

EADLS: ELECTRONIC AIDS FOR DAILY LIVING

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Learning Objectives

- Understand how a home Wi-Fi network along with other wireless computing technologies allows control of home devices and appliances
- The three transmission technologies and which works best for a type of device
- Have the courage to explore apps and hardware for iOS & Android devices for increased control of home devices
- Other types of AT devices that can send IR, RF and house wiring signals to enable control of the environment
- Locate online resources that will enable you to learn more

Why did I think this might be important?

- You are here because you are highly motivated to have a life with the best “quality of life” possible
- You like “being in control” and for you that means you most likely believe:
 - Knowledge is power
 - There must be another way
 - Maybe this wheel has already been invented
- I work with individuals who have spinal cord injuries and my goal has been to give them back some control over their daily lives and their environment
- I think you may have some issues in common

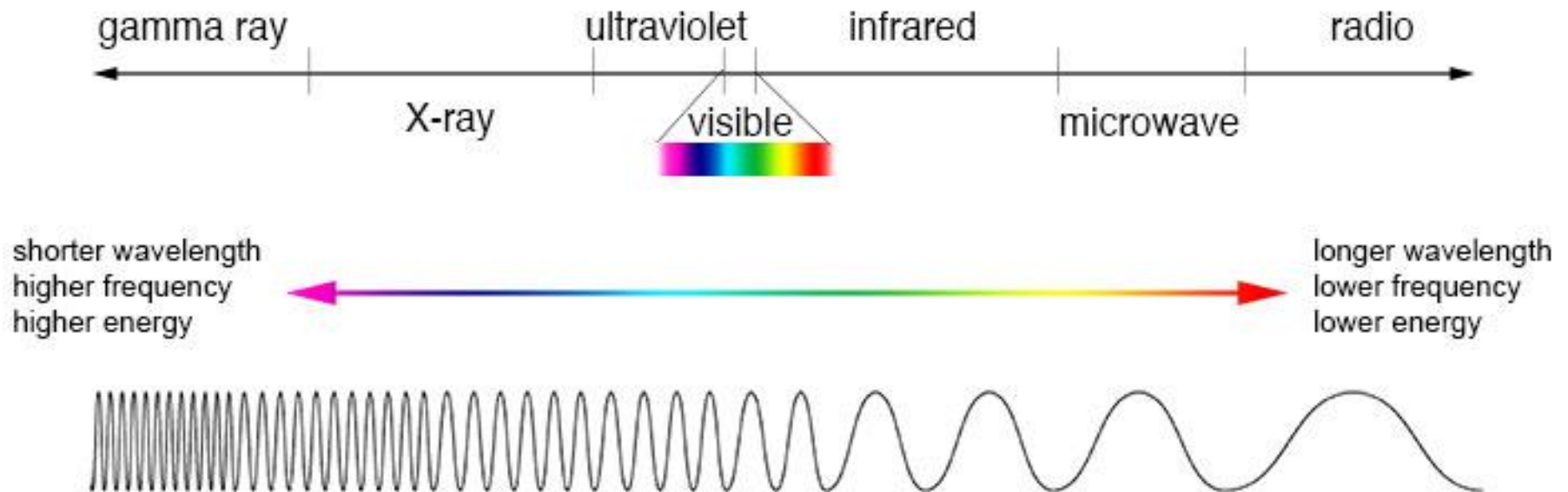
The back story

- In the past... EADLs have been very expensive
 - \$10,000 for some devices
 - Required technical skill and extensive time for set up
- Now we have home Wi-Fi, tablets, smart phones and plug and play devices
 - Costs are lower because they were created for home automation
 - Expertise can be you local “technology geek” or even your grandkids
- It is now common for new power wheelchairs to be capable of sending IR or Bluetooth signals which will allow control of computers, smart phones and tablets
- Be prepared... even more innovations are coming

Let's get some terminology

- Whether you call it:
 - Home Automation
 - Electronic Aids to Daily Living
 - Environmental Control
- The goal is to have an alternative way to control things in your everyday environment
- Society and technology progress are cooperating!
- We now have technologies and concepts like ...
 - GPS, Wi-Fi, plug n' play, streaming video, etc.

