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

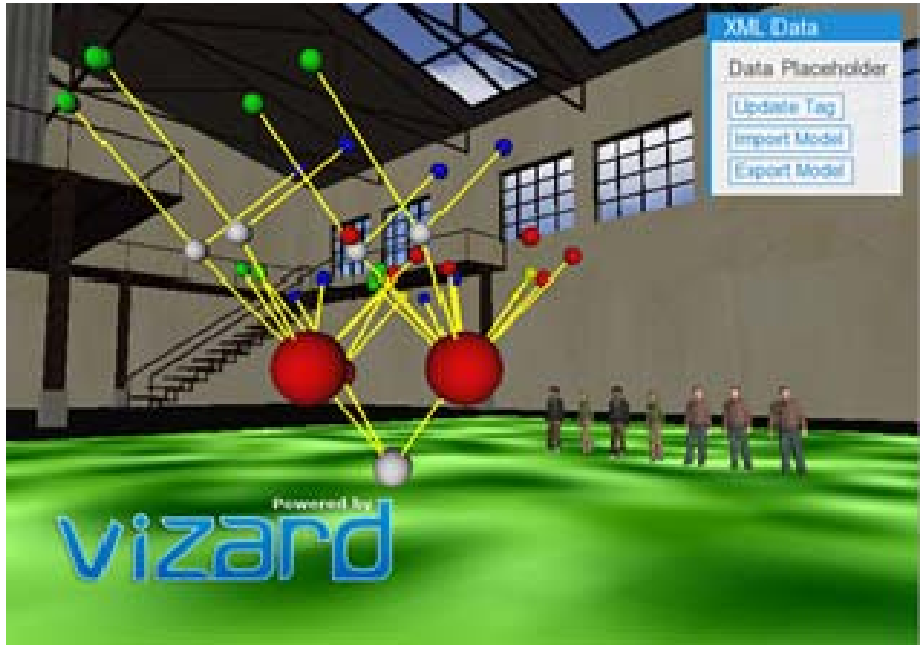
Goal and Objectives

- 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 jut to the user, but also to the developers. Team members look forward to continuing this work.

References

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Questions ?

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