Accessing Assistive Technology

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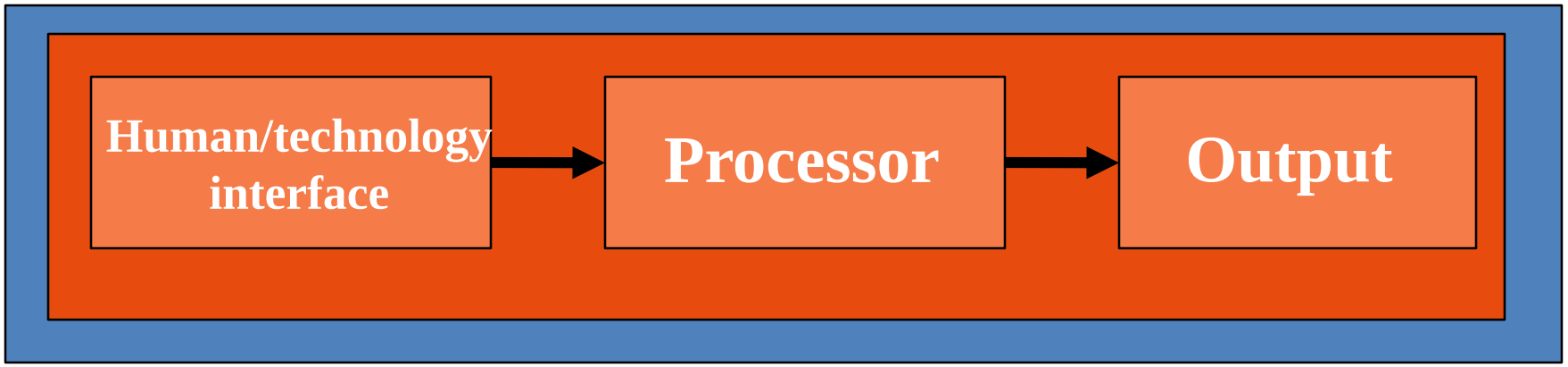
Learning Outcomes

- 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

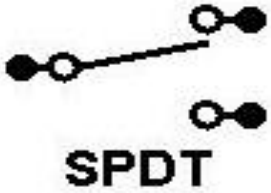
Latching

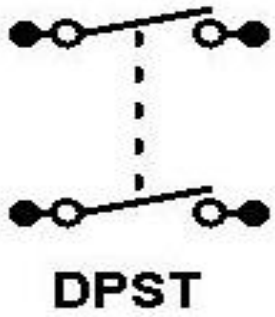
Timed

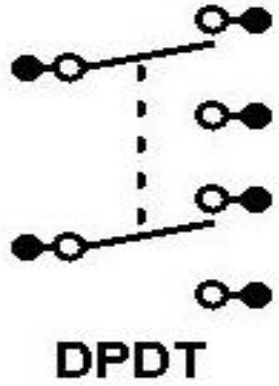
Switches

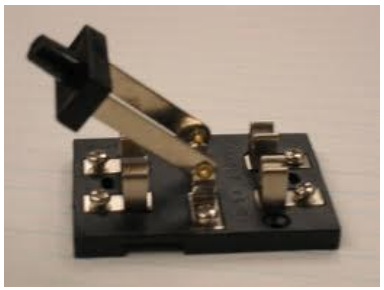
"Pole" = # of Conductors

"Throw" = # of Positions



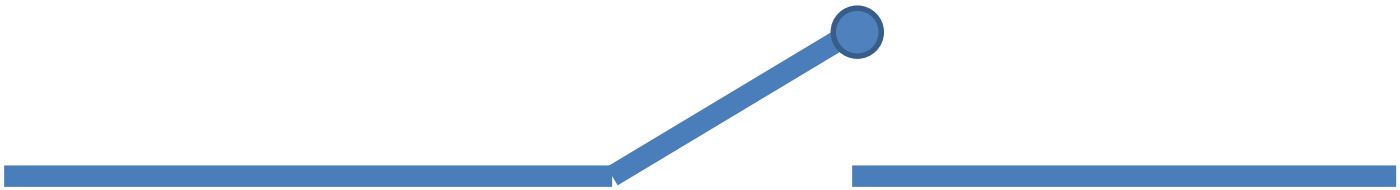






Switches

Single Pole, Single Throw (SPST)

