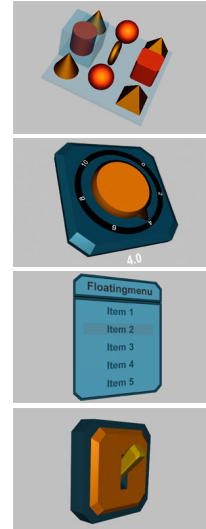


Three-Dimensional Widgets Revisited – Towards Future Standardization



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Outline

- Problems and Motivation
- Related Work
- Classification of 3D-Widgets
- Consistent Widget Specification
- Conclusion and Future Work

Problems and Motivation

■ 3D User Interfaces

- Basically in VR applications for experts using specialized HW
- Future alternative of present WIMP interfaces with great potential

■ Desktop-VR

- Broader variety of application domains including OS interfaces
- 3D-Widgets [2]: especially important for Desktop-VR
- Desktop 3D applications for the mass market? Standardization!



Problems and Motivation

■ Problems

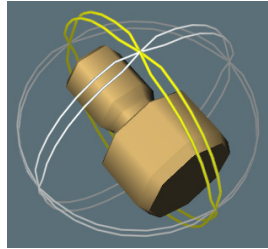
- Lack of 3D design standards and guidelines
- Lack of ready-to-use general purpose 3D widgets
- Unifying classification & consistent description of 3D widgets missing

■ Vision

- Repertoire of well-defined, standardized 3D widgets (and 3D interaction techniques)
- Towards standards for desktop VE and 3D-UIs

Related Work

- 3D Widgets [2]
 - More than 200 solutions already developed
 - 3D widget libraries and toolkits, e.g. it3d [9]
 - First 3D widgets overview by Leiner et al. [6]
 - Few other partial classification approaches (e.g. [11])
- VR interaction techniques
 - Various 3D interaction techniques available (e.g. [1])
 - XML-Specification & Classification: InTML [5]



Classification Approach

- Only for existing 3D widget solutions which
 - have a geometric representation,
 - are general enough to be used in various 3D projects.
 - Focus on widgets for system/application control incl. 3D menus
- Various criteria considered [3]
 - application area
 - interaction task
 - input device / degree of freedom
 - appearance
 - **interaction purpose / intention of use**
 - facilitates the practical use of widgets in real 3D projects

Classification of 3D-Widgets

Direct 3D Object Interaction

Object Selection

Geometric Manipulation

3D-Scene Manipulation

Orientation and Navigation

Scene Presentation Control

Exploration and Visualization

Geometric Exploration

Hierarchy Visualization

3D Graph Visualization

2D-Data and Document Visualization

Scientific Visualization

System / Application Control

State Control / Discrete Valuator

Continuous Valuator

Special Value Input

Menu Selection

Containers

Menu Selection

Temporary Option Menus

Rotary Tool Chooser

Menu Ball

Command & Control Cube

Popup Menu

Tool Finger

TULIP

Single Menus

Ring menu

Floating Menu

Drop-Down-Menu

Revolving Stage

Chooser Widget

3D-Palette, Primitive Box etc.

Menu Hierarchies

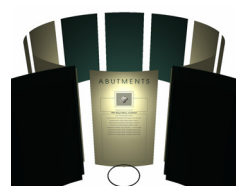
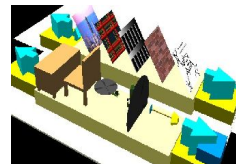
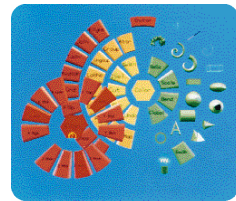
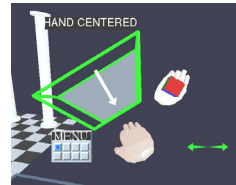
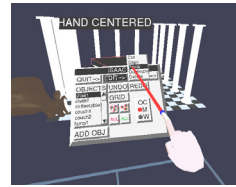
Hands-off Menu

