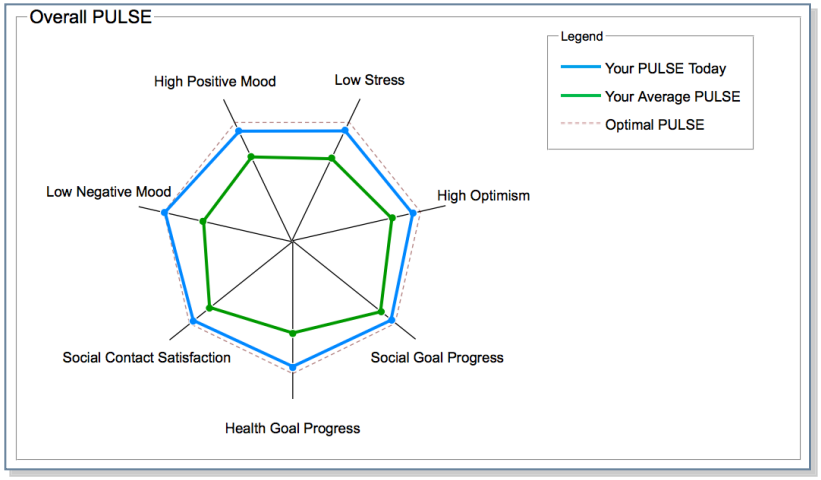
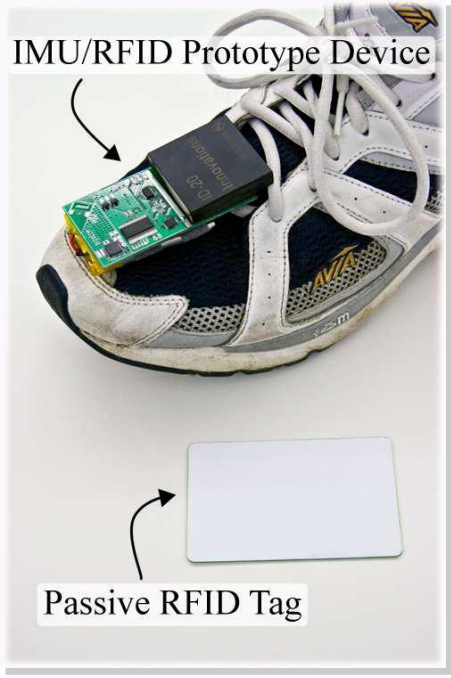
IGERT in Healthy Aging Gerontechnology Core Research

Ronald A. Metoyer
Associate Professor
School of Electrical Engineering and Computer Science





