Characteristics Of Electronic Aids To Daily Living

RESNA
Rehabilitation Engineering and Assistive Technology Society of North America

Learning Outcomes

- Recognize the definition of Electronic Aids to Daily Living
- Identify functional applications of specific Electronic Aids to Daily Living
- Distinguish between transmission methods for specific Electronic Aids to Daily Living

What are Electronic Aids to Daily Living?

- EADLs provide independent control of electrical devices within the environment
- EADL Definition: “Any electronic technology used for the specific purpose of providing independent operation of appliances”

  Barker, Lange 2003

What's in a name

- EADLs
- Formerly Environment Control Units (ECUs) or Environmental Control System (ECSs)
- EADLs defines the task rather than what is being controlled
- ECU technically refers to HVAC

EADL Applications

What do EADLs control?

- Audio / visual equipment
- Powered hospital bed controls
- Door openers & Security Cameras
- Telephone
- Lights and Appliances
- Heating and air conditioning

User Interface

How can the client access the EADL?

- Direct Selection to Control Unit
- Switch (Single Switch or Scanning)
- Voice
- Via a computer
- Via a communication device
- Via Smartphone Interface

Who can benefit from EADLs?

- Nearly all ages
  - children need control for play
- Any client who cannot independently control devices in the environment due to physical, cognitive and/or sensory issues

Environments

Where can EADLs be used?

- Home
  - i.e. stereo, bed, HVAC, security cameras
- Work
  - i.e. lights, door
- School
  - i.e. slide projector, automatic fish feeder
- Community
  - i.e. elevators, door openers

Needs Assessment

Consumer

- Goals - short and long term
  - Choosing a system which is expandable
- Control needs - applications
- Physical abilities
  - motor, endurance
- Psycho-social issues
- Cognitive skills
  - memory, sequencing, reading
- Sensory skills
  - vision to see display

Needs Assessment

- Environmental considerations
  - Where will the EADL be used?
    - i.e. home
  - Does the EADL need to be portable?
    - i.e. use from wheelchair and bed
  - Will the client use the EADL in more than one room?
    - i.e. possibly use a transmission method that goes through walls

Classification

- General function EADL
  - Limited output
  - Multiple output
- Specific function EADL

Limited Output EADLs

- Intermittent switch control of battery operated or electrical devices
- Typically single switch access
- Modes of control
  - momentary or direct
  - latched
  - Timed
- Can be used to develop scanning skills

Limited Output EADLs

Switch Latch and Timer

PowerLink 4

Multiple Output EADLs

- Control more than one device
- Multiple Control Interface/Access options

Multiple Output EADLs: User Interface or Access Method

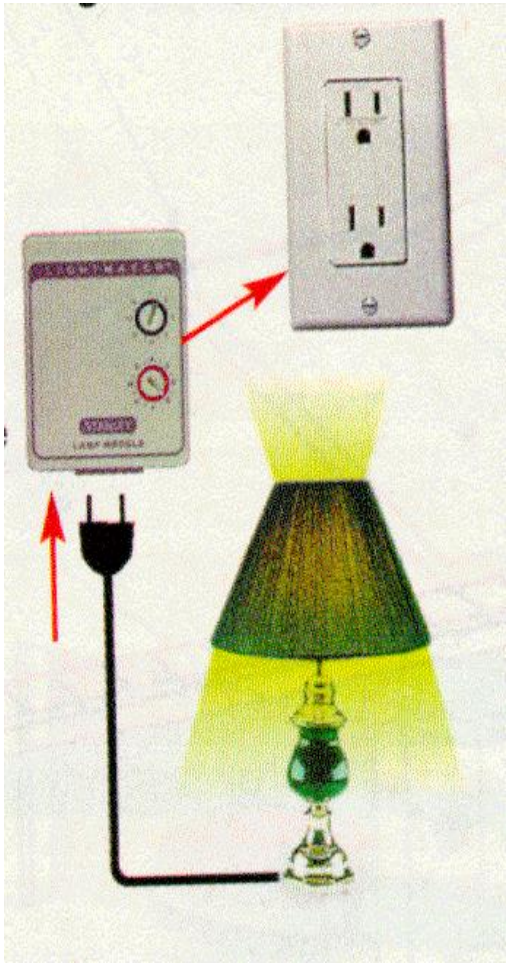
- Keyboard/direct
- Single switch/switch array
- Speech recognition
- Via a computer
- Via a communication device
- Via a power wheelchair
- Via smartphone interface