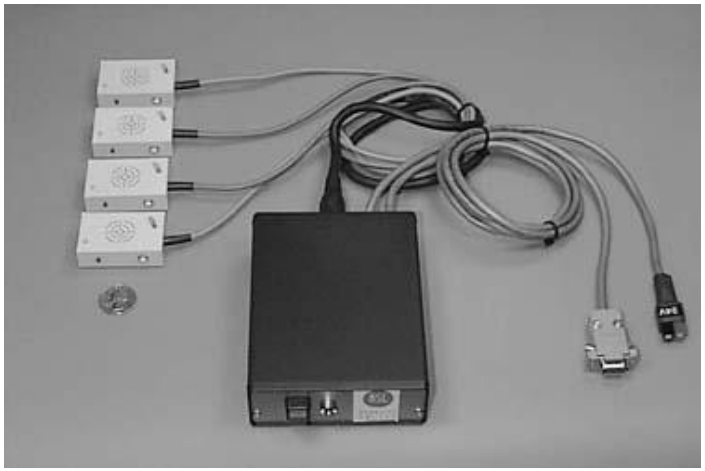


ON-OFF

Single switches

Switch arrays

Electronic Head Array



Proximity Switch Array

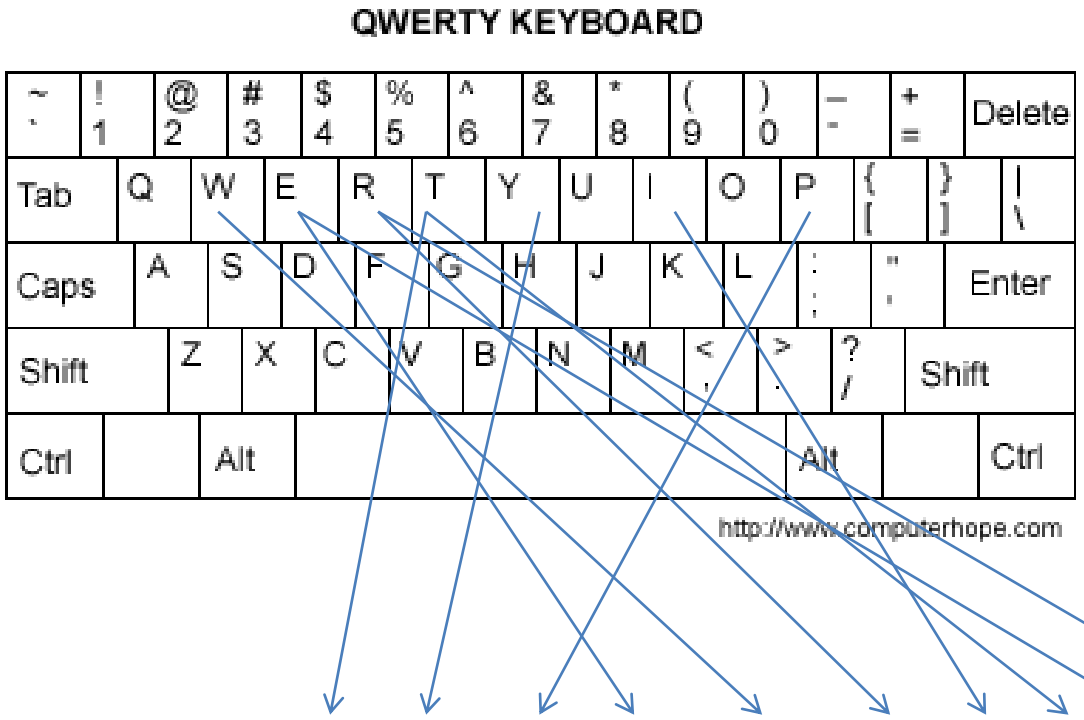
Keyboards

QWERTY KEYBOARD

~ `	! 1	@ 2	# 3	$ 4	% 5	^ 6	& 7	* 8	(9	) 0	_ -	+ =	Delete
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		

http://www.computerhope.com

Keyboards



TYPEWRITER

Keyboards

BAT Keyboard

Half-Qwerty Keyboard

BigKeys Keyboard

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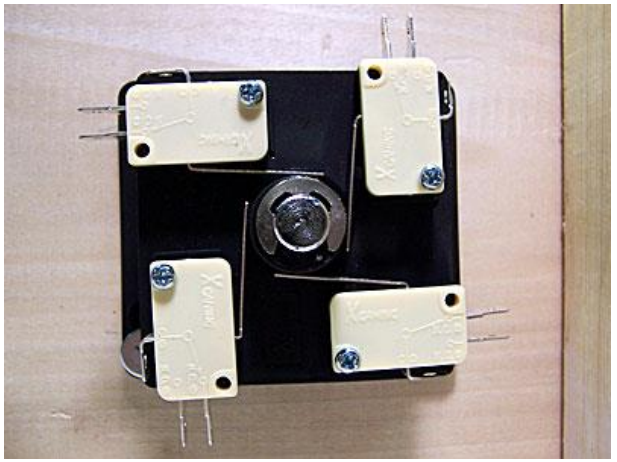
Joysticks

- 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

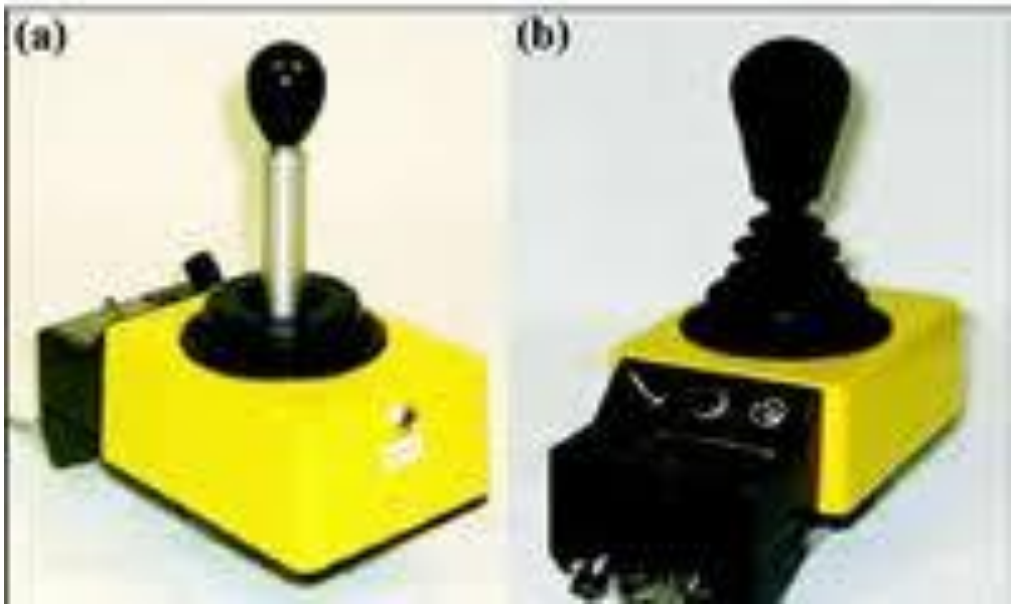
- Number of targets
- Individual target size
- Overall dimension of selection surface incorporating all targets
- Spacing between targets
- Activation method
- Feedback
- Durability

Activation methods

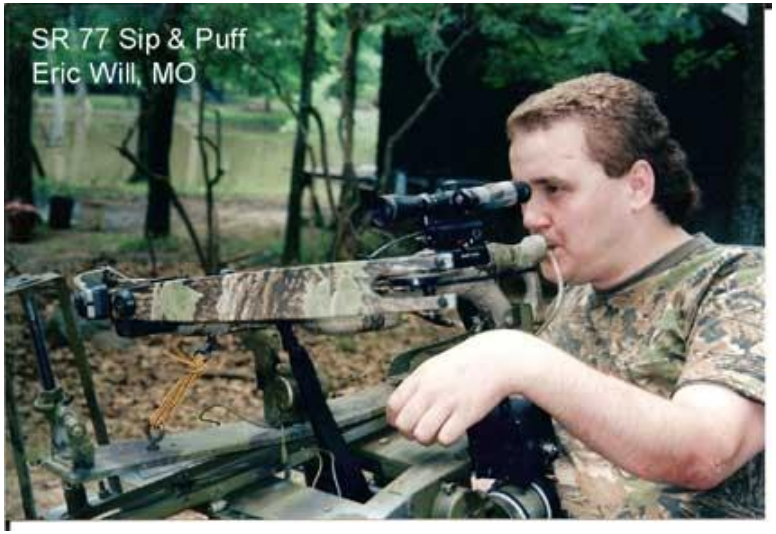
- Movement
- Force
- Sip & puff
- Speech recognition/ sound
- EMG
- Eye gaze
- Sensors
- Brain Interface