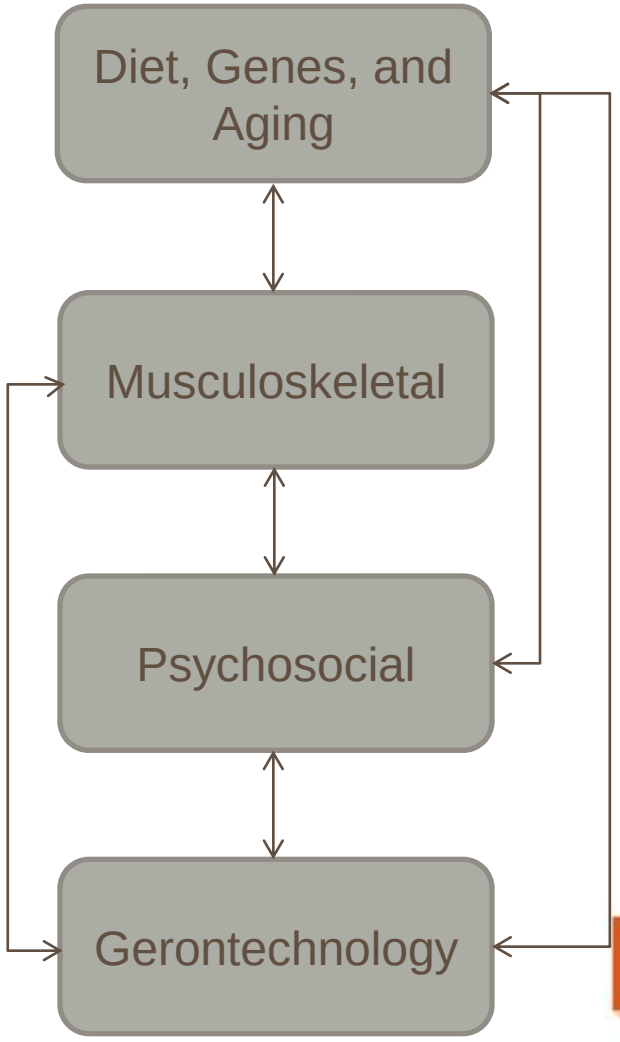
OSU IGERT

Life in an Aging Society

PI: Dr. Karen Hooker

Fall 2011

9 Students



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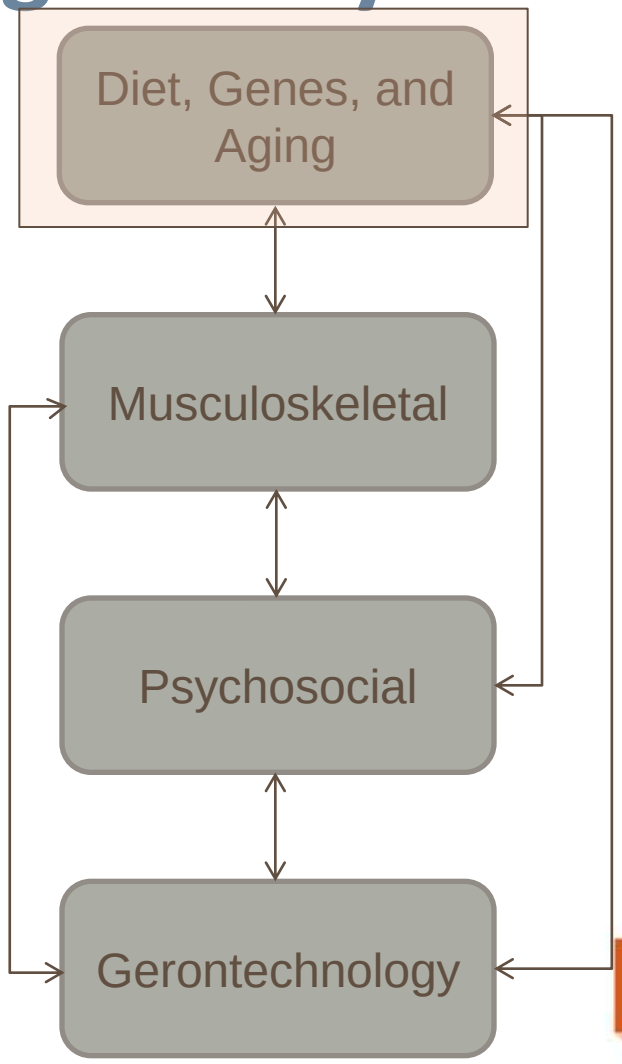
Life in an Aging Society

Biological mechanisms underlying aging processses

Strategies for maintaining and promoting good health



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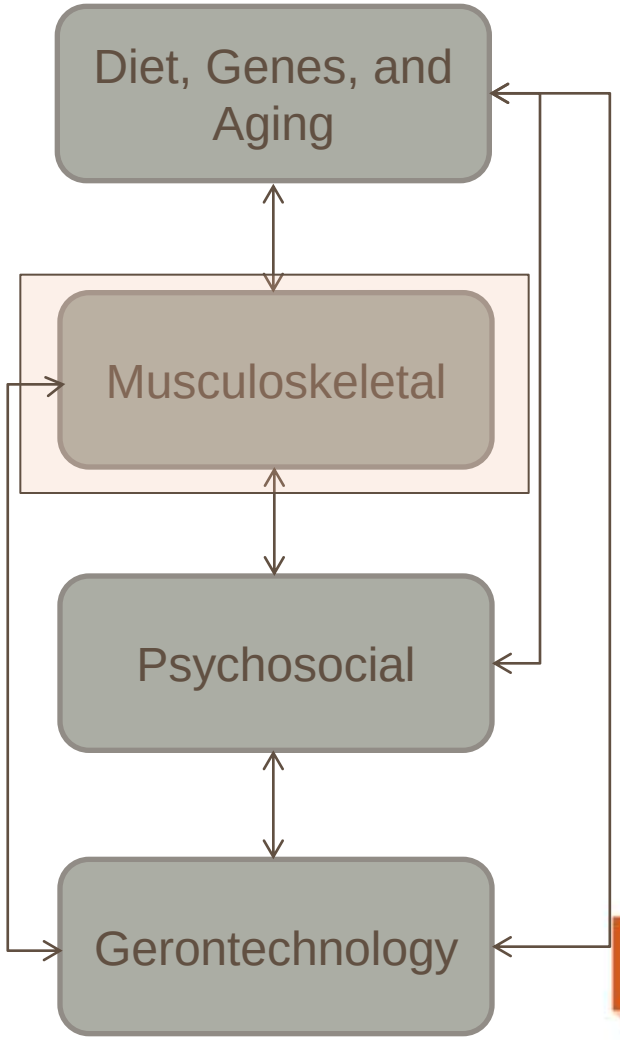
Life in an Aging Society

Methods to preserve functioning, prevent disability, and optimize overall well being