User Interface/Access Method

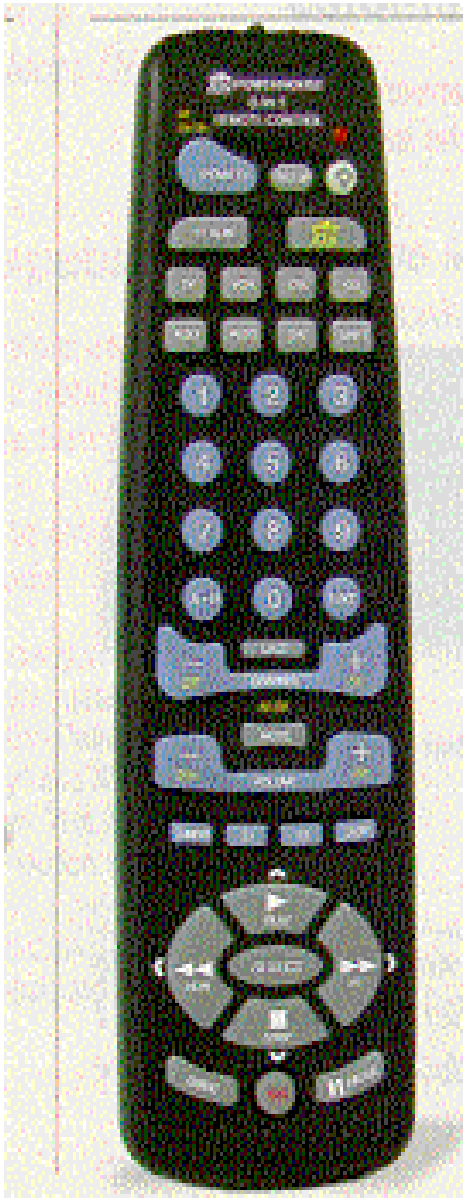
- Keyboard
- Direct

- Note: newer technologies Interface with older X-10 modules.

