Virtual Reality: 
Home Health & Imagination

The Living Environments Laboratory
at
the Wisconsin Institutes for Discovery

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University of Wisconsin-Madison
The Living Environments Laboratory

• LEL – Motivation
• LEL – Vision and Reality
• LEL – Research & future directions
25 years of Health @ Home

• ComputerLink (1988~1995)

• HeartCare (1997-2005)

• Project HealthDesign 2006-Present
Rethinking the Power and Potential of Personal Health Records
Health @ HOME
What we learned from Clarence

1. Homes are messy, crowded, personal spaces

2. Effective self-management requires that people remember a lot, often!

3. Familiar thing, like cell phones and bar coding, can help a lot

4. Homes aren’t built for health care, and technologies aren’t built for homes

5. Designers need to better understand the context of care
How can we inspire designers?

- Replication to scale of familiar, built environments
- Natural interaction with objects
- Ability to study actions in context
- Minimal latency, maximum mapping
- Ability to engage two or more people in the scenario
Twin institutes under one roof on the UW-Madison campus
Imagine recreating every household in the world!
LEL – Vision & Reality
Virtual Reality

Computer-simulated environments that use visual images to create a sense of *presence* through a head-mounted display or *immersion* in a special room, called a CAVE.
Creating the VR environment at the WID Living Environments Laboratory
Digital Projection
Titan 1080p 3D

- total of 1920 x 1920 pixels
- max brightness 4,500 lumens per projector
Kitchen Scenario
SCENARIO 2: HEATLH IN THE BATHROOM!
Chart House

(Catherine Arnott Smith- Library Science)

What pieces of the personal health record (PHR) can be set free for optimal use in the home environment?

– Medication list
– Alerts
– Symptom trackerS

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Effective Replays and Summarization of Virtual Experiences

Kevin Ponto, Joe Kohlmann, Michael Gleicher
University of Wisconsin–Madison
Physical Interactions with Virtual Objects

Robert G. Radwin, PhD
Kevin Ponto, PhD
Karen Chen, MS
Ryan Kimmel, MS
Aaron Bartholomew, BS
Overview

• Purpose: To learn how people perceive & interact with real and virtual objects represented in a CAVE
• Measure how people move & locate objects in a CAVE
• Use results to improve future simulations
Materials & Procedures

- **Independent variables:**
  - 3 real boxes varying in size
  - 3 virtual boxes identical to real boxes

- **Covariates:**
  - Stature and standing eye height
  - Interocular distance

- **Dependent Variables:**
  - wand and head tracker coordinates over time, box corner coordinates
  - Calculate distance from wand to box corners

![Participant pointing to a real box corner.](image1)
![Researcher changing box for a new trial.](image2)
![Participant pointing to a virtual box corner.](image3)
Results

Participants located virtual box corners with more error

Average distance from wand to target box corner. (±1SD)
Virtual Exertions: a user interface combining visual information, kinesthetics and biofeedback for virtual object manipulation

- Major Contribution: Methods to interact with virtual objects using EMG signals
  - Virtual objects are assigned a minimum level of exertion for interaction
  - Users have the ability to acquire objects from a distance by tensing their muscles
By using kinesthetic information and biofeedback, users have the ability to grab, lift, move and drop objects.
Collaborations with Artists
LEL – Research & Future Directions
The Living Environments Laboratory is both a place and a concept!
Program of Research

• Every-day Environments
• High dimensional data
• Visualization
Imagining the future of Health@Home

Creating effective Visualizations

Education and Outreach
Imagining the future of Health@Home
On the Horizon:

Cultivating Imagination in VE
it’s hard to be healthy *every* day!

Lots to remember
Constant vigilance
Remind, replace, deprive!

IT developed on this model focuses on the bad behavior, not the health outcome
Imagination

The ability to envision what one has never been seen, experienced or heard about
Just maybe...

if we develop the *skill of imagination*
within our patients
we will equip them not only to

**manage** anticipated situations
but also

**handle** those situations never envisioned!
Imagination is *important* and in a CAVE we can create imagination-stimulating experiences.

**Potential Benefits!**

- Creating solutions on the fly that have never been thought of
- Treating the human response not with prescription but with production!
Cultivating Imagination
UW-Madison - RISD - Brown - UTSAHSC

- Create experiences that stimulate imagination
  - Computer Visualization and gesture interface
    - Ponto, Dobson

- Devise Measurement Strategies
  - Human Performance
    - Radwin
  - Neuroscience
    - Davidson

- Develop & Evaluate Intervention
  - Brennan, Ahern

- Translate to Clinical Practice
  - Jaen
On the Horizon:
AWARE Houses and SMART Homes
RATHER THAN THINKING OF THE HOUSE AS A PLACE FOR HEALTH, IT'S TIME TO THINK ABOUT THE HOME AS A TOOL FOR HEALTH
Outreach and Education
WID Saturday of Science

- Open house for the general public
- 60-75 people per visit; over 1000 people since May
- Challenges & Delights
- Wisconsin Idea
  - the borders of the University are the borders of the State
Science for the Public
Academic Courses

- CS 653 Programming for 3d Environments
- BME 691 Design Practicum
- English 550 Smart Media and Critical Information Design
Collaborations with Industry and R & D

- Design firms
- Construction
- Weather forecasting
- On the horizon
  - Energy
  - Advanced manufacturing
  - Surgical training
Join us while we work!

SIGN-UP SHEET

Are you interested in helping us understand virtual reality?

Please leave your contact information below. Thank you!!

- the Living Environments Lab

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• Open House
  – First Saturday of the month, 12-1PM

• Brown Bag
  – 2nd Wednesday
    12-1PM

• Researcher’s Open
  Third Monday, 11-12