

# 3D User Interface System Control Techniques

Lecture #11: System Control

Spring 2016

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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

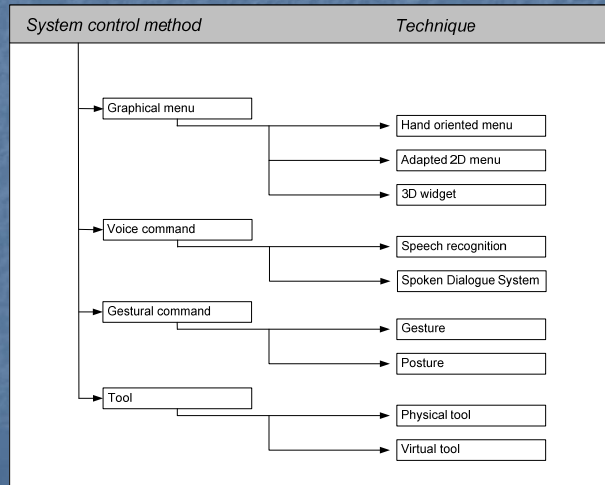
- Learn from mechanical systems
  - transfer of mechanical energy/information to system
  - control-body linkage
    - interaction between control device and human body
- Effectiveness of control-body linkage
  - human experience, training
  - shape and size of control
  - visual representation and labeling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

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# Classification



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## Graphical Menus – Adapted 2D Menus

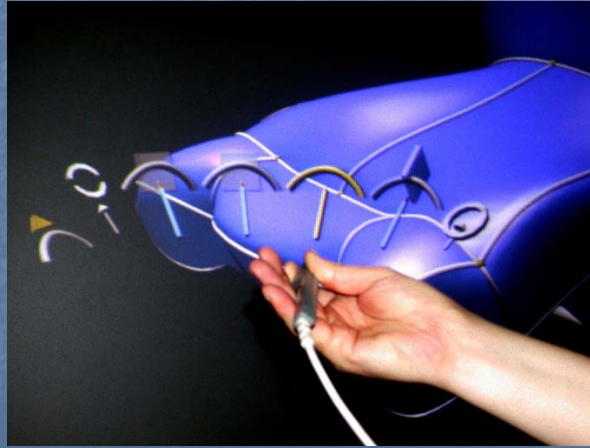


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## Graphical Menus – 1-DOF Menus

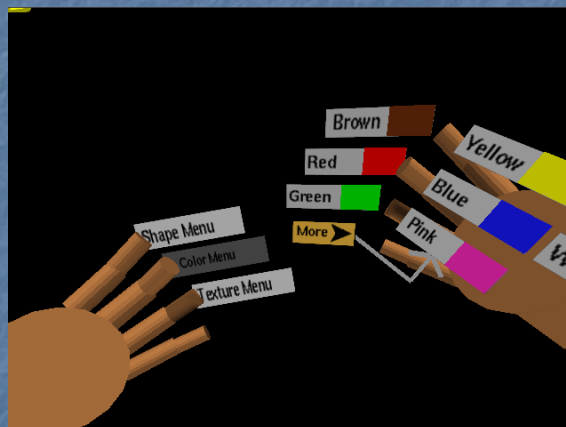


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## Graphical Menus – TULIP

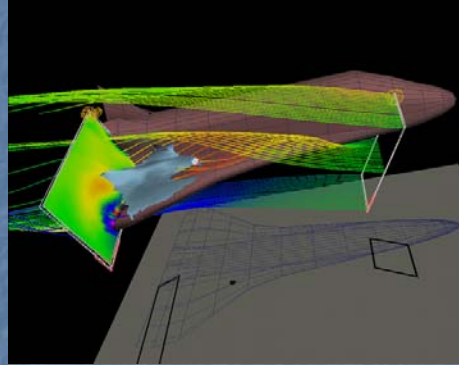
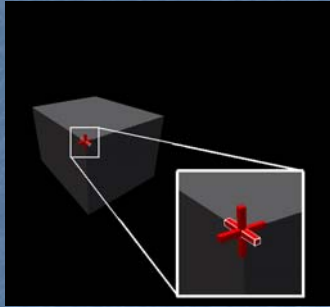


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## Graphical Menus – 3D Widgets (1)



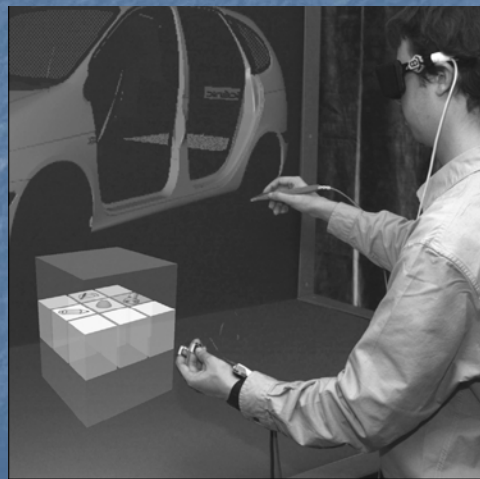
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## Graphical Menus – 3D Widgets (2)

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

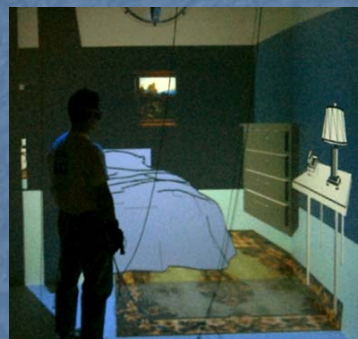
- More than one input modality (speech, gesture, facial expression, etc...)
- Advantages
  - decoupling
  - flexibility and complementary behavior
  - control of mental resources

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## Multimodal Interaction – Examples



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# Next Class

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