X-10 mini controller



User Interface/ Access Method: Keyboard/Direct



Universal Remote Control

User Interface or Access Method

- Single switch/ switch array

- Tash – Relax Unit

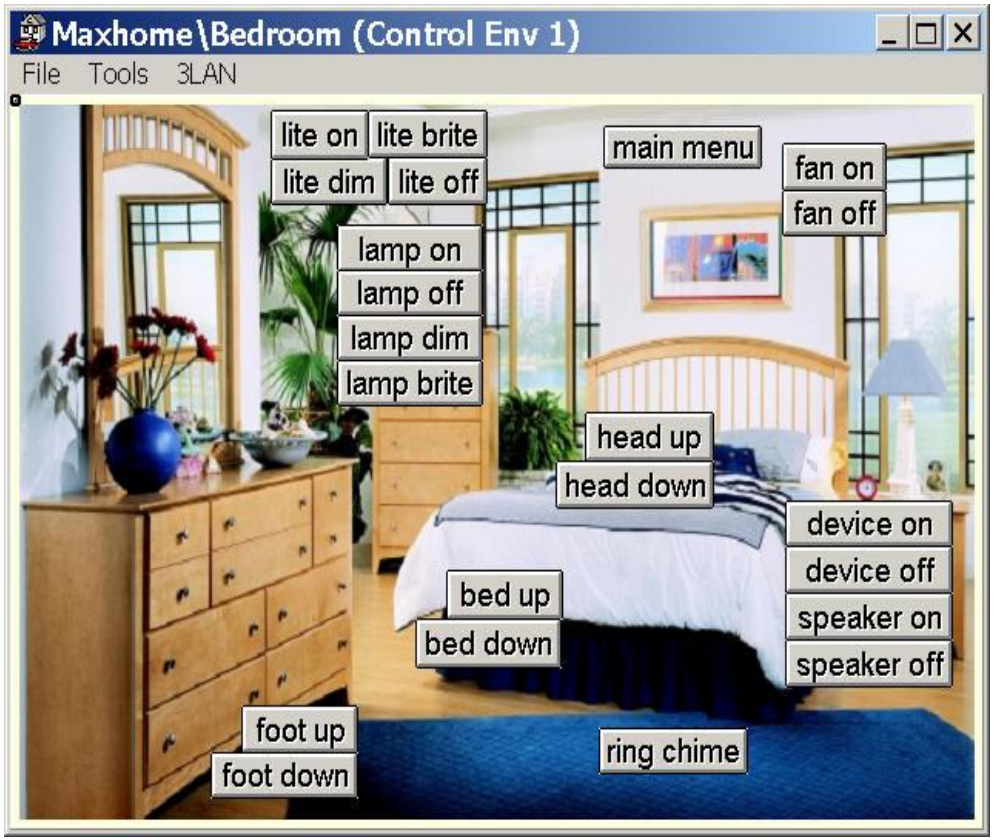
Pilot

User Interface or Access Method

Speech recognition

RESNA
Rehabilitation Engineering and Assistive Technology Society of North America

User Interface or Access Method



Using a computer or smartphone interface

Multimedia Max or current Home Automation Systems

RESNA
Rehabilitation Engineering and Assistive Technology Society of North America

User Interface or Access Method

Through a communication device

Dynavox

Home Automation Resources

Autonome
1-800-933-8400
https:asi-autonome.com

Smarthome
1-800-762-7846
www.smarthome.com

Home Controls Incorporated
1-800-266-8765
www.homecontrols.com

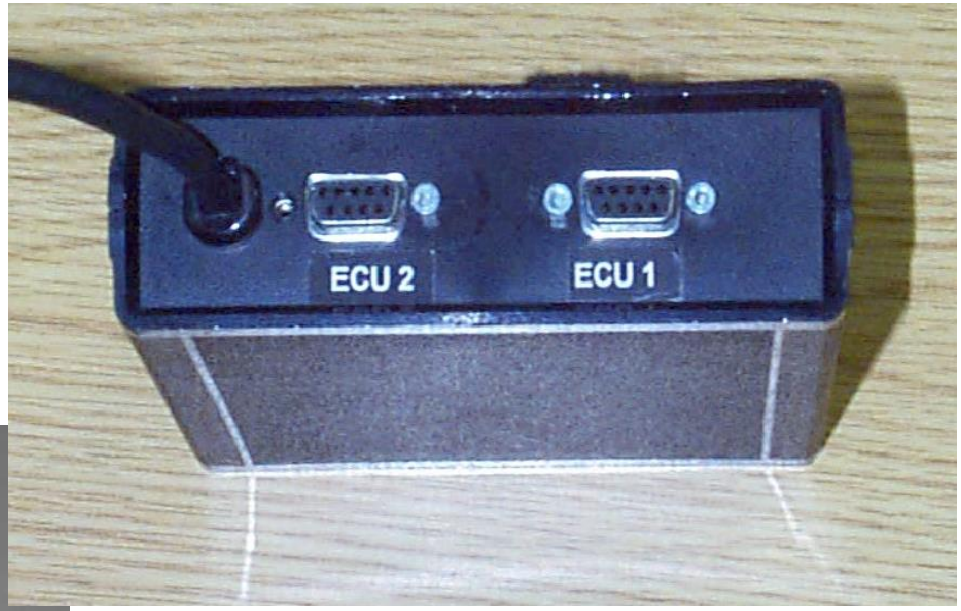
Home Automation Resources

- Amazon Alexa Smart Home
- Google Home
- Apple Home
- Internet of Things (IoT)