Hierarchical Pop-Up Menus

Tool Rack

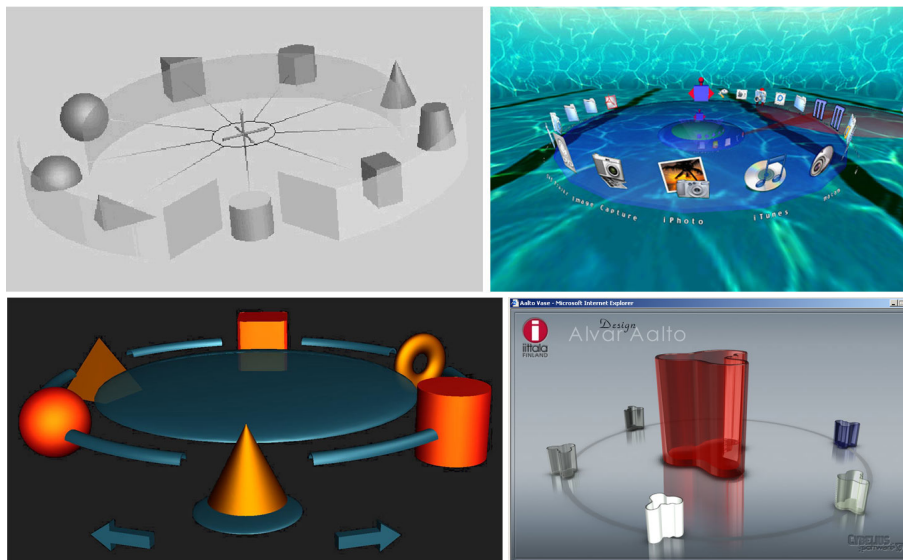
3D Pie Menu

→ Hierarchy Visualizations



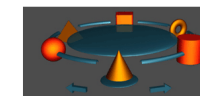
Specification of 3D-Widgets

- Classification of more than 70 Widgets in 38 classes by now
 - Classification online: www.3d-components.org
- Similar solutions presented as a singular widget type
- Sample Ring Menu [7]: Consistent specification needed



Ring Menu Component

General Parameters Geometry Parameters Appearance Parameters Behavior Parameters Developer



A ringmenu component is composed of items arranged on a rotatable ring. In addition to the ring there is a fixed geometry, which doesn't rotate. In front of the menu a selection geometry highlights the current selection. When the mouse is moved over the geometry parts rotate left and rotate right, the ring is rotated accordingly.

3D-Preview

Version: 1.0 date: 2001-10-11
 Developer: Michael Hinz
 Licence model: none

Usage:

complement CoMenuComponent

Download Ring Menu Component

General Parameters	dataType	configurable	receivesEvents	generatesEvents		
ItemList List of menu entries	CoAnyURLList	✗			✗	✗
SelectedItem Index of currently selected item (zero based)	CoInteger		✗		✗	✗
SelectedItemURL URL of currently selected item	CoAnyURI			✗		✗
Geometry Parameters	dataType	configurable	receivesEvents	generatesEvents		
FixedGeometry Fixed geometry does not rotate with the ring, it should be used as a frame.	CoGeometryGroup	✗				✗
InterItemGeometry Geometry between the items	CoAnyURI	✗				✗
RotateLeftGeometry Ring rotates left when mouse is moved over this geometry.	CoGeometryGroup	✗				✗
RotateRightGeometry Ring rotates right when mouse is moved over this geometry.	CoGeometryGroup	✗				✗
SelectionGeometry Selection geometry does not rotate with the ring, it should be used to highlight the selected item.	CoGeometryGroup	✗				✗
Appearance Parameters	dataType	configurable	receivesEvents	generatesEvents		
ItemRatio Ratio between items and in between geometry	CoFloat	✗				✗
RingRadius Radius of the ring	CoFloat	✗				✗
Behavior Parameters	dataType	configurable	receivesEvents	generatesEvents		
RotationSpeed Rotation speed of the ring (must be > 0)	CoFloat	✗	✗			✗

- Goal: specification data sheets for widgets

Specification of 3D-Widgets

- XML-Schema based specification language [3],[4]
 - within the research project CONTIGRA
 - defines interfaces of 3D widgets/components
 - Common metadata for each widget type: name, description, author, publication, picture
 - Set of high-level parameters describing the functionality and configuration options



Conclusion and Future Work

- Contribution towards the standardization of 3D user interfaces
 - Classification and specification of 3D-Widgets
- Future Work
 - Refinement and extension of the widget repertoire
 - Discussion of parameters/functionality among experts
 - Integration of 3D interaction techniques

Discussion

Widget Classification: www.3dcomponents.org

Project Website: www.contigra.com

And that's Raimund:



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