

A Visual Programming Environment Based on VTK for Scientific Visualization

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ABSTRACT

The Visualization Toolkit (VTK) is a C++ class library for 3D computer graphics, image processing and visualization. In addition to C++, the user can also access VTK through interpreted interface layers. To make use of VTK's ability, the user must have enough knowledge of object-oriented programming or interpreted languages that VTK supports. For clinical users or generic researchers, the learning threshold of VTK is quite high. In this thesis, a VTK-based visual programming environment is proposed to solve the above VTK problem of high learning threshold. Our system allows the user to intuitively drag and drop VTK objects, and create a pipeline by connecting these objects with a graphical user interface. Also, for each VTK object, its attributes or parameters can be set by the use of a dialog box. Each pipeline can be executed to have the results displayed on the screen, or to generate its corresponding C++ code. With the help of our system, users without professional programming skills can easily create a domain specific application or a prototyping system. Three examples, including sphere creating, image processing and surface rendering, are given to demonstrate the feasibility of our system.

Keywords : Visual Programming ; VTK ; Computer Graphics ; Image Processing

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REFERENCES

- [1] William J. Schroeder, Lisa S. Avila and William Hoffman, "Visualizing with VTK: A Tutorial," IEEE Computer Graphics and Applications, Vol. 20, No. 5, pp. 20-27, 2000.
- [2] Kanis Charntaweekhun and Somkiat Wangsiripitak, "Visual Programming using Flowchart," Communications and Information Technologies, pp. 1062-1065, 2006.
- [3] Hoang D. K. Le, Rongxin Li, and Sebastien Ourselin, "Towards a Visual Programming Environment Based on ITK for Medical Image Analysis," Digital Image Computing: Techniques and Applications, pp. 558- 565, 2005.
- [4] Gobbi D., Mousavi P., Li K., Xiang J., Campigotto A., LaPointe A., Fichtinger G. and Abolmaesumi P., "Simulink Libraries for Visual Programming of VTK and ITK," Systems and Architectures for Computer Assisted Interventions, 2008.
- [5] Da-Qian Zhang and Kang Zhang, "VisPro: a visual language generation toolset," IEEE Symposium on Visual Languages, pp. 195-202, 1998.
- [6] Kang Zhang, Da-Qian Zhang and Jiannong Cao, "Design, Construction, and Application of a Generic Visual Language Generation Environment," IEEE Transactions on Software Engineering, Vol. 27, No. 4, pp. 289-307, 2001.
- [7] Ingmar Bitter, Robert Van Uiter, Ivo Wolf, Luis Ibanez and Jan-Martin Kuhnigk, "Comparison of Four Freely Available Frameworks for Image Processing and Visualization That Use ITK," IEEE Transactions on Visualization and Computer Graphics, Vol. 13, No. 3, pp. 483-493, 2007.
- [8] Margaret M. Burnett, Adele Goldberg, Ted G Lewis, Visual object-oriented programming, Manning Publication Co, 1995.
- [9] LabVIEW, <http://www.ni.com/labview/zht/>, 2009. VTK Homepage, <http://www.vtk.org/>, 2009.
- [10] VTK Homepage, <http://www.vtk.org/>, 2009.
- [11] Lisa S. Avila, Sebastien Barre, Rusty Blue, Berk Geveci, Amy Henderson, William A. Hoffman, Brad King, C. Charles Law, Kenneth M. Martin, William J. Schroeder, The VTK User's Guide, Kitware, 2004.
- [12] Will Schroeder, Ken Martin, Bill Lorensen, The Visualization Toolkit - An Object-Oriented Approach to 3D Graphics, Kitware, 2003.
- [13] OpenGL, <http://www.opengl.org/>, 2009.
- [14] PEX, <http://research.microsoft.com/en-us/projects/pex/>, 2009.
- [15] 游峰碩, "UML系統分析與設計", 台北市, 學貫行銷股份有限公司, 2007.

- [16] Debbie Stone, Caroline Jarrett, Mark Woodroffe, Shailey Minocha, User Interface Design and Evaluation, Morgan Kaufmann, 2005.
- [17] 黃健彰, 「VTK之安裝與使用」, 大葉大學資工系技術報告 - TR9602, 2006.
- [18] 蕭世文, “演算法導論 – Introduction to Algorithms”, 台北市, 文魁資訊股份有限公司, 2004.
- [19] VTK Documentation, <http://www.vtk.org/doc/release/5.4/html/>, 2009.
- [20] MSDN, <http://msdn.microsoft.com/library>, 2009.