Interfacing EADLs to a Power Wheelchair

- Allows client to access the EADL using the driving access method
- Always switch output
- Requires interfacing component and a cable
  - i.e., Invacare AUX1/2 or AUX 3/4
- Some newer power wheelchair electronics send IR signals

Interfacing EADLs to Power Wheelchairs



Invacare COMM 1,2

Specific Function EADLs

- Door openers
- Adaptive phones
- Page Turners

Adaptive Phones

- Infrared
- Switch controlled
- Voice controlled

GEWA Tel200

Door Openers

- Battery back-up is essential in an emergency
- May receive IR or X10 signals

Page Turners

- Tend to be expensive and not work well
- Consider other options
  - Audiobooks/MP3
  - computer

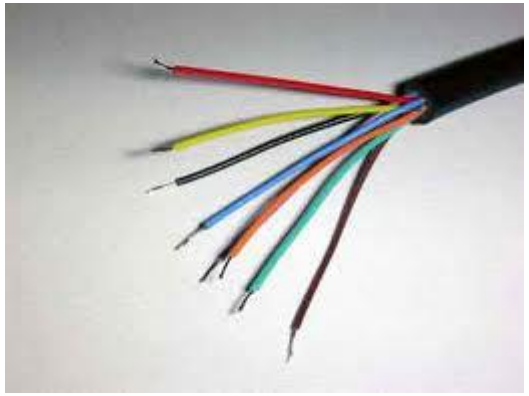
GEWA PAGE TURNER

Modes of Transmission

- Direct connection
- Remote

Direct Connection

- 2-wire cables and multi-wire cables
- House wiring
  - Circuits
  - Breakers and fuses
- Not portable



Remote

- Requires a transmitter and receivers (or transceivers)
- Trainable/programmable remote control
- Usually portable
- Technology
  - Radio frequency (RF)
  - Infrared (IR)
  - Wi-Fi
  - Bluetooth

Module Control

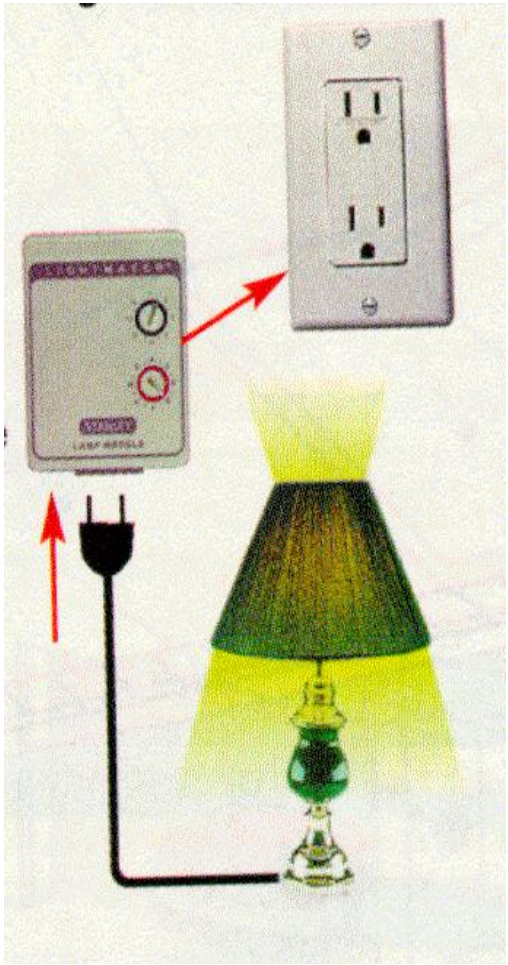
- X10
  - Uses existing house wiring (powerline)
  - Remote uses radio frequency (RF) or IR
  - Can be interfaced with new wireless technologies
- Insteon
  - Powerline and RF
  - More reliable than X10, can control more devices
- Z-wave (Zigbee system)
  - Single band RF wireless network

