基于改进Marching Cubes算法的乳腺MRI肿块三维重建

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摘 要：

核磁共振成像(MRI，Magnetic Resonance Imaging)已成为乳腺癌肿块检测的重要手段，对肿块进行三维重建可以帮助医生更加直观，迅速，准确的对病变进行诊断。MC(Marching Cubes)面绘制算法是三维重建的经典算法，它提供了一种精确地定义体素及其等值面的生成方法，但它存在等值面提取方法单一，三维网格数据量庞大等弊端。针对这一情况，提出改进算法：通过分析乳腺MRI序列图的成像特点和相邻层间的相关性，包括相邻几帧间图像灰度分布的相似性和肿块组织形状相近性，提出了一种基于帧间相关性的等值面提取改进算法，并对重建产生的大量三角网格进行了简化。将本文方法应用于30例乳腺MRI序列图，实验结果表明，通过以上的算法改进，对于乳腺肿块的三维重建在精度和绘制速度上都比使用传统MC算法有很大提高。

关键词：乳腺MRI；三维面绘制；肿块分割；Marching Cubes

Three-Dimensional Reconstruction of Breast MRI Masses Based on Improved Marching Cubes Algorithm

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Abstract:

MRI (Magnetic Resonance Imaging) has become one of the primary means of breast cancer's diagnosis .The extraction of the region of interest (tumor area) and the 3D (Three-dimensional)visual display can help the doctors make the more accurate treatment. MC (Marching Cubes) surface rendering algorithm is he classic algorithm of three-dimensional reconstruction , which provides a precise definition of the voxel and a method of isosurface generation.But it has the defects of the single-method of isosurface extraction and huge amount of three-dimensional grid.By analyzing the imaging characteristics of breast MRI sequences and the correlation between adjacent layers,including the similar of adjacent interframe image gray distribution and mass organizations shape, propose an isosurface extraction algorithm based on interframe correlation and an effective method to simplify rebuilding triangular mesh.This method was applied to 30 cases of breast MRI sequence diagram, the experimental results show that the improved algorithm was more better than MC algorithm in the accuracy and speed of rendering for three-dimensional reconstruction of the breast lumps.

Keywords: breast MRI; tumor segmentation; surface rendering; Mesh simplification

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