Bone health, fall prevention, interventions to promote exercise



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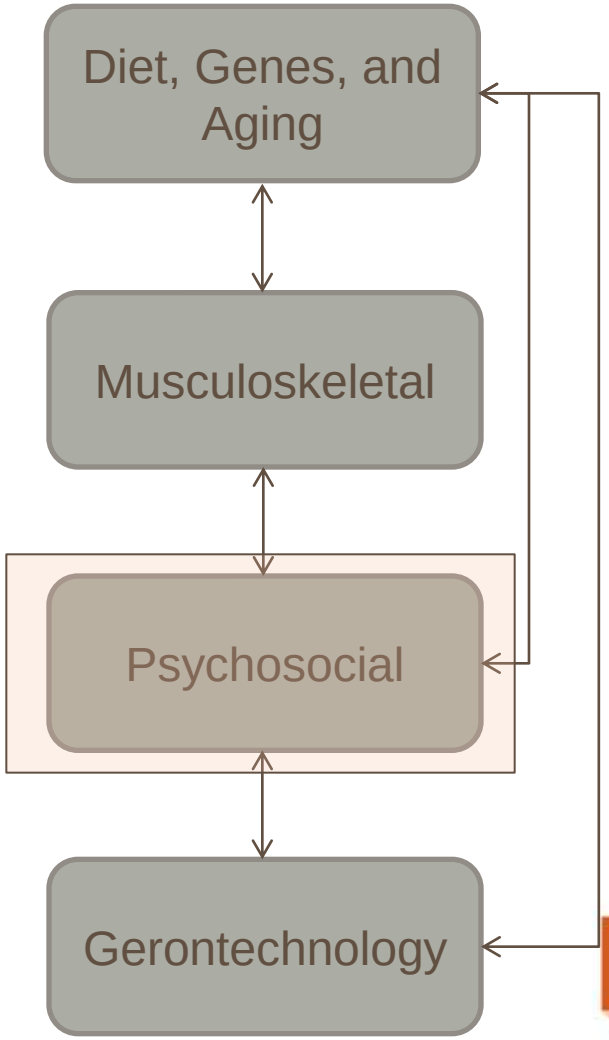
Life in an Aging Society

Aging individuals and their families in social contexts

How aspects such as stress affect aging and how individual cope with and self-regulate successfully



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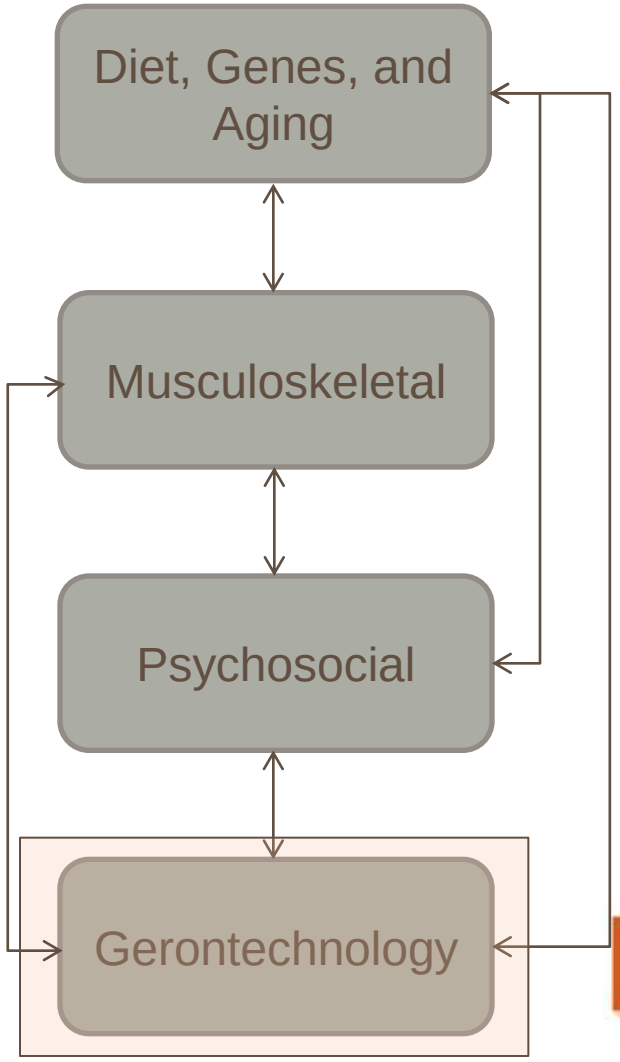
Life in an Aging Society