Module Control

- These technologies can control:
  - Lights
  - Simple appliances (i.e. fan)
  - Specialized Thermostats
  - Window A/C units
  - Electric Hospital beds (with adaptor)
  - Power door openers

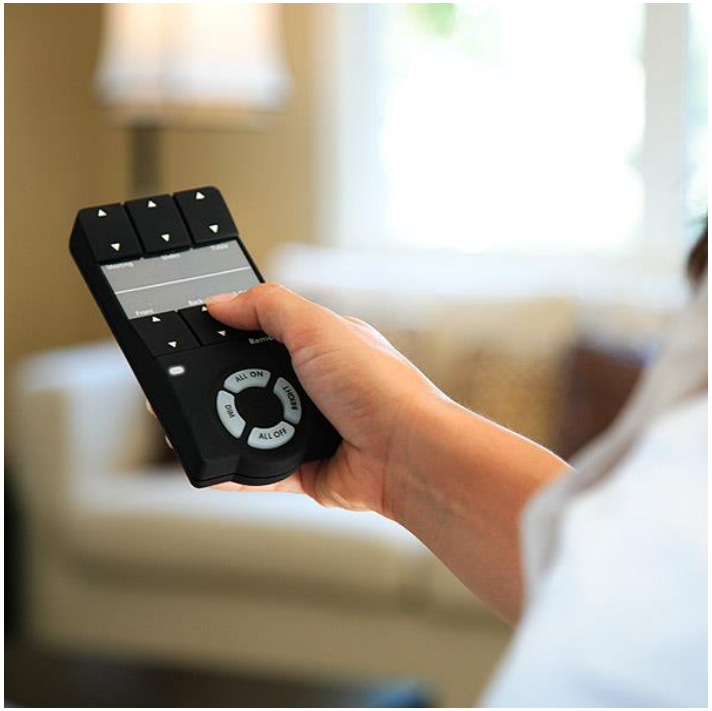
Module Control

- X10:
  - X10 is technology that sends signals over the house wiring to turn on and off simple appliances, such as lights and fans



Module Control

- Insteon Technology
  - Mesh Network
    - Combines house wiring and RF
  - RemoteLinc
  - 6 scenes (macros)
  - 417 devices
  - Requires Access Point



Module Control

- Z-Wave Technology
- Mesh Network
  - House wiring
  - RF
- Vizia RF Z-Wave Programmer
- 256 devices
- Scenes (macros)

