XML Data Model Visualization

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COSC 729 Virtual Reality and Its Applications
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Rationale

• Data models are often represented as spreadsheet tables or XMI files
• Relationships are sometimes visualized using UML and related software architecture tools
  • These are often flattened and limited views

• An interactive 3D representation provides a new and different way of looking at and manipulating models
• The immersive VR modality can foster interest in data architecture and data modeling
Goal and Objectives

• To create an interactive 3D representation of a data model in a virtual environment.

• Foster interest in data architecture and data modeling
  • Begin exploration of a new modality for manipulating data modeling
  • Demonstrate VR fundamentals through creation of an inviting and relaxing virtual environment

• New Concepts
  • Additional manipulation of objects
  • Ability to read in and write out external files
  • Ability to read in data and represent visually
  • Requires to arrangement of the data nodes and links
Project Description

• The VR XML Data Model Visualization Project is a python based virtual reality project that:
  • Generates 3D tree-graph representation of XML data in
  • Includes an immersive and interactive virtual environment.
Software

• System Requirements
  • Software required: Windows 10 OS
  • Hardware required: Keyboard and Mouse

• Development Software
  • Vizard
  • Python
  • Sketchup
  • XML Element Tree APIs
  • Math libraries for trigonometric functions
Modeling

• **Vision**: Use of textures and 3D models to provide detailed information in the project.
  - Building setting with outdoors
  - XML Model – uses color and size to represent different data types

• **Sound**:  
  - Music for the setting

• **Animation**:  
  - Avatar animations
  - Grabber node interactions

• **Interactivity**: Use at least three user-triggered events in the project.
  - UI Create node
  - Delete node
  - UI Import Model
  - UI Export Model
  - Keyboard trigger Avatar behaviors to
Demonstration
Future Application:

• Include avatar representation of multiple users (requires network)
• Allow multiple users to view the model
• Allow multiple users to manipulate the model
• Add new Hardware support
  • Oculus
  • Pinch glove
Future application: Data Model Training

• Interactive guided tutorial on how to build data models in the 3D environment
• Making the model more interactive and provide visual and haptic feedback when incorrect connections are made
• Include a scoring mechanism
Future Application: Human Factors

• Human factors opportunities for extended studies / future work
  • Node size shape & color
  • Link size shape and color
  • Measures – attentiveness
  • Duration of game play
  • Initial node selection
Conclusion

• Basic demonstration of a 3D VR representation of XML data models 3-dimensional tree-graphs.
  • Multiple XML documents were imported and rendered as models in the virtual environment.
• Exercised fundamentals of creating an immersive VR environment
  • On-screen prompts, sounds, VR sensors, timers, animations, and avatars
  • Recursion and trigonometric functions were used to create patterned structures
  • Color, links, and node sizes were used to illustrate differences in datatypes and relationships between nodes
• VR is a good medium for gaining a new perspective on visualizing structure of data models.
• The immersive environment makes data visualization more interesting not just to the user, but also to the developers. Team members look forward to continuing this work.
References

• Ms90Prod, Composer, Reggaeton vs Rap. [Sound Recording]. looperman. 2019.


Questions?

• For more information, contact:

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