Investigation and design of supportive technologies

Caretakers, to enable research, enhance living

Privacy, social and ethical ramifications of wellness monitoring



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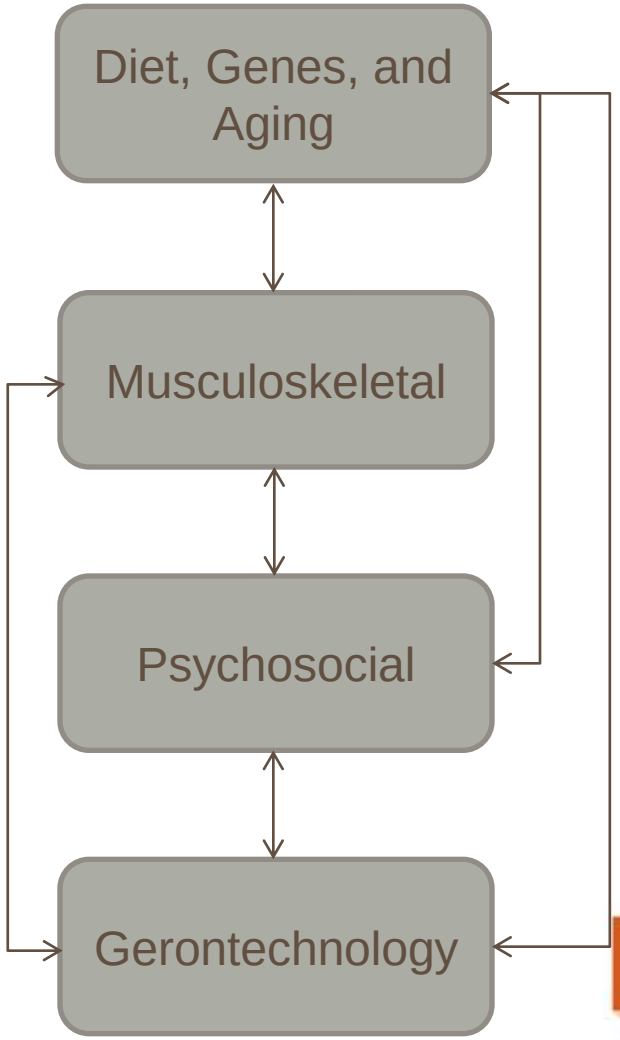
Life in an Aging Society

Rate of Aging

Engineering Aging



Person Environment (PE) Fit

Steggell & Lien

Can we identify problems in the fit between the individual and his/her environment so that the appropriate environmental interventions can be made

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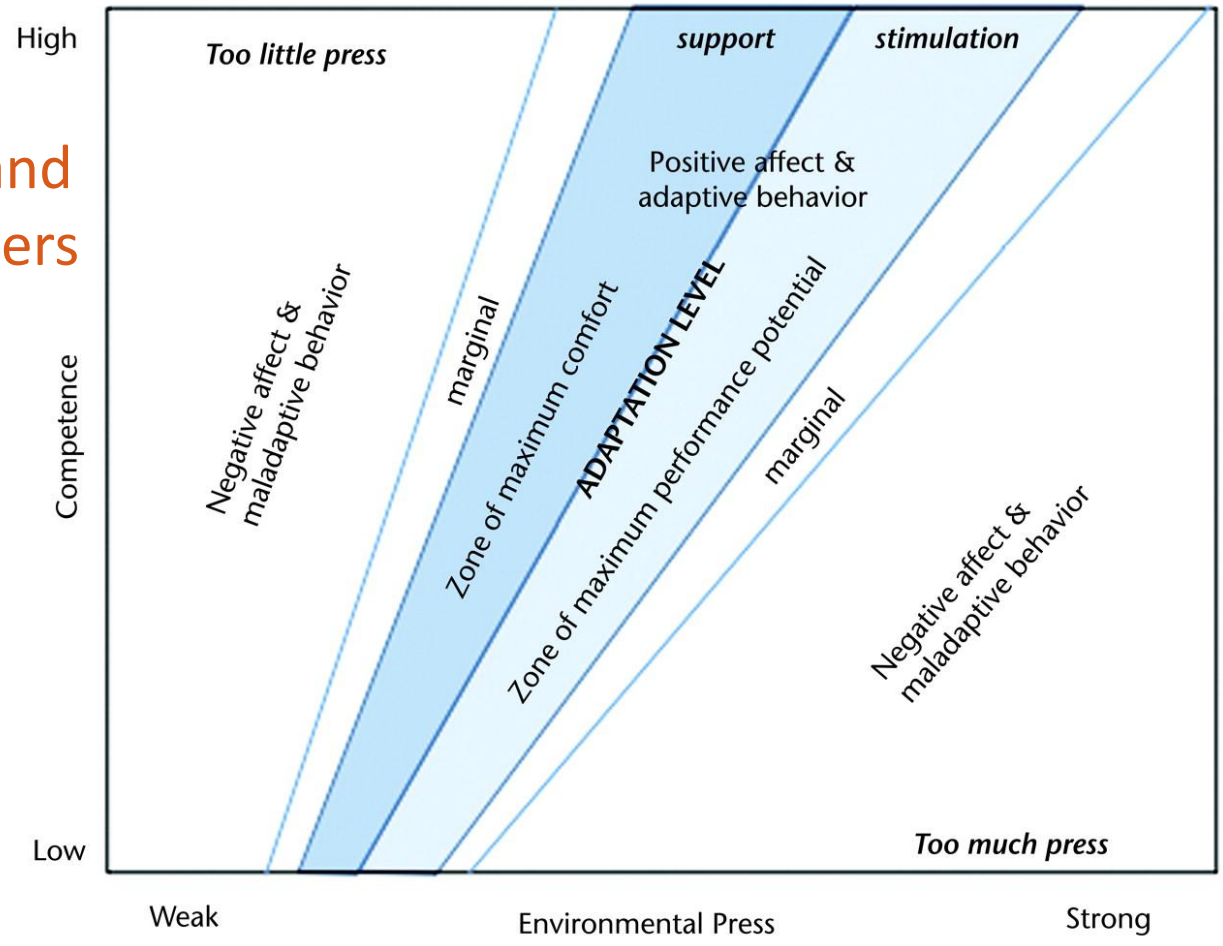
PE-Fit theory