Transmission Modes



This is the electromagnetic energy spectrum. Electromagnetic energy travels in wave-like forms i.e., high frequency to low frequency with varying performance characteristics.

EADLs use various “Transmission Modes:” Electromagnetic (EM) Radiation

- The FCC designates which part of the EM spectrum will be used for specific types of communication
- We use only a small part of the spectrum when we try to control home electronics:
 - InfraRed or IR – TV remote, boom box, DVD player, etc.
 - Radio Frequency – garage door opener
 - House wiring – the electrical supply for a home or apartment, electrons are moved through the house wiring
 - WiFi – a longer range wireless signal
 - Bluetooth – short range (30 ft.) wireless signal
 - Zigbee – a short range, (33 ft.) wireless signal

Match the control with the device

- Example: Controlling a TV
- The EADL device will need to send IR
- What are the most important features to control?
 - Just On/Off and 3 channels?
 - Or... All possible TV channels, plus volume up/down and mute?
 - Want to scroll through channels or input the numbers?
- The more options to be controlled; the more complex the device and the user interface need to be
- Another Example: Opening a garage door

The “Infrastructure” is now ready!

- Different from 10 years ago, home automation is now a “mass market” product for consumers
- The technologies are currently available and new ones arrive every day
- Products exist to manage
 - Lights on, off and dimmed – both plug in and house wiring
 - Thermostats
 - Entertainment devices
 - Security cameras
 - Irrigation
 - Control through small hand held devices or through computers, smart phones and tablets... Next? Smart wrist watches?

Lets see an example



A battery powered 360 degree infrared (IR) sender that communicates with a iPhone, Android or iPad app by Bluetooth using a free app for developing screens to interact with your specific TV, speakers, DVD, or music player

http://www.youtube.com/watch?v=Zwi1NkmP_6

Here is how you get started...

- What do you want to control & what is the current user interface?
- Why is control not possible?
- Observe and think about why:
 - Motor control?
 - Sensory?
 - Cognitive?
 - Or is it a combo?
- Given current skills and abilities, is the best solution a compensation or finding another way to do it?
- Begin a “needs list” and start to check out options!



What do you want to control?