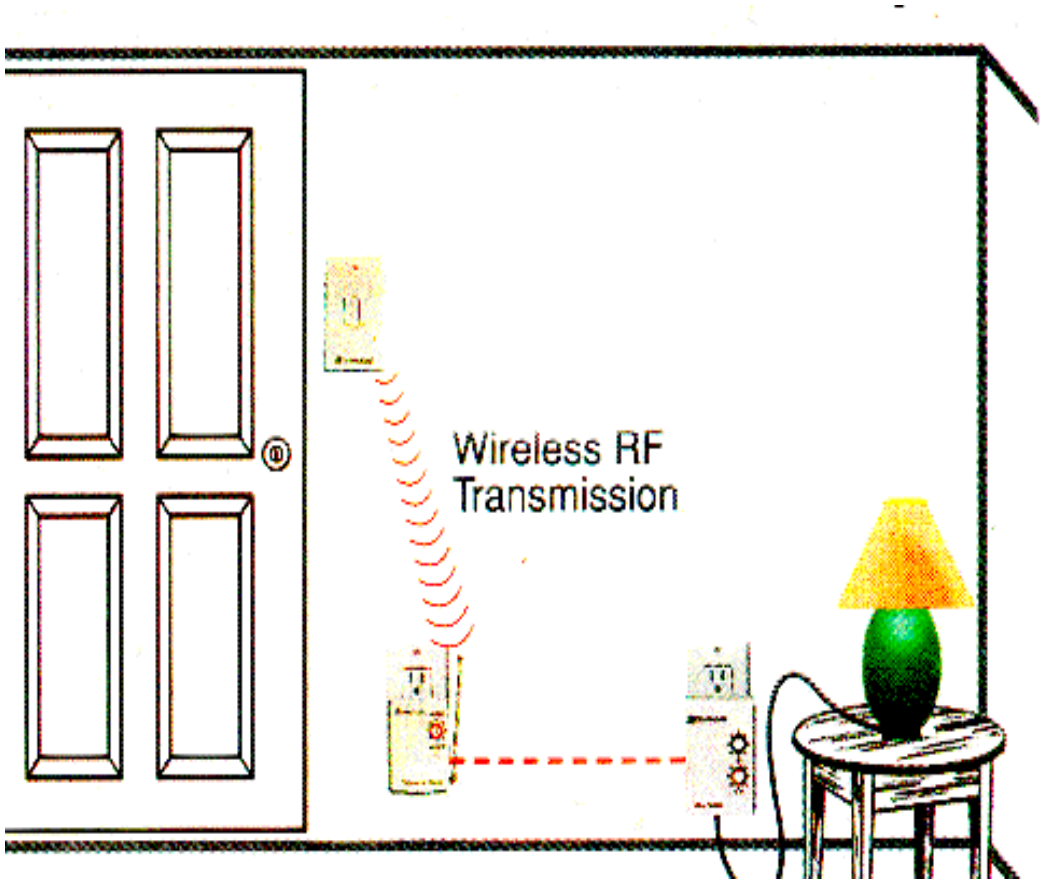
Infrared (IR)

- Line of sight
- Inexpensive
- Readily available
- Can be subject to light interference

Relax

Radiofrequency (RF)

- Goes through walls and ceilings
- Subject to interference
- Good range



The X10 problem…

- X10 stopped making their IR/X10 receiver
- This was the only way to control X10 modules from EADLs and SGDs that only send IR signals
- What to do?
  - Insteon!
  - Zigbee

Insteon Module Control

- www.smarthome.com
- IRLinc Receiver #2411R
  - Receives IR signals and sends to modules
  - Includes remote
- Access Point #2443
  - Order 2, phase couplers that allow devices to talk across circuits

Insteon Module Control

- ApplianceLinc #2456S3
  - Appliance module
- LampLinc #2456D3
  - Lamp module
- Thermostat #2491T1
  - Thermostat control
- Insteon Wall Switch #2477D
  - For ceiling lights

Safety

- User understanding of operation and modes
- Operational limits to prevent injury to user (powered bed controls)
- Equipment power ratings
- Power outlet multiplication
- If client has access to door opener, are they safe outside alone?
- If client has access to phone, will they use this responsibly? (i.e. not call 911 if not required)

Emerging Technologies

EADL Technologies are constantly changing – web searches and YouTube will often find current applications which are available – “youtube, disability, home controls.”