A measure of the physical capacities and environmental barriers present in one's surroundings

Utilizes Lawton & Nahemow's (1973) press-competence model



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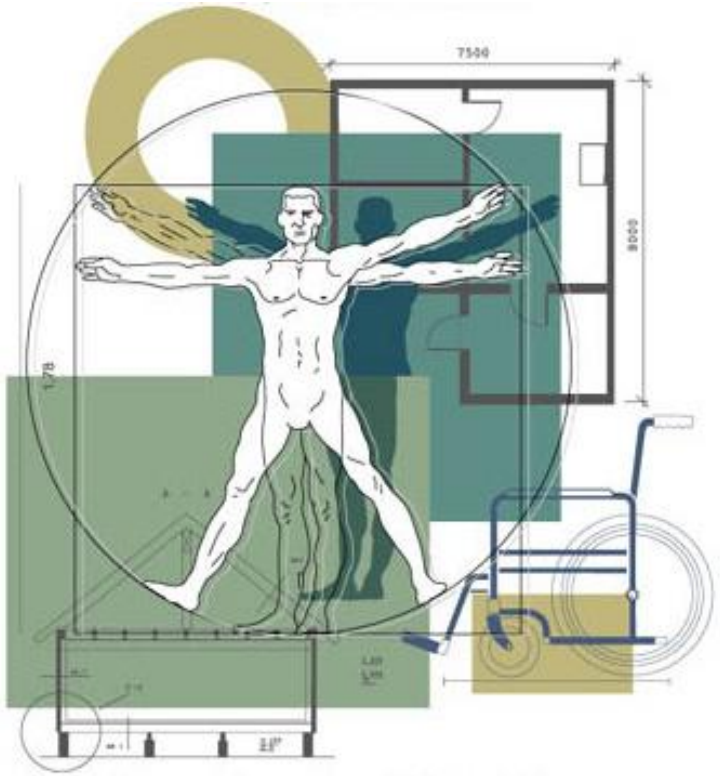
PE-Fit methods

Housing Enabler (www.enabler.nu)



- Developed in Sweden
- Assess PE-Fit of homes for older adults
- Needs adaptation to the US
- Modifications to include measures of emotional and cognitive aspects of meaning of home

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OSS & Aging

Jensen and Davidson

Can we utilize retiring programmers to 1) improve the diversity and productivity of open source software projects and possibly 2) maintain the cognitive skills of the programmers

