have proposed a completely new theory of multiresolution analysis based on subdivision wavelet tight frames，which makes its practical applications to 3D graphics become a new subject worthy of investigation.Since the assumption of multiresolution analysis based on subdivision surface is that the input mesh is semi-regular，in the present paper a new rapid algorithm of constructing meshes which not only have subdivision connectivity but also approximate to the input mesh is proposed.Furthermore，based on the study of the new theory，the decomposition and reconstruction formulas of Loop subdivision wavelet tight frames are given in detail.Then the algorithm is implemented and applied to the progressive transmission and denoising of 3D graphics.In the last of the paper，by comparing it with the biorthogonal Loop subdivision wavelets of Bertram，the numerical results illustrate the good performance of the new technique.

Key words multiresolution analysis subdivision wavelets subdivision wavelet tight frames progressive transmission denoising

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