Movement Activation

Force Activation



Sip & Puff Activation



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Speech Activation

Voice Recognition

EMG Activation

Eye Gaze Activation

Sensor Activation

Thought Activation

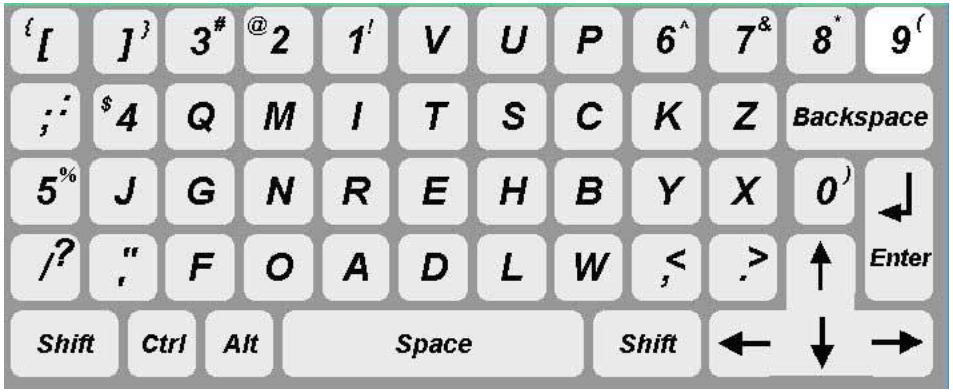
Brain Interface

Symbol Set

- Pictures
- Letters or words
- Tactile markers
- Auditory cues

Presentation Layouts

- Frequency of use
- Alphabetical
- Sequential
- Spatial



Selection Methods

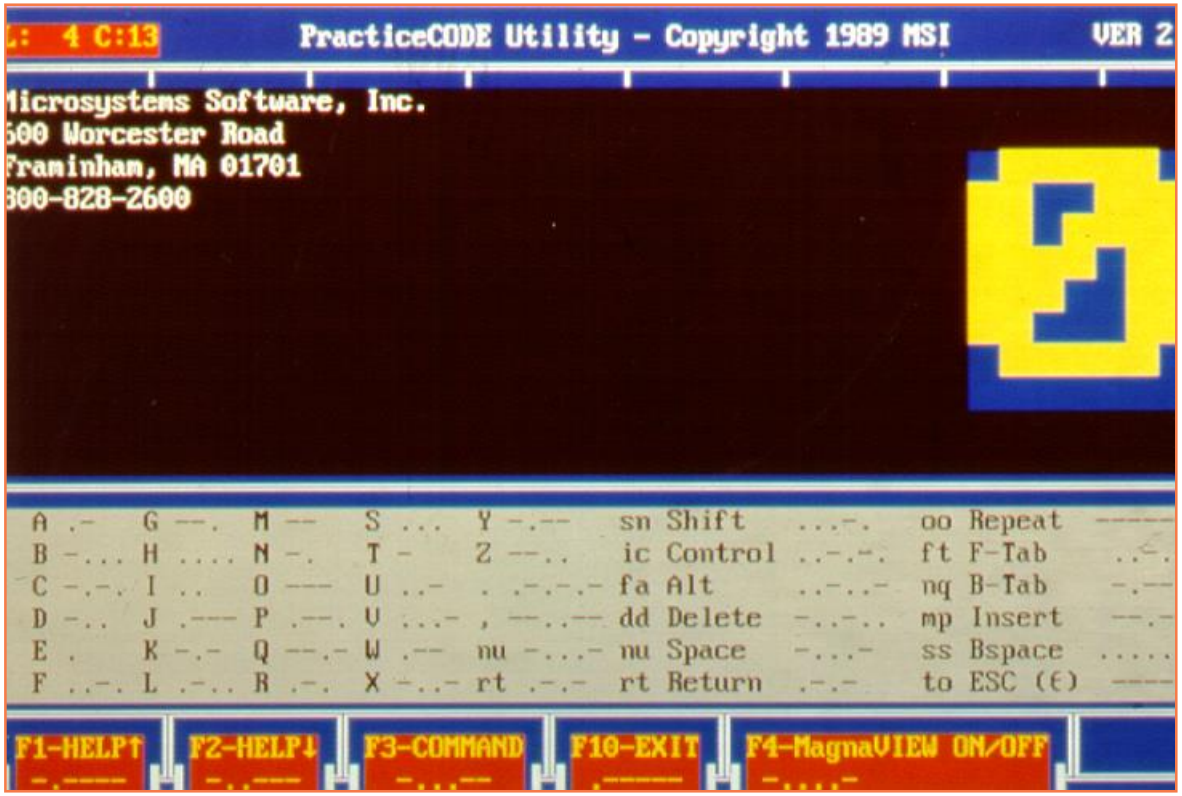
- Direct selection
- Scanning