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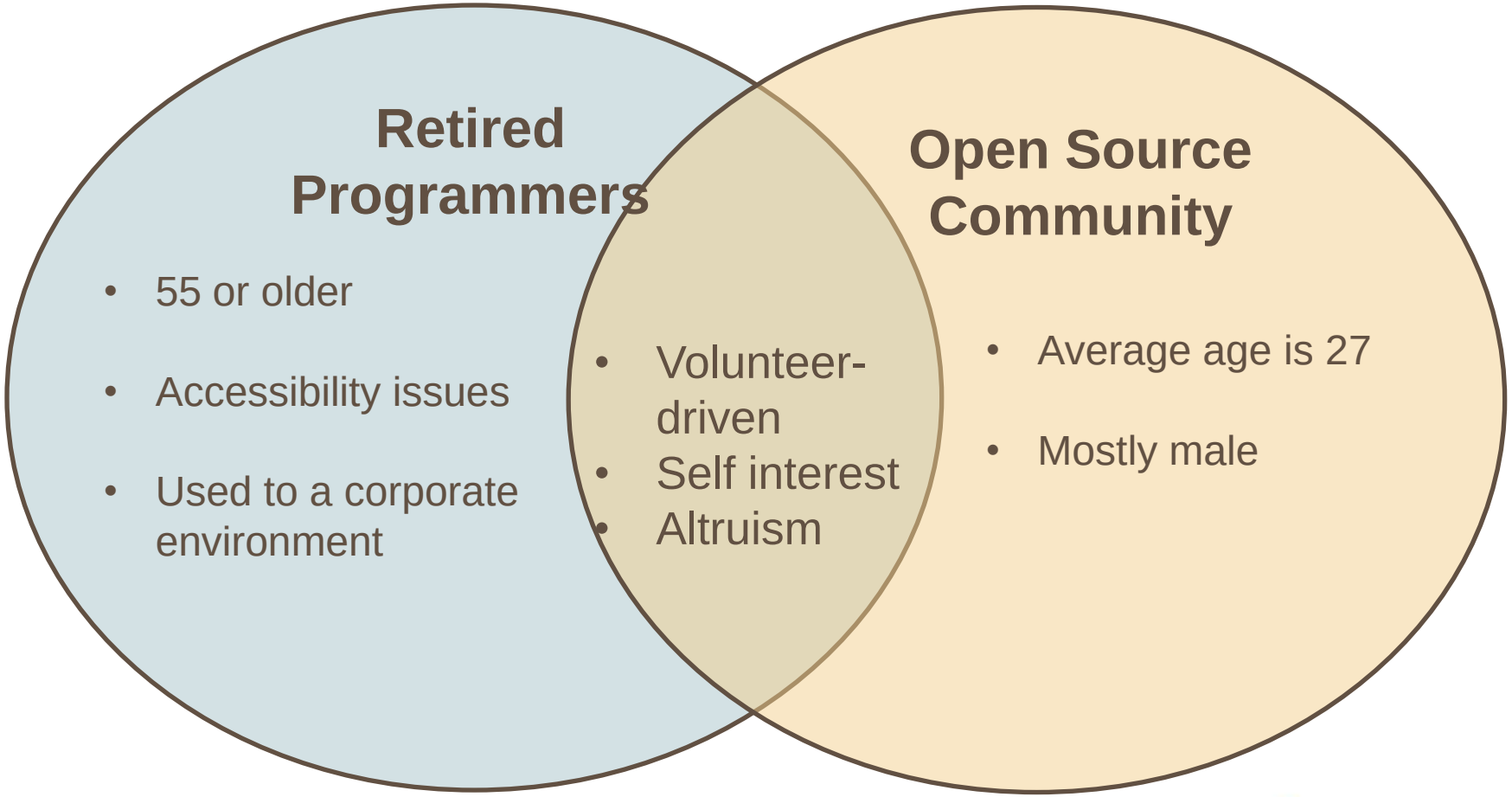
Why Retired Programmers?



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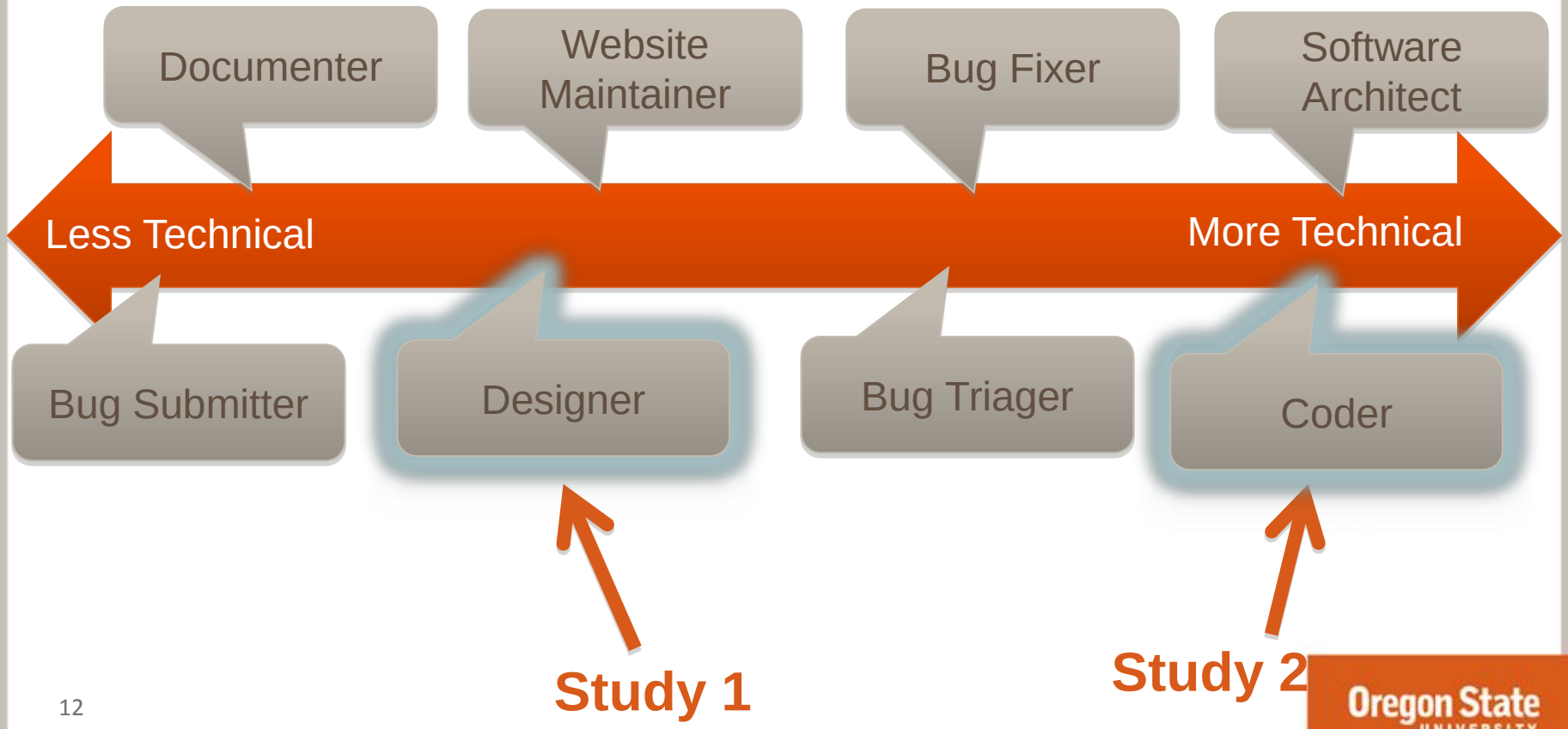
Studies

