Accessing Assistive Technology
Learning Outcomes

• Identify the major principles and goals for access to assistive technology
• Identify the steps in assessing clients for access to assistive technology
• Identify features of access technologies
Characteristics of Technologies Available to Meet Client Needs

- Human/technology interface
- Processor
- Output
- Packaging
Human/Technology Interface

- Input device or control interface
- Selection (or symbol) set
- Presentation layout/arrangement
- Selection method
Control Interface Classifications

• Discrete Input
  • Single switches
  • Switch arrays
  • Keyboards
  • Speech

• Continuous Input
  • Joysticks
  • Mouse emulators
Switches

Momentary

Latcheing

Timed
Switches

“Pole” = # of Conductors

“Throw” = # of Positions

SPST

SPDT

DPST

DPDT
Switches

Single Pole, Single Throw (SPST)

ON-OFF
Single switches
Switch arrays

Electronic Head Array

Proximity Switch Array
Keyboards

QWERTY KEYBOARD

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http://www.computerhope.com
Keyboards

QWERTY KEYBOARD

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Tab  Q  W  E  R  T  Y  U  I  O  P  {  }  [  ]
Caps  A  S  D  F  G  H  J  K  L  ;  :  "  Enter
Shift  Z  X  C  V  B  N  M  <  >  ?  /  Shift
Ctrl  Alt  Alt  Ctrl

TYPEWRITER
Keyboards

BAT Keyboard

Half-Qwerty Keyboard

BigKeys Keyboard
Joysticks

- Proportional
- Non-proportional or digital
  - Via programming
Mouse emulators

- Stand alone mouse emulators
- Using new power wheelchair electronics for mouse emulation
- Using a speech generating device for mouse emulation

Qlogic display

ASL mouse emulator
Control Interface Features

• Number of targets
• Individual target size
• Overall dimension of selection surface incorporating all targets
• Spacing between targets
• Activation method
• Feedback
• Durability
Activation methods

- Movement
- Force
- Sip & puff
- Speech recognition/ sound
- EMG
- Eye gaze
- Sensors
- Brain Interface
Movement Activation
Force Activation
Sip & Puff Activation
Speech Activation

Voice Recognition
EMG Activation
Eye Gaze Activation
Sensor Activation
Thought Activation

Brain Interface
Symbol Set

• Pictures
• Letters or words
• Tactile markers
• Auditory cues
Presentation Layouts

- Frequency of use
- Alphabetical
- Sequential
- Spatial
Selection Methods

• Direct selection
• Scanning
Direct Selection

• Keyboarding
• Speech recognition
• Coded
Direct Selection

Coded
Indirect Selection

Scanning

- Item-by-item
- Group-item or row-column
- Halving or quartering
Scanning

Presentation formats

• Linear
• Circular
• Group
Row Column Scan
Row Column Scan

Scanning Rows

Scanning Columns
Row-Column Scanning Demonstration

To select the location marked by “X”, the individual activates a single switch. The rows are highlighted in sequence from top to bottom. When the row containing the “X” is highlighted, the individual activates the switch again. The locations in the selected row are highlighted in sequence from left to right. When the “X” location is highlighted, the individual activates the switch to select that location.

Click the left mouse button to start the demonstration.
Group Row Column Scan
Scanning

Selection techniques

• Auto
• Inverse
• Step
• Directed
• Auto-entry (dwell) vs. manual
Customizing the scanning method

- Scan rate
- Acceptance delay
- Repeat delay
- Time/dwell
Principles for access

• Positioning of consumer and equipment is crucial
• All positions must be considered
• Ergonomic and bio-mechanical principles should be considered
Goals of access

• Acceptable to the consumer
• Provides AT access which is
  • consistent, reliable, reproducible
  • not easily subject to error
  • minimizes abnormal tone
  • avoids use of reflexive patterns
• Identify backup and secondary access methods
Assessment

Screen for controllability

- Sensory
- Cognitive
- Physical
Screen for controllability

• Sensory
  • Visual
  • Auditory
  • Tactile/Somatosensory

• Cognitive
• Physical
Screen for controllability

- Sensory
- Cognitive
  - Memory
  - Sequencing
  - Problem-solving
- Physical
Screen for controllability

• Sensory
• Cognitive
• Physical
  • Range
  • Resolution
  • Strength
  • Endurance
  • Repeatability
• Versatility
Potential Sites

- Fingers, hand
- Head, forehead, chin,
- Face, mouth, tongue, eye
- Elbow, arm, shoulder
- Foot, knee
Assessment

Match physical /sensory abilities to control interface features

<table>
<thead>
<tr>
<th>Range</th>
<th>Resolution</th>
<th>#</th>
<th>Types of input</th>
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<tbody>
<tr>
<td>Large</td>
<td>Fine</td>
<td>&gt;10</td>
<td>keyboards</td>
</tr>
<tr>
<td>Large</td>
<td>Gross</td>
<td>5-10</td>
<td>large keyboard, switch array</td>
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<tr>
<td>Small</td>
<td>Fine</td>
<td>&gt;10</td>
<td>small keyboards, joystick, mouse</td>
</tr>
<tr>
<td>Small</td>
<td>Gross</td>
<td>1-2</td>
<td>switches</td>
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Assessment

Optimize use of control interface

- Stabilize
- Extend
- Training/practice
Mounting

• Safety
• Consistent placement
• Removable as needed
• Easy to setup for caregivers
• Avoid interference with other equipment
Assessment

Comparative Testing

• Speed
• Accuracy
• Reliability
• Endurance/fatigue
• Comfort
• Ease of operation
• Independent use
• Space restrictions - minimally obtrusive
• User acceptance
Integrated vs Distributed Controls

• Distributed
  • Each access method controls one assistive technology device

• Integrated
  • One access method can be used to control more than one AT device
  • Typically done through power wheelchair electronics
Universal Control
Review Questions  (feel free to discuss with your neighbors)

1. Integrated controls are defined as:
   a. Two switch scanning
   b. One access method is used to control more than one assistive technology device.
   c. Multiple access methods are used to control a single assistive technology device.
   d. Multiple access methods are used, and each controls a single device.

2. Once a user is optimally positioned, what is the first step of the access assessment process?
   a. identify an input device
   b. match physical ability to control interface features
   c. screen for controllability
   d. measure reaction time

3. What is the typical control interface for row-column scanning?
   a. Switch
   b. Keyboard
   c. Auto
   d. Voice
Review Questions (Here are the answers. How did you do?)

1. Integrated controls are defined as:
   a. Two switch scanning
   b. **One access method is used to control more than one assistive technology device.**
   c. Multiple access methods are used to control a single assistive technology device.
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   b. Keyboard
   c. Auto
   d. Voice
Questions ?