Direct Selection

- Keyboarding
- Speech recognition
- Coded

Direct Selection

Coded



Indirect Selection

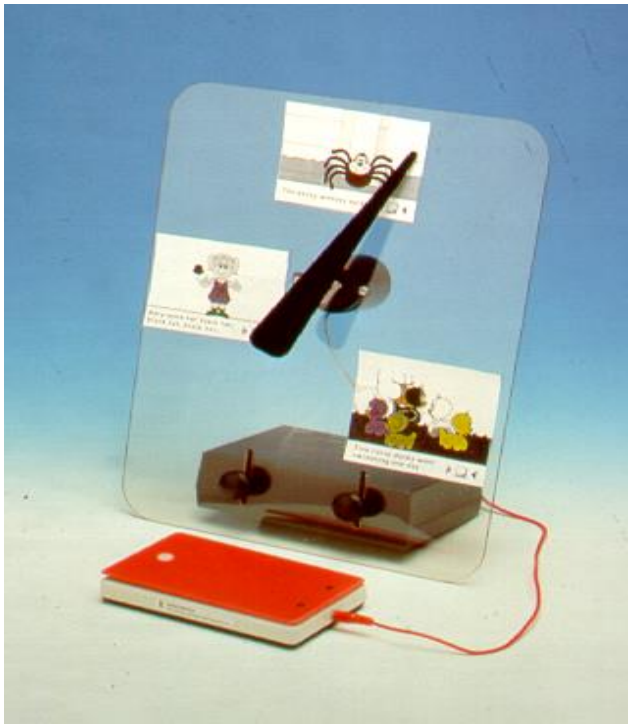
Scanning

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

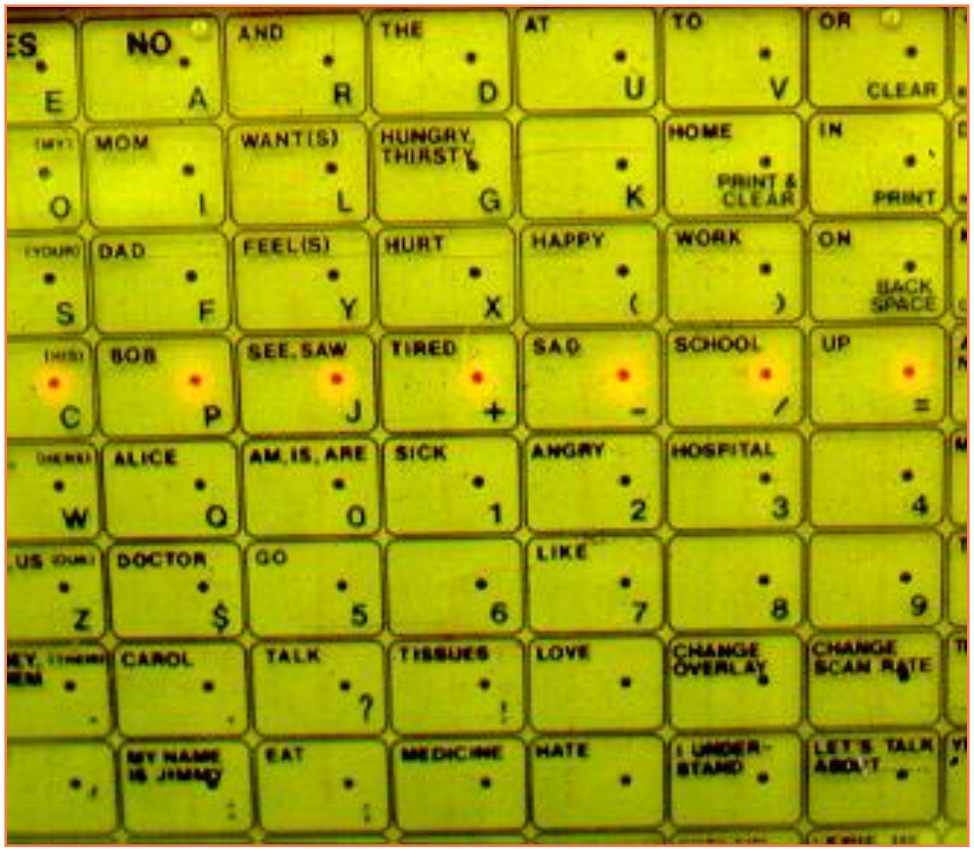
Scanning

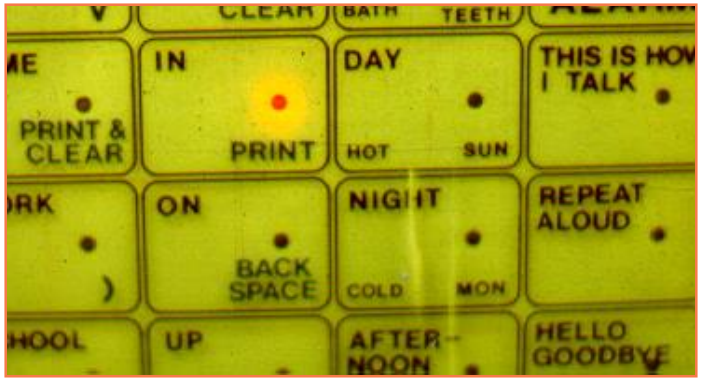
Presentation formats

- Linear
- Circular
- Group



Row Column Scan





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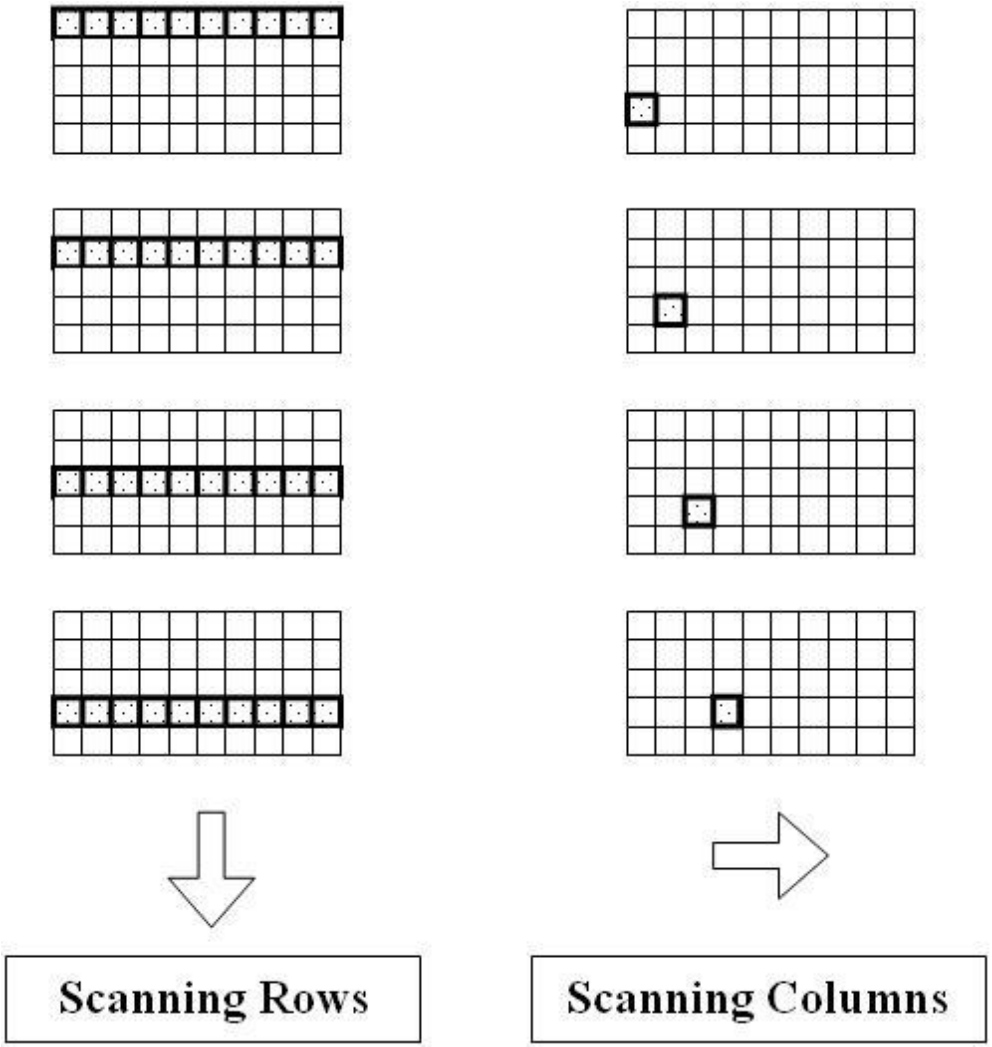
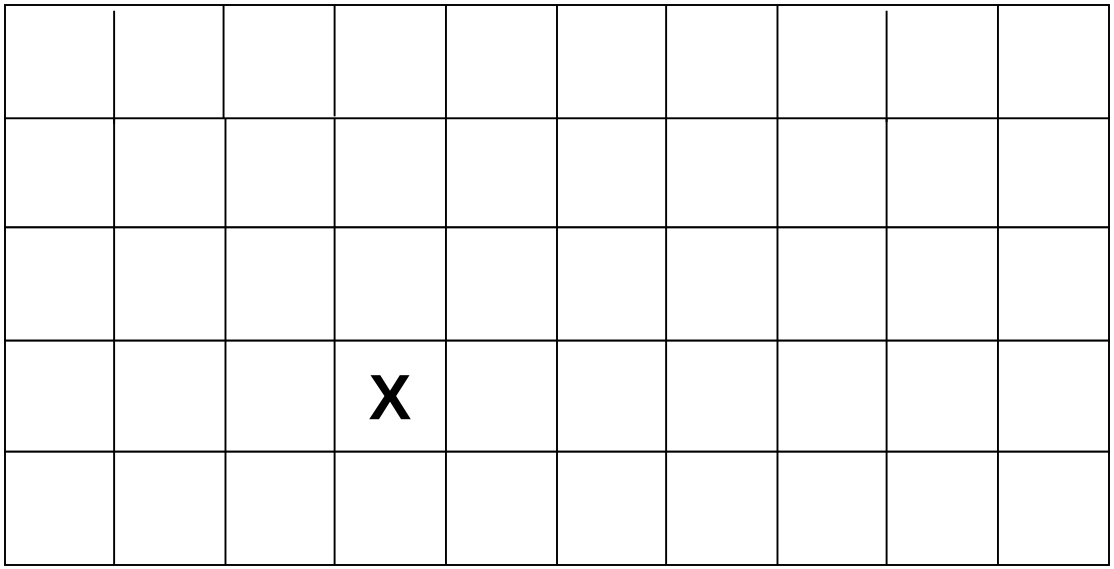
Row Column Scan