Open Source Continuum



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Non-invasive Monitoring

Patrick Chiang

How do we build low-cost, scalable, non-invasive monitoring solutions to both study aging and to improve independent living

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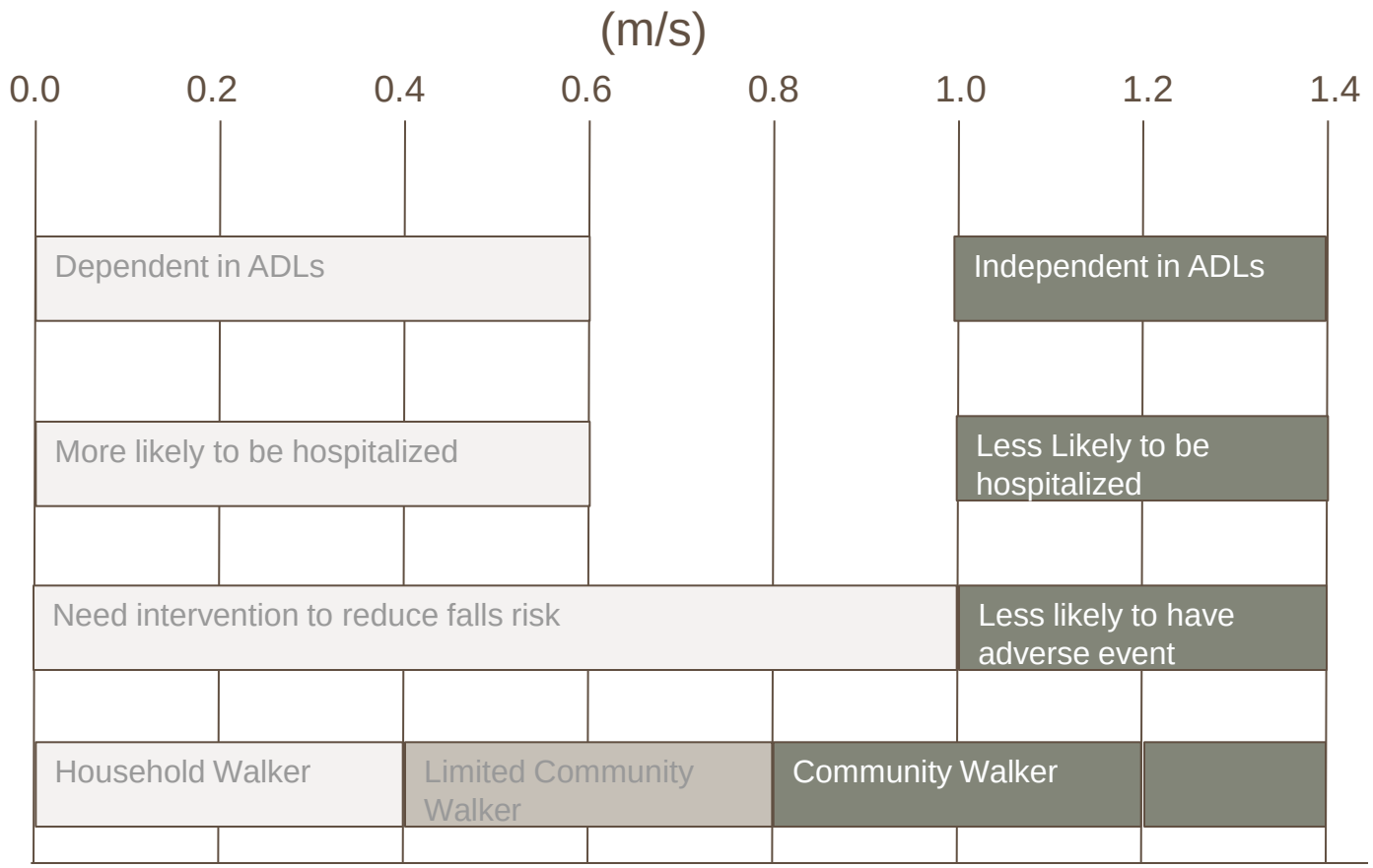
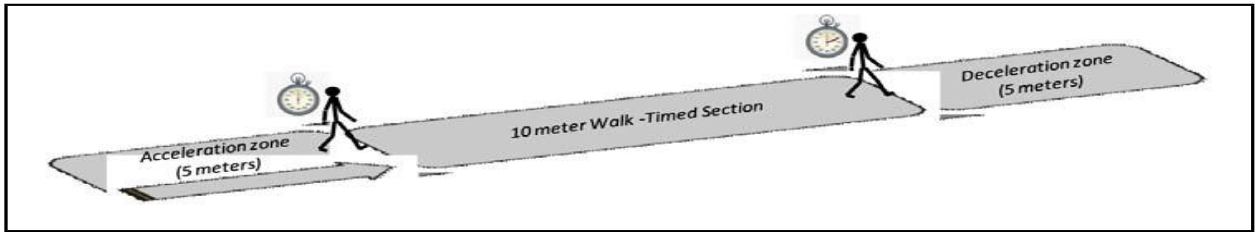
Walking Speed