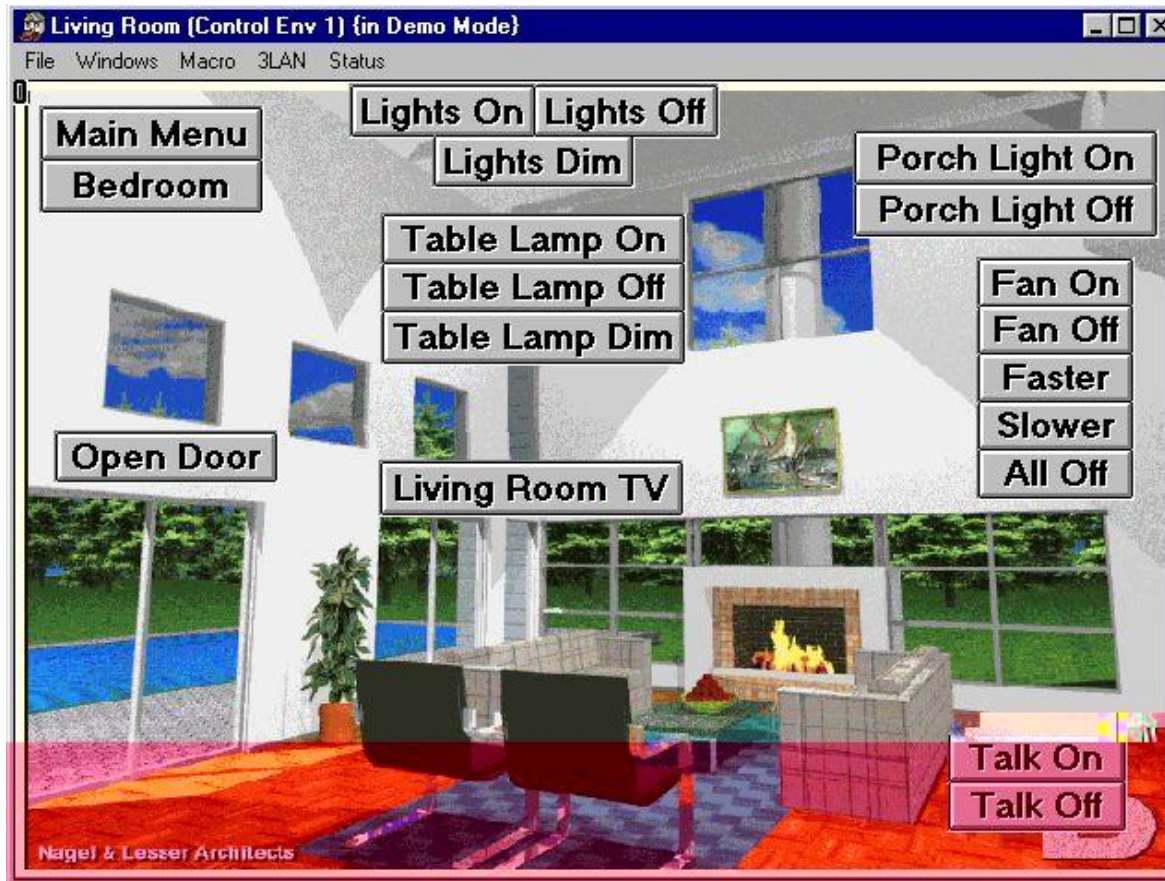
- Something with a simple ON/OFF
 - Light
 - Fan
- Something with multiple or variable features
 - Volume
 - Channels
 - Tracks

Something that uses a combination of functions

- Satellite dishes
- Downloaded Internet videos

Client Needs Evaluation

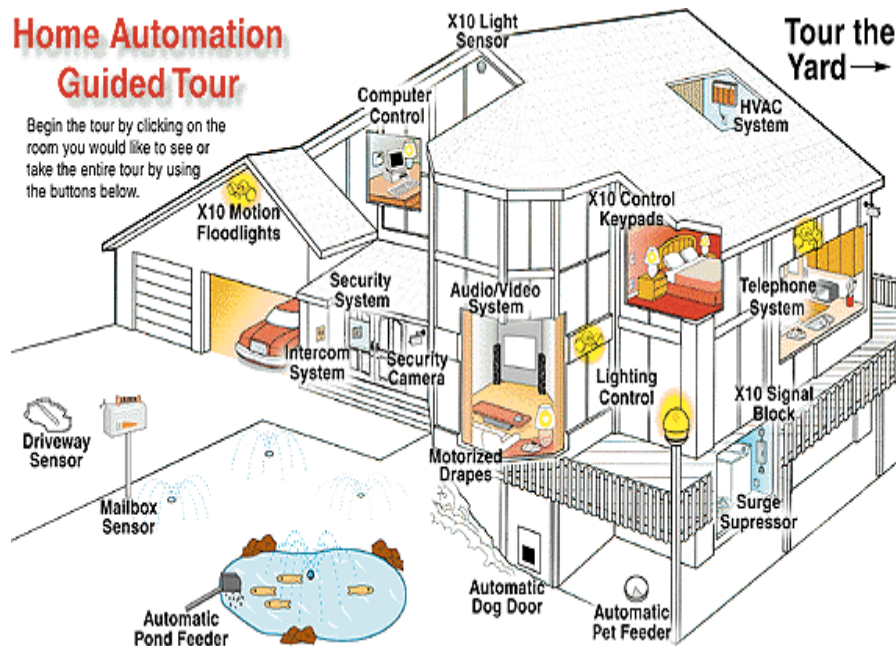
- What do you want to control?



Once you have some ideas about this.... You are ready for the next step!

Client Needs Evaluation

- Think about your daily environments



- Locations of user?
- Are you mobile?
- Locations of devices?
- Mounting/positioning equipment
- Do you have technical supports?
- What's your budget

Hierarchy of Access

- The objective? Use the least amount of technology necessary to do the job!
- First, look at task ergonomics:
- Then seating, positioning, and mounting
- Consider “universal design” or device accessibility options
- Use “performance enhancers” i.e., a stylus, a mouthstick, a splint or rubber “bumper”
- Use general purpose hardware or software: like iPhone and iPad apps and a “transmission technology”
- Special or “adaptive” hardware, software or devices (we will talk about some of these)

An example: “User Interface”

- Standard Controls: Think of a TV remote control or the dials, push buttons, and tuners on a stereo receiver
- If someone can manage these; no help is needed
- If they cannot, what is needed to make control possible?
 - Larger targets?
 - Smaller range of motion?
 - Better positioning to enable use of available motor skills?
 - More friction? More resistance to involuntary movement?
 - More contrast? More light?
 - A smaller set of choices or options for control or for simplicity?

Larger targets?



Better positioning?



Or more perhaps a more realistic solution: use Velcro® to attach typical TV and appliance remote controls to a “just the right size” pillow!

A Remote Control Pillow

A mounting arm?



An n-clamp for Phone

21st Century Scientific



A better way to accurately select

- Capacitive Touch Stylus



Replicates the small electrical field that is created by the touch of a finger tip on a capacitive touch screen

An Adaptive “User Interface” or the *Assistive Technology*

- A progression of “alternate” controls by Hierarchy of Access
 - Optimal positioning of the control device
 - An easel
 - A mounting arm
 - Attach a typical device remote to a pillow with Velcro®
 - A larger keypad – Large button remote
 - An existing device – AAC device or power wheelchair
 - Smartphone or tablet
 - A hand sock
 - Stylus
 - Modified stylus
 - Mouthstick
 - A dedicated device – Imperium
 - A “scanning” interface – Mini Relax

Match the user interface with user's ability

- Example: Controlling a TV
- Options:
 - Placing a typical remote on an easel or AbleNet arm?
 - A large button universal remote?
 - An iPad with a Gear 4 Unity remote
 - A Relax or Mini Relax from AbleNet

More fine motor skill required, but can use adaptive stylus & positioning

Only gross motor skill required



Lets talk about some products... and why I like them!

- X-10 and Insteon lamp and appliance modules
- AbleNet Power Link4 with Jelly Beamer Switches
- AbleNet Mini Relax and Relax
- Gear4 Unity Remote paired with iPad or iPhone
- Belkin WeMo
- Capacitive Touch Stylus options

Transmission Technology: X-10



- X-10
 - Uses the current in the AC house wiring to send a coded signal to a module
 - Developed as a mass market so its low cost
 - Many controller options
 - Many module types

X-10 & Insteon Modules

- The signal pathway is the house wiring
- Can be slow, found to be less reliable as expectations for electronics increased; now being replaced with more robust signaling



Purchase at
Smarthome.com
and x10.com

Transmission Technology: Infra-Red

- Commonly used for entertainment appliances
 - Controller has code for many functions
 - Direct interface to commercial devices
- Line-of-sight
- Trainable
- Many signals available



Teachable Infrared (IR)

- Most older universal remotes
- Alternative Augmentative Communication Devices
- Power wheelchairs
 - You will need the original remote control
 - Put the EADL device in “learn mode”
 - Follow instructions to teach the IR code for each function
- Less common devices to be controlled with Unity Remote
- Not necessary with newer appliances as you can get access to a database of IR Codes, e.g., a Panasonic TV w. DVD

AbleNet Relax and Mini Relax

- Scanning interface
- Mini-Relax: Simple for control of one technology
- Relax: Complex for control of several
- Need the skills for scanning and literacy
 - Sequence or read options
 - Timing for switch hit
 - Adjustable scan rate
 - No auditory feedback only LED



Gear4 Unity Remote paired with iPad or iPhone or Android

- Multiple options for set up from simple to complex
- Enables control of two part sequences
- Has a database of common appliances
- Can learn novel IR code
- Cost about \$70.00
 - Free app



Gear4 Unity Remote paired with iPad or iPhone or Android

- The Unity remote sends IR signal in 360 degrees
- Set up is easy
- Communicates with iPhone/iPad and Android via bluetooth
- About \$80.00



Belkin WeMo

- Each WeMo has its own IP or Internet address
- Can be integrated into a home Wi-Fi network
- Plug in a device and control it remotely with an app
 - Coffee pot
 - Curling Iron
 - Fan
 - Lamp
 - Humidifier
 - Space heater
- About \$50.00



Capacitive Touch Stylus options



- Enables or improves fine motor control
- Improves accuracy



Mounting Wi-Fi Devices

- **Loc-Line Modular Hose**
- Commonly used in manufacturing processes
- AT kits
- Very inexpensive placement of AT device



Mounting W-Fi Devices

21st Century Scientific



An n-clamp for Phone



Mounting Wi-Fi Devices

- **iPhone and iPad mounts** by Stealth Products
- Highly adjustable but static device mounts
- <http://www.stealthproducts.com/>



Mounting Wi-Fi Devices

- **Mount 'n Mover** by Blue Sky Designs
- User controlled placement of AT device
- <http://www.mountnmover.com/>
- <http://www.youtube.com/watch?v=ZZiPj9LhNz4>



Wheelchair Control of EADLs

- Currently possible with Quantum, Permobil, and Invacare power wheelchairs
- For extra cost or with an upgraded controller:
- The joystick is capable of sending IR signals for control of IR-controlled devices like TV, DVD & music
- The joystick on all new Quantum power wheelchairs with Q-Logic2 controllers can send Bluetooth for mouse control on a computer or to select language on an AAC device
- The consumer uses the same user-interface technology that they use for driving (joystick, head array, or sip 'n puff)

Bed Control

- No bed manufacturer makes it easy!
- Each bed/company requires its own solutions: Hill-Rom (AbleNet) or Invacare Adaptive Switch Laboratory (ASL)
 - Modify the circuits that are behind each function in a typical bed control touch pad, e.g., head up, head down, foot up, foot down.
 - Solder a connection to an IR receiver into the circuit for each bed function
 - Place the IR receiver in line of sight and use a device that can send an IR signal.
- Cost for EADL purchase = about \$1000 to \$1500

Paying for EADLs

- Cost versus Funding
- Home automation is very exciting...
 - The cost is way down & availability up
 - More usable devices, easier to install and set up; easier to use
- Funding Sources
 - Health insurance - rarely
 - Auto insurance
 - Worker's compensation
 - Medicaid waivers
 - Benevolent organizations
 - Vocational Rehabilitation



Remember to Think about Safety



- Electrical
 - Isolate the user from electrical circuits
 - What *not* to connect to an EADL
 - Be respectful of house wiring and circuit loads
 - Avoid power strip multiplication
 - Pay attention to device power ratings
- Security or emergency back up system
 - If safety depends on EADLs, be sure to use an Uninterruptible Power Supply (UPS)

Resources

- SmartHome
 - <http://www.smarthome.com/>
 - Learning Center: <http://www.smarthome.com/learningcenter.html>
- X-10.com – if you are not yet a Wi-Fi home
 - <http://www.x10.com/>
- Michelle Lange, OTR at Access to Independence has created an EADL comparison grid
 - <http://www.atilange.com>
 - [http://www.atilange.com/ESW/Files/BASIC ELECTRONIC AIDS TO DAILY LIVING.pdf](http://www.atilange.com/ESW/Files/BASIC_ELECTRONIC_AIDS_TO_DAILY_LIVING.pdf)
- For more: search Google: using “Electronic Aids to Daily Living” and/or “Environmental Control Units”

Review of the Learning Objectives

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Questions?

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