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.

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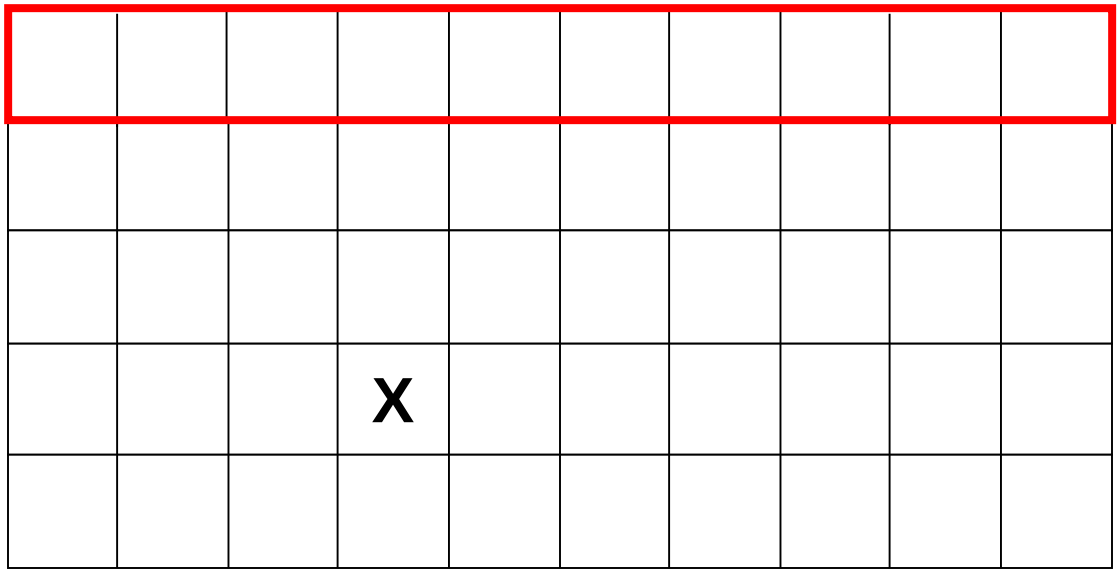
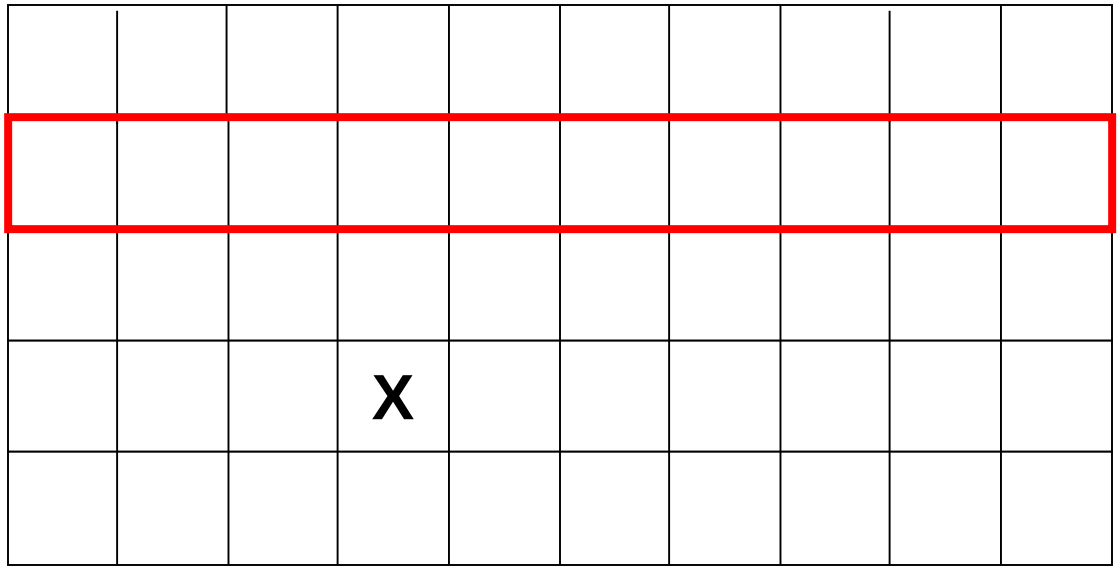

