6.811 / PPAT: Principles and Practice of Assistive Technology

Today: Course Overview and Structure; Assistive Technology Terminology

Wednesday, 4 Sept. 2013
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Today

- Staff introductions
- Definition of AT
- Class structure and goals
- Textbook
- Partner organizations
- Term structure and key dates
- Grading
- Resources
- Terminology and language
- Lab (*today* at 4pm in 32-044)

Staff

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What is Assistive Technology?

- A device, service or process that eases or facilitates *performance* of some daily living task and/or *participation* in some activity in some environmental/social context
- Assistive technology is a broad and necessarily interdisciplinary field, involving mechanical design, materials, electronics, software, cognitive science …

Goals

- Broad introduction to assistive technology
  - Terminology, models, approaches, characteristics
  - Experience with existing commercial AT devices
- Term-long small-team project with a "client"
  - Team works with a person living with a disability
  - Practitioners (clinicians, therapists, technicians)
  - Practice contextual inquiry, systems thinking, spiral design and implementation, evaluation
  - Feedback from staff/practitioner panels
- Explore opportunities beyond end of term
  - MIT AT group; MIT IDEAS Challenge; MIT100K

Structure: Three Components

- Lectures
  - Broad overview of AT as a discipline
  - Guest lectures from ATPs, PWDs, researchers
- Labs
  - Using, evaluating various assistive technologies
- Project
  - Intensive AT design experience with a client
  - In-lab design sessions; feedback from staff

In Scope: Functional Deficits

- Human performance and participation!
- Mobility impairment
- Motor impairment (manipulation)
- Communication impairment
- Sensory impairment
- Cognitive impairment

Client Description

[Image processing, app development, user interface]

Sunish is blind. He has some perception of light and dark, and can distinguish between light and dark colors, but cannot distinguish among similar shapes or similar colors. He desires a smartphone application (to run on any platform), that can verbally report the color and pattern of an article of clothing at the touch of a button. It should work in ambient light (in daylight or artificial light), or supply its own light. He would also like the ability to name an article of clothing, e.g., ``This is my blue work shirt,'' and have the device generate that name the next time it is asked to ``describe'' the article.

Client Description

[App development, user interface]

Samantha has a brain injury, causing deficits in short-term and working memory. She finds existing reminder devices ``too simplistic,'' and past experience with multiple devices ``overwhelming.'' She desires easy creation of ``multiple, recurring'' reminders that ``do not interfere with one another.'' She wishes to have reminders announce themselves in her own voice rather than as ``meaningless tones.'' She desires easy creation of recurring reminders such as ``take vitamins'' (daily) or ``drink water'' (several times per day), as well as creation of one-time reminders such as ``car is parked on Level 3'' or ``attend class today at 1pm.'' Integration with her calendar program would be desirable.

Client Description

[Mechanical engineering, usability]

Derek has muscle weakness and partial paralysis in his arms and hands. He wishes to eat soup more independently. He desires a utensil that is comfortable to grip and that will not spill when used to convey food from his plate or bowl to his mouth.

Client Description

[Electronics, machine vision, software]

Brian is blind. He wishes to ride a bicycle safely within a suitable environment, for example around an outdoor high-school track near his workplace. The track has a rubberized surface and clear white stripes.

Partner Organizations

- MIT IS&T AT Information Center (ATIC)
- MIT Public Service Center
- MIT Hobby Shop
- The Boston Home (Dorchester)
- The Carroll Center for the Blind (Newton)
- Leonard Florence Center for Living (Chelsea)
- Braintree Rehabilitation Hospital

What to Expect

- Intensive work with your teammates
- Regular contact with your client
  - At times involving travel off campus
  - Certainly outside of scheduled lab times
- Weekly evaluation and feedback from staff
- Consultations with clinicians, practitioners
- Formal presentation opportunities (panels)
- Also: ethics, human subject experiments

Term Structure, Milestones

- Week 1: Introduction and overview
- Week 2: Human subject protection
- Week 3: Team formation & client matching
- Week 4: Contextual inquiry
- Week 5: Brainstorming, V1 prototyping
- Week 6: Evaluation metrics
- Week 7: Continued work with clients
- Week 8: Mid-semester panels

Term Structure, Key Dates (cont.)

