

3D User Interface System Control Techniques

Lecture #11: System Control

Spring 2017

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Universal 3D Interaction Tasks

- Navigation
 - Travel – motor component
 - Wayfinding – cognitive component
- Selection
- Manipulation
- System control
- Symbolic input

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System Control

- Often considered glue of 3D UI
- Specify the “what”
- Commands are issued to
 - request system to perform a particular function
 - change interaction mode
 - change system state

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Human Factors and System Control

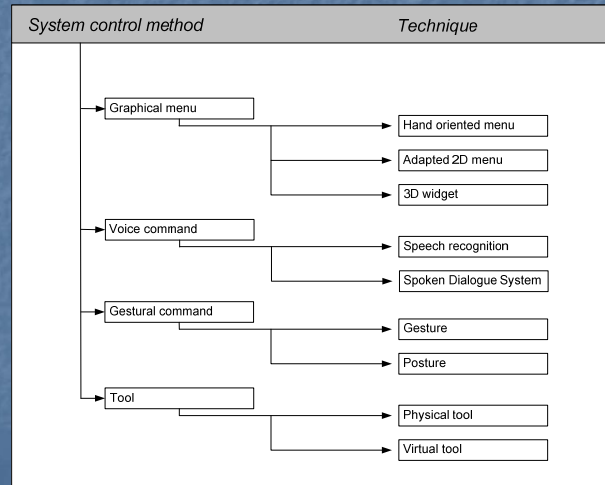
- Learn from mechanical systems
 - transfer of mechanical energy/information to system
 - control-body linkage
 - interaction between control device and human body
- Effectiveness of control-body linkage
 - human experience, training
 - shape and size of control
 - visual representation and labeling
 - methods of selection

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Classification



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Graphical Menus – Adapted 2D Menus

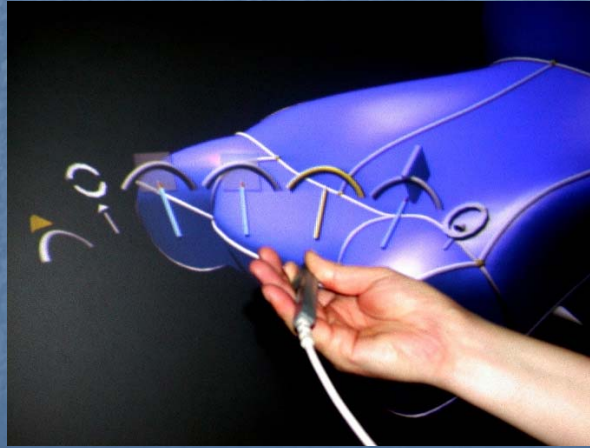


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Graphical Menus – 1-DOF Menus

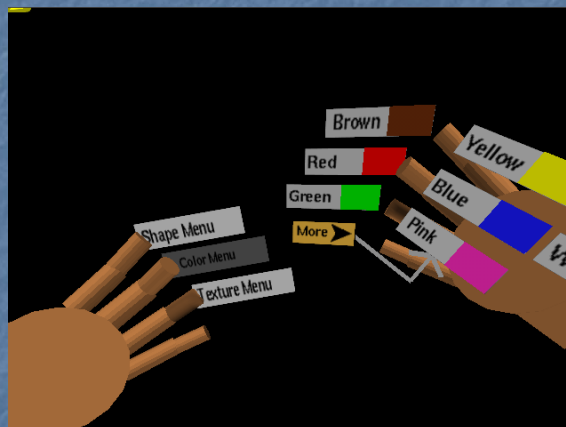


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Graphical Menus – TULIP

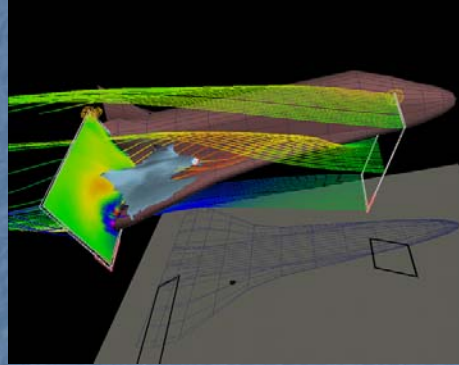
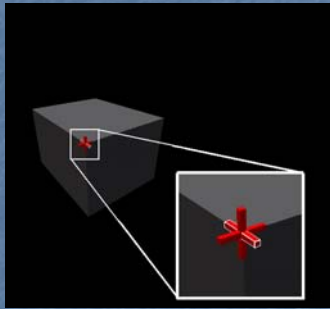


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Graphical Menus – 3D Widgets (1)



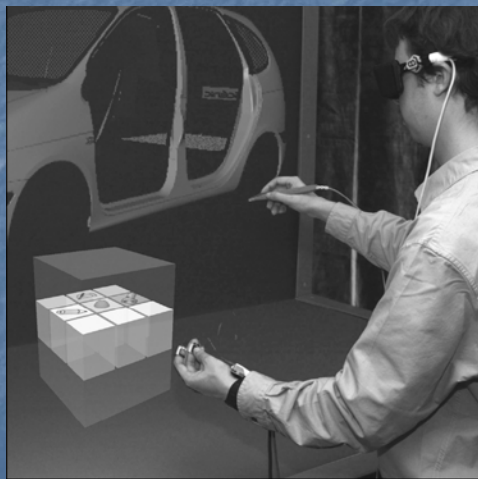
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Graphical Menus – 3D Widgets (2)

Command and Control Cube



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Graphical Menus – Design

- Placement
 - world-referenced (freely in world)
 - object-referenced (centered to object in world)
 - head-referenced (view centered)
 - body-referenced
 - device-centered
- Selection
 - Degrees of freedom, constraints
- Representation and structure
 - form, size, space, affordance
 - hierarchy: functional and semantic grouping, context sensitivity, control coding

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Voice Commands

- Speech recognition
- Spoken dialogue techniques
- Requires
 - speech recognition engine
 - speaker dependent vs. independent
 - varying vocabulary size
 - good microphone
- Invisible to the user
- Push to talk

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Gestural Commands

- One of the first system control techniques
- Posture – static hand configuration
- Gesture – dynamic movement



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Gesture Command Types

- Speech connected
- Mimic gestures
- Symbolic
- Sign language



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Tools

- Provide directness of interaction
- Familiar (real-world devices)
- Physical tools
 - real physical objects (props)
 - may have graphical representation
- Virtual tools

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Tools – Virtual Tool belt



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Tools – Tricorder



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Tools – TUI



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Multimodal System Control

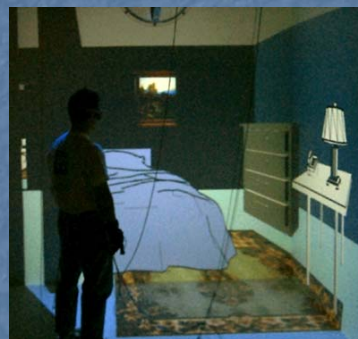
- More than one input modality (speech, gesture, facial expression, etc...)
- Advantages
 - decoupling
 - flexibility and complementary behavior
 - control of mental resources

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Multimodal Interaction – Examples



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Next Class

- Symbolic Input
- Readings
 - 3DUI Book – Chapter 8