X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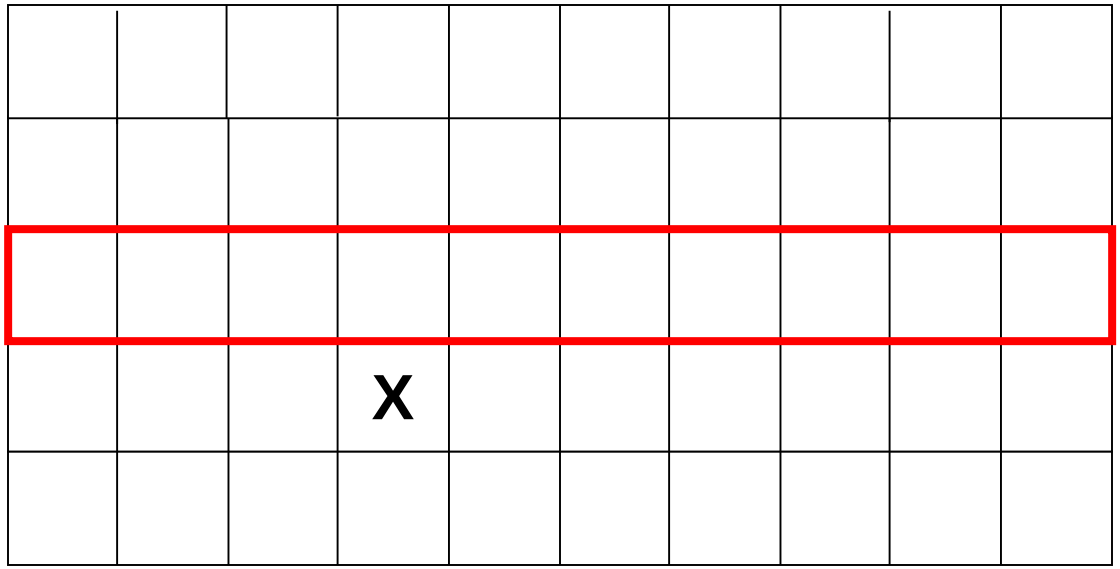
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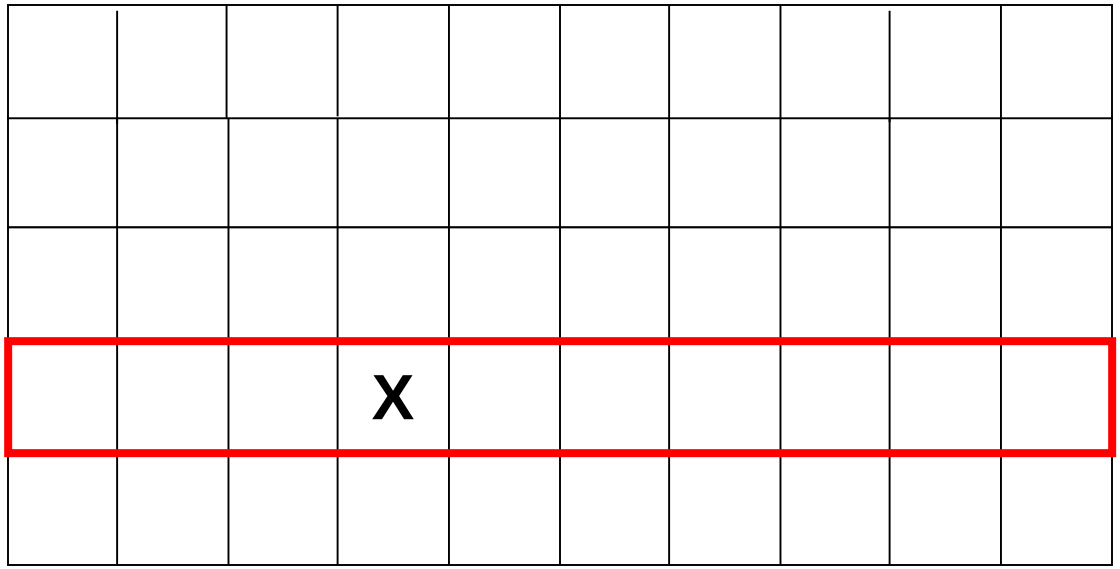
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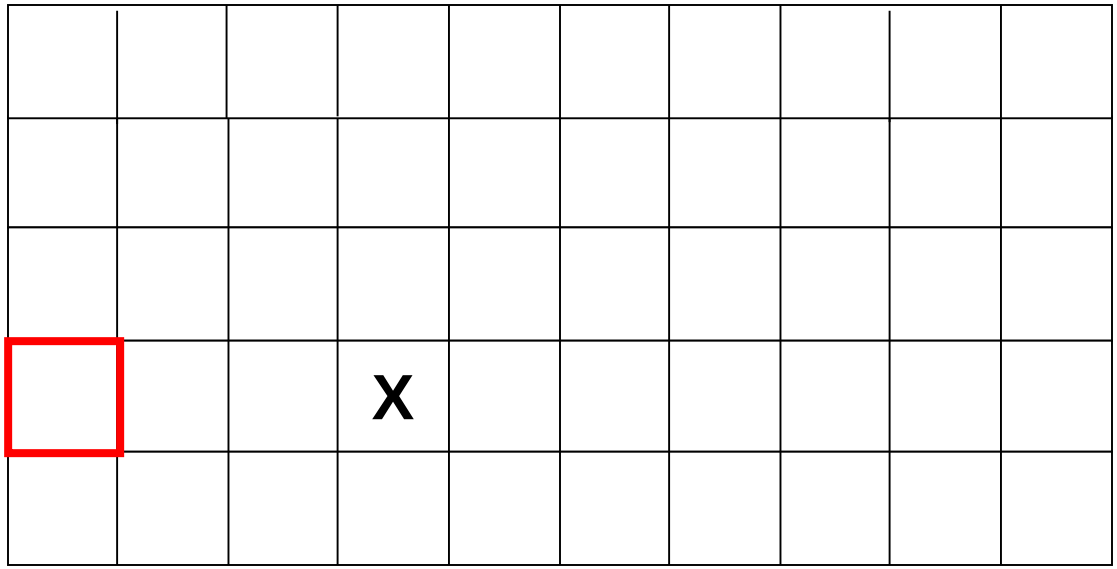
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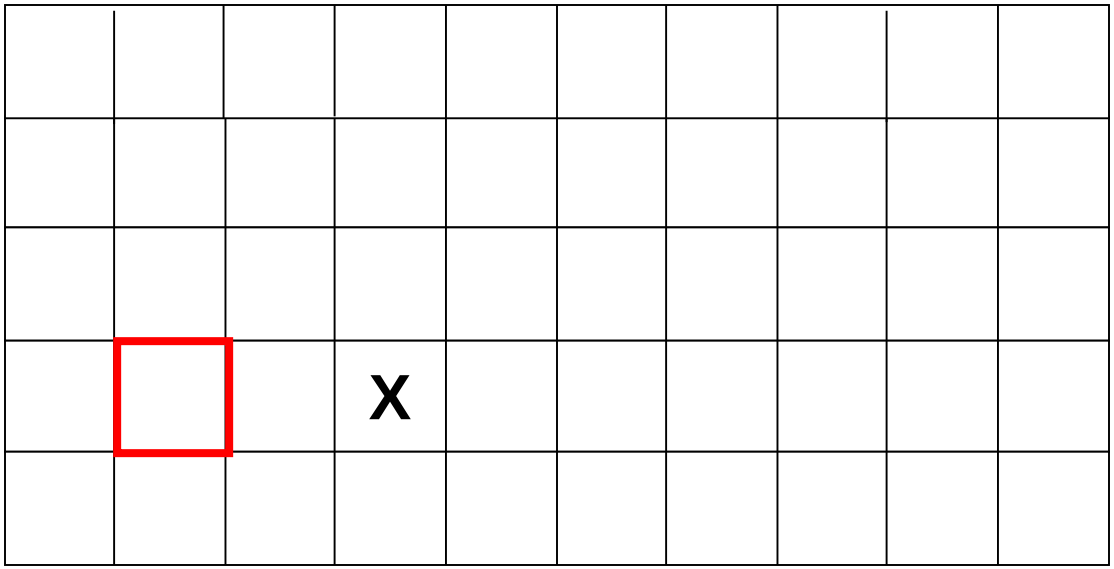