IR Remote Controls

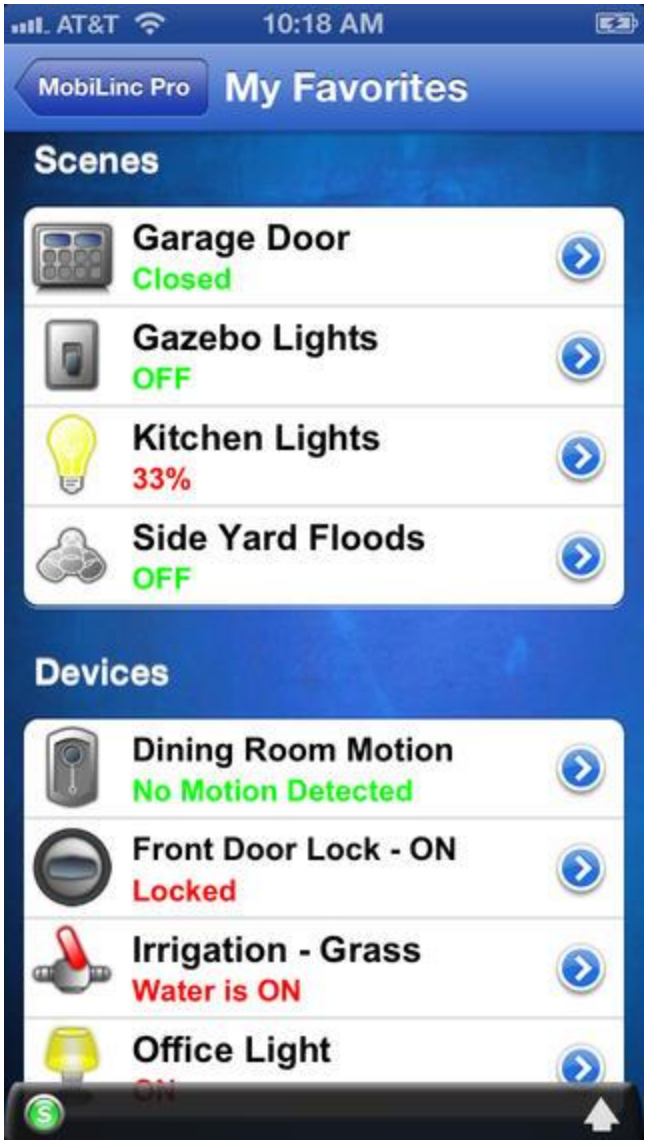
- Tablets and Smartphones
  - Apps are available that can control specific TVs and Cable boxes.
  - An external hardware device is required to send the IR signal (Samsung Android built-in)
    - Plugs into Tablet
    - Hub
  - Much of the Cable Box control is through a wireless network
  - Requires reading, good vision, precise control

IR Remote Controls

RESNA
Rehabilitation Engineering and Assistive Technology Society of North America

Module Control

- Tablets and Smartphones
- More Apps are coming out to control these modular systems
- Work on wireless network



Module Control Apps

- INSTEON Hub
- Netvox Zigbee System
- MobiLinc
- Cortexa
- These require the App, a controller and modules

Servus 10-Z

- Windows 8 Tablet PC
- Uses The Grid 2 software
- Can be controlled by touch, switches, voice or USB input device
- Both IR and RF
- $2680
- Zygo

HouseMate

HouseMate ECU for Android

- Available from Broadened Horizons
- 1-2 switch access
- IR learning
- Customize templates
- Hardware is BT switch interface and learning IR Controller
- $1500
- http://housemate.ie

ClickToPhone

HouseMate ClickToPhone for Android

- SmartPhones
- Built-in scanning
- Available from Broadened Horizons
- $999

Review Questions (feel free to discuss with your neighbors)

1. Assistive technologies that control devices within the environment are defined as:
    a. Environmental Control Units (ECUs)
    b. Environmental Control Systems (ECSs)
    c. Environmental Aids to Daily Living (EADLs)
    d. Electronic Aids to Daily Living (EADLs)

2. Using Limited Output EADLs to control a switch toy provides intermittent switch control which can be used to develop what skills?
    a. Mobility concepts
    b. Cause and effect concepts
    c. Scanning concepts
    d. Motor skills

3. Which technology uses house wiring for transmission?
    a. X10
    b. Bluetooth
    c. Radio frequency
    d. IR

Review Questions (Here are the answers. How did you do?)

1. Assistive technologies that control devices within the environment are defined as:
    a. Environmental Control Units (ECUs)
    b. Environmental Control Systems (ECSs)
    c. Environmental Aids to Daily Living (EADLs)
    d. Electronic Aids to Daily Living (EADLs)

2. Using Limited Output EADLs to control a switch toy provides intermittent switch control which can be used to develop what skills?
    a. Mobility concepts
    b. Cause and effect concepts
    c. Scanning concepts
    d. Motor skills

3. Which technology uses house wiring for transmission?
    a. X10
    b. Bluetooth
    c. Radio frequency
    d. IR

Questions?