应用生态学报 » 2011, Vol. 22 » Issue (01): 137-143 DOI:

小麦根系三维形态建模及可视化

谈 峰,汤 亮 胡军成 姜海燕 曹卫星 朱 艳 **

南京农业大学江苏省信息农业高技术研究重点实验室, 南京 210095

Three-dimensional morphological modeling and visualization of wheat root system.

TAN Feng, TANG Liang, HU Jun-cheng, JIANG Hai-yan, CAO Wei-xing, ZHU Yan

Jiangsu Key Laboratory for Information Agriculture, Nanjing Agricultural University, Nanjing 210095, China

全文: PDF (1326 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要

作物三维形态建模和可视化技术是数字植物研究的重要组成部分，本文旨在构建基于形态特征参数的小麦根系三维形态模型，并实现小麦根系生长的可视化.基于小麦根系生长的可视化技术框架，首先构建了小麦根轴的三维显示模型，包括根轴生长模型、分枝几何模型和根轴曲线模型；然后结合根系拓扑结构，确定相应的图元，利用根系形态模型输出的形态特征参数，对整个小麦根系进行三维重构；最后基于OpenGL图形平台，综合纹理映射、光照渲染、碰撞检测等真实感处理手段，实现了小麦根系生长的三维可视化表达.结果表明：模型输出的根系真实感较强，能较好地实现不同品种、水分和氮素条件下小麦根系的三维可视化表达.研究结果为进一步建立完整的可视化小麦生长系统奠定了技术基础.

关键词： 小麦 根系 几何建模 形态参数 可视化

Abstract:

Crop three-dimensional (3D) morphological modeling and visualization is an important part of digital plant study. This paper aimed to develop a 3D morphological model of wheat root system based on the parameters of wheat root morphological features, and to realize the visualization of wheat root growth. According to the framework of visualization technology for wheat root growth, a 3D visualization model of wheat root axis, including root axis growth model, branch geometric model, and root axis curve model, was developed firstly. Then, by integrating root topology, the corresponding pixel was determined, and the whole wheat root system was three dimensionally re constructed by using the morphological feature parameters in the root morphological model. Finally, based on the platform of OpenGL, and by integrating the technologies of texture mapping, lighting rendering, and collision detection, the 3D visualization of wheat root growth was realized. The 3D output of wheat root system from the model was vivid, which could realize the 3D root system visualization of different wheat cultivars under different water regimes and nitrogen application rates. This study could lay a technical foundation for further development of an integral visualization system of wheat plant.

Key words: wheat root system geometric modeling morphological parameter visualization

引用本文:

. 小麦根系三维形态建模及可视化[J]. 应用生态学报, 2011, 22(01): 137-143.

. Three-dimensional morphological modeling and visualization of wheat root system.[J]. Chinese Journal of Applied Ecology, 2011, 22(01): 137-143.

链接本文:

http://www.cjae.net/CN/ 或 http://www.cjae.net/CN/Y2011/V22/I01/137

没有本文参考文献

[1] 郑有飞,倪艳利,麦博儒,吴荣军,冯妍,孙健,李健,徐静馨. **太阳辐射减弱对冬小麦旗叶光合速率的影响**[J]. 应用生态学报, 2011, 22(06): 1457-1464.