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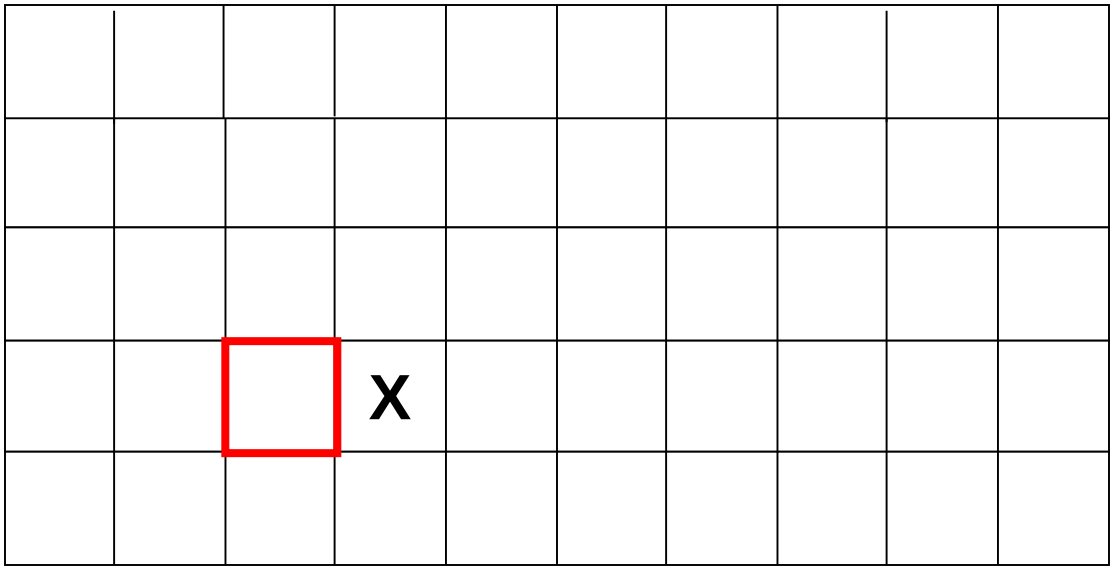
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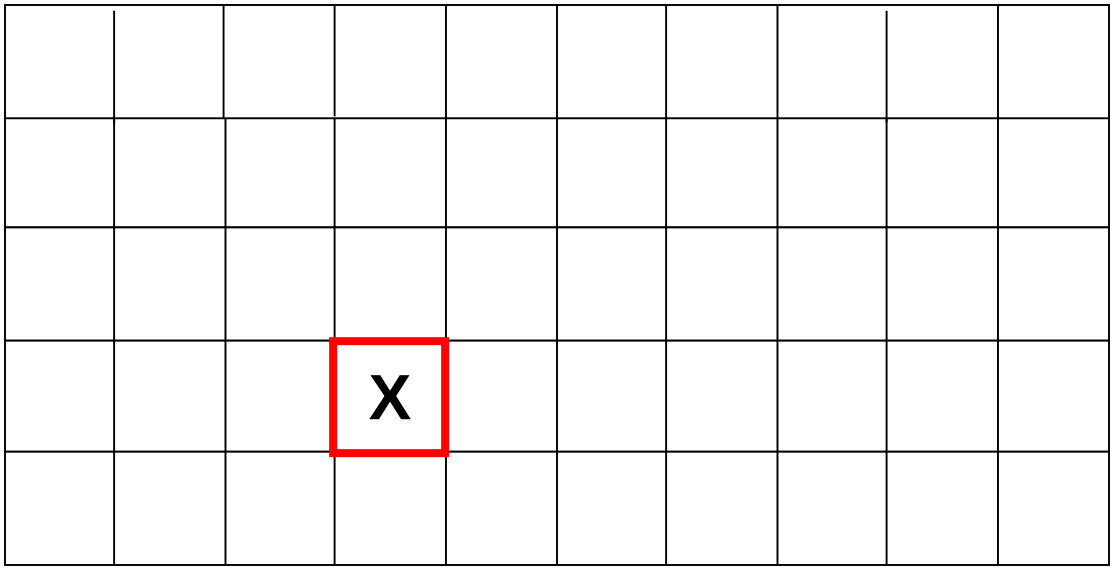
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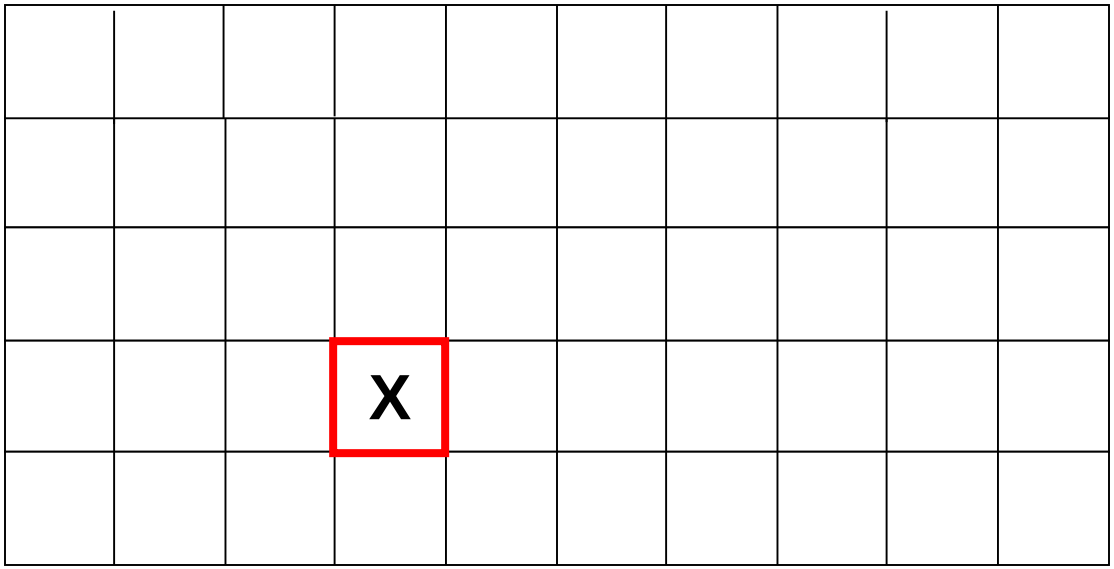
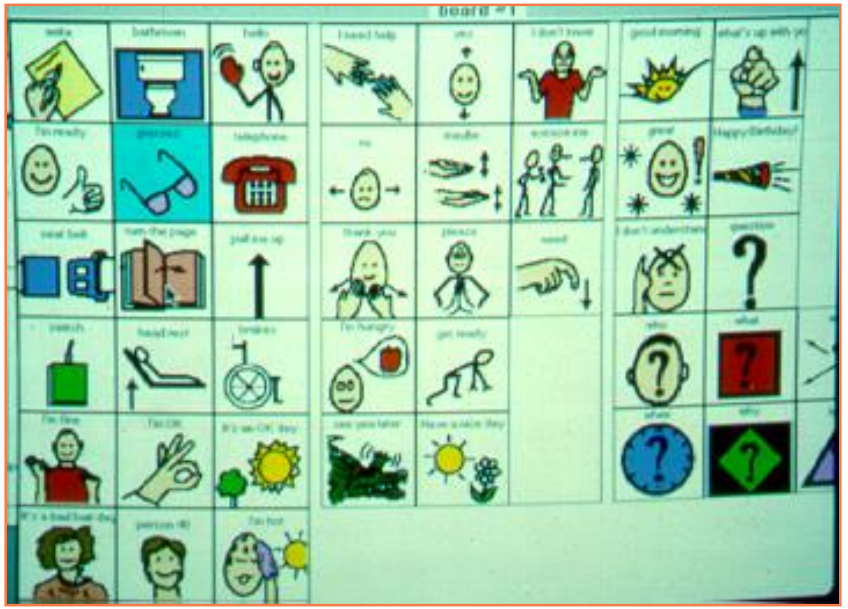
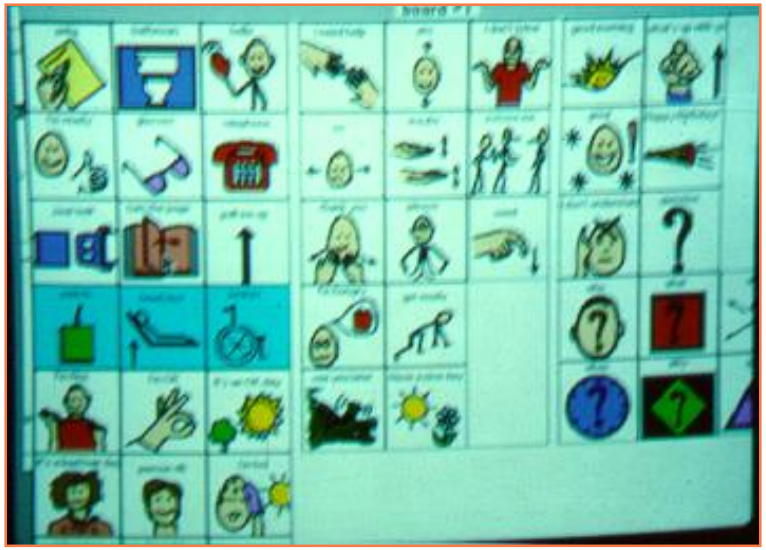