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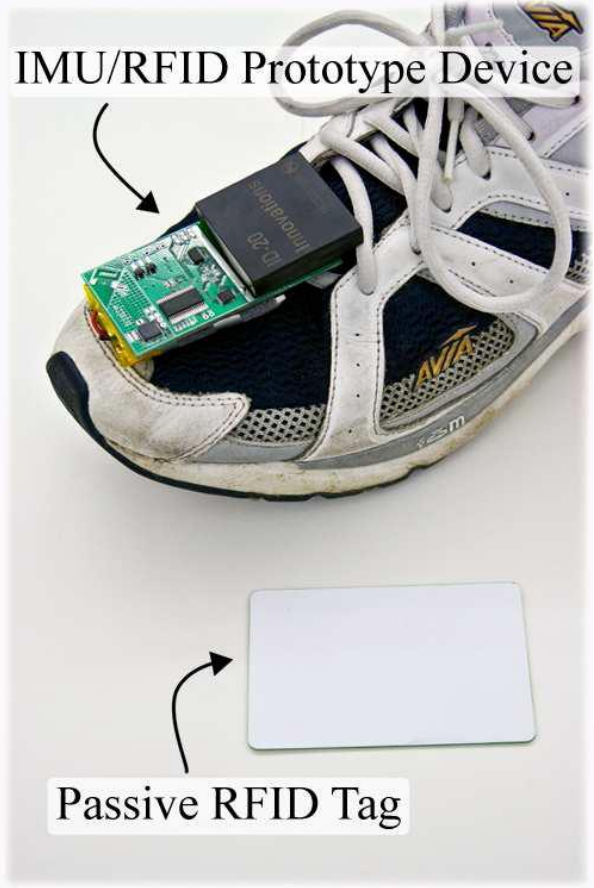
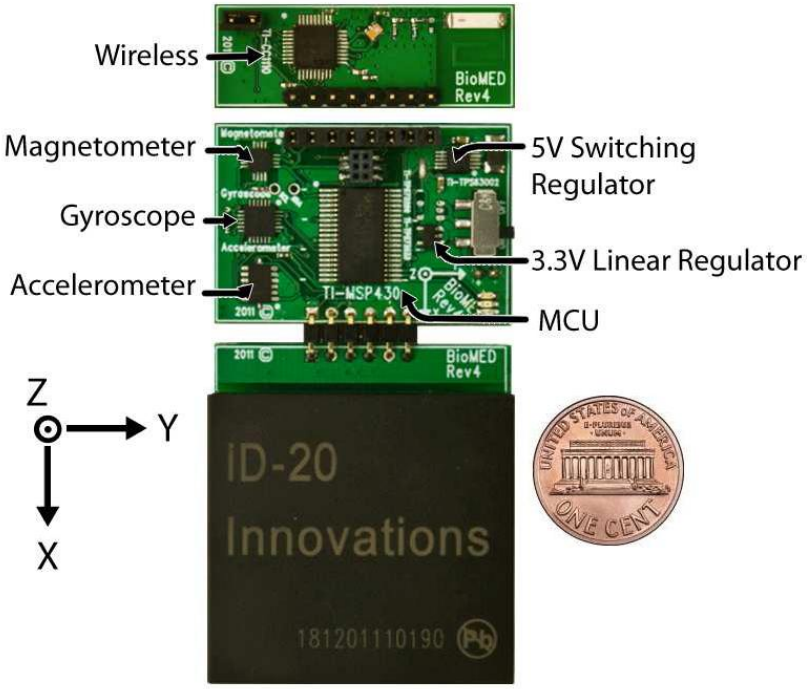
Foot Mounted
Indoor tracking





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