- Week 9: User testing
- Week 10: V2 development
- Week 11: User testing
- Week 12: V3 development
- Week 13: User testing
- Week 14: End-of-term Panels
- Week 15: Submit "make" post, final report

Grading

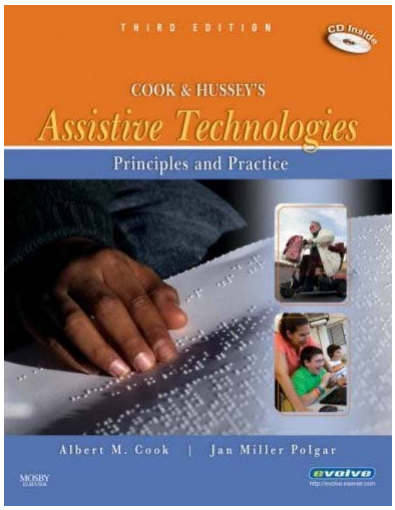
- Individual assignments (20%)
- Writeup of initial findings (10%)
- Weekly project deliverables (35%)
- Week 8 & 14 panel presentations (20%)
- Make post, final report (15%)
- Class participation (qualitative)
- No exams, midterm or final

Administrative Notes

- PPAT satisfies:
  - In EECS: elective in HCI concentration (not AUS)
  - In MechE: Concentration subject in CIR track
  - In Aero/Astro: Elective PAS credit by petition

Textbook

- Albert M. Cook and Jan Miller Polgar, Cook & Hussey's Assistive Technologies: Principles and Practice (Third Ed.)
- ~$80 at the Coop
- Reserve copies available at Barker



Resources

- Web site (with resource links), textbook
- Course staff
  - Help facilitate client contact
  - Help scoping your team project
  - Provide regular feedback on progress, direction
- Partner organizations
  - Source of clients, clinicians and practitioners
- Rapid prototyping facilities (e.g. hobby shop)
  - Wood shop, metal shop, waterjet, laserjet
  - Safety training, additional design guidance
  - Your own initiative (Edgerton, MITERS, etc.)
  - We'll cover associated fees, material costs

Terminology and Language

- Definition of AT: "The broad range of devices, services, strategies, and practices that are conceived and applied to ameliorate the problems faced by individuals who have disabilities."
- Note: AT is about more than devices; key focus is application of knowledge for problem-solving
- Note: as a discipline, AT practitioners and providers [ATPs] focus on *addressing functional deficits* in some *task context*

Rehabilitative vs. Assistive

- Rehabilitative technology
  - Focus on regaining function or capability after injury or illness; used for remediation of loss of function, rather than being part of person's daily activities. Could include educational technology (e.g. cognitive retraining software). Intended for transient use.
- Assistive technology
  - Client comes as s/he is, with existing capabilities and limitations. ATPs work with client to define a device or system that addresses the client's needs and wishes. Intended for life-long use.
    Main focus of this class.

People-First Language

- Deprecated terms (no longer in common use): retarded, epileptic, crippled, quadriplegic etc.
- Disability no longer the sole adjective that defines the person; it is something that a person is living with, just as he or she has other characteristics
- Focus on the person (and the function to be augmented or provided), not on the disability
- Thus: person with developmental disability, person with epilepsy, person who uses a wheelchair
- But: choice of language is complex and can often be contentious. Subject of today's Lab.

Activity and Participation

- Activity: "execution of tasks" [ICF]
- Participation: "involvement in life situations"
- Concepts are not entirely distinct
- Example components of activity and participation: "learning, applying knowledge, communication, mobility, self-care, community, social and civic life;" access to public, private, built and natural spaces; access to people and animals that provide support. [Is anything major missing?]

ICF = *WHO International Classification of Functioning, Disability and Health*

Hard and Soft Technologies

- Hard technologies
  - Tangible
  - Assembled from readily available components
  - Mouth sticks, computers, software, …
- Soft technologies
  - Decision making, strategies, training, service delivery
  - People, written or on-line documentation & processes
  - Dependent on human knowledge; harder to obtain
- Both are integral to AT systems

Appliances and Tools

- Appliance: "provides benefits to the individual independent of the individual's skill level"
  - E.g. glasses, splints, seating system
- Tool: "requires development of skill for use"
  - E.g. mouth stick, speech interface, power chair
  - Require training, strategies, skills (soft techs!)
  - PWD may be only one in env't using the tool
- Design may render tools (e.g. complex, multi-part environmental control systems*) as appliances

*Also called EADLs (electronic aids for daily living)

Orthotics and Prosthetics

- Orthotic devices (or orthoses): devices that assist or augment function
- Prosthetic devices (or prosthetics): devices that provide a functional replacement

Other AT Terminology

- Minimal vs. maximal technology
- General vs. specific technology
- Commercial vs. custom technology
- See C&H Chapter 1 for definitions and discussion

Coming Up

- *Come to lab this afternoon*! 4pm in 32-044.
  - People-first language; talking with and about PWD
- Monday lecture:
  - Assistive technology system models
  - Read Chapter 1 of Cook & Hussey
- Next Monday's lab: wheelchair mobility
  - Meet in [location TBD] at [time TBD]
  - Wear comfortable clothes
- Next Wednesday's lecture
  - The Human User