X

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

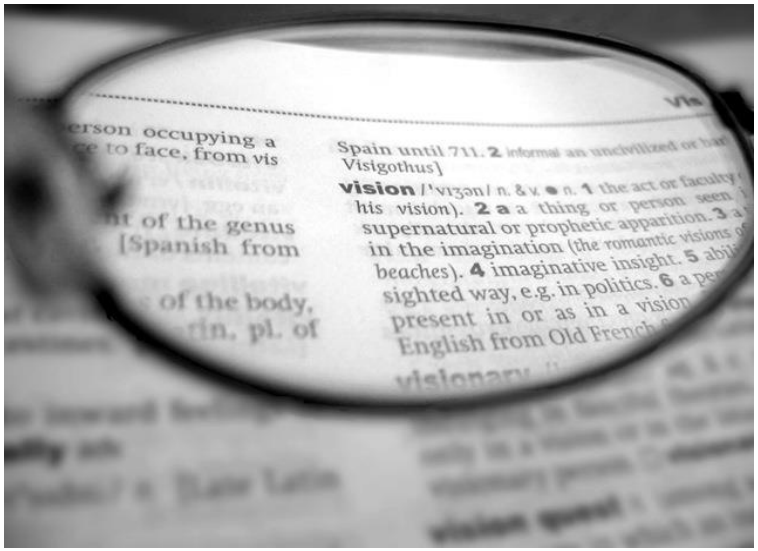
Assessment

Screen for controllability

- Sensory
- Cognitive
- Physical

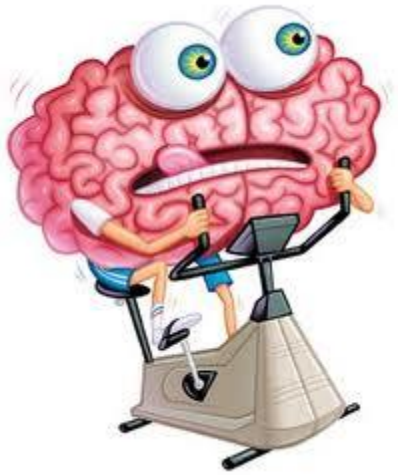
Screen for controllability

- Sensory
  - Visual
  - Auditory
  - Tactile/Somatosensory
- Cognitive
- Physical



Screen for controllability

- Sensory
- Cognitive
  - Memory
  - Sequencing
  - Problem-solving
- Physical

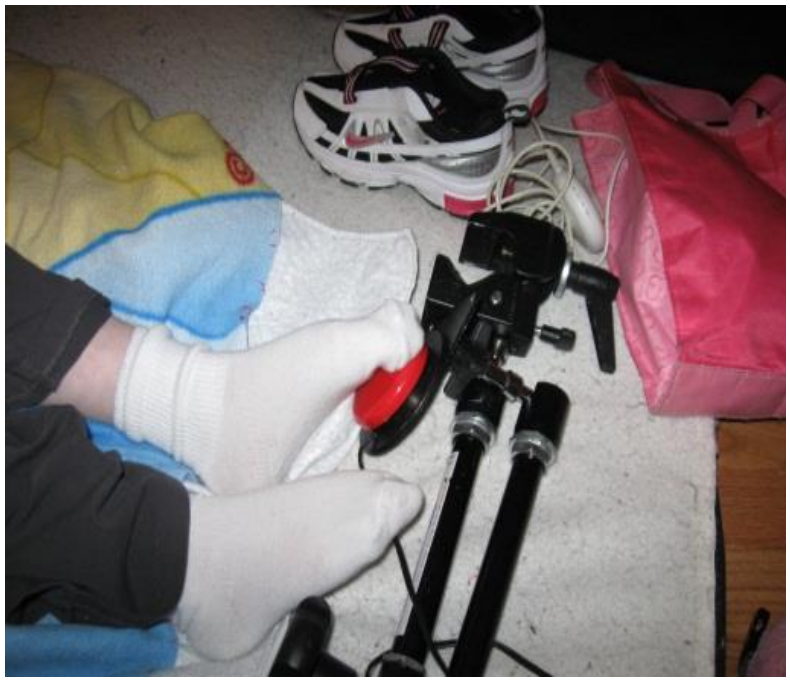


Screen for controllability

- 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

Range	Resolution	#	Types of input
Large	Fine	>10	keyboards
Large	Gross	5-10	large keyboard, switch array
Small	Fine	>10	small keyboards, joystick, mouse
Small	Gross	1-2	switches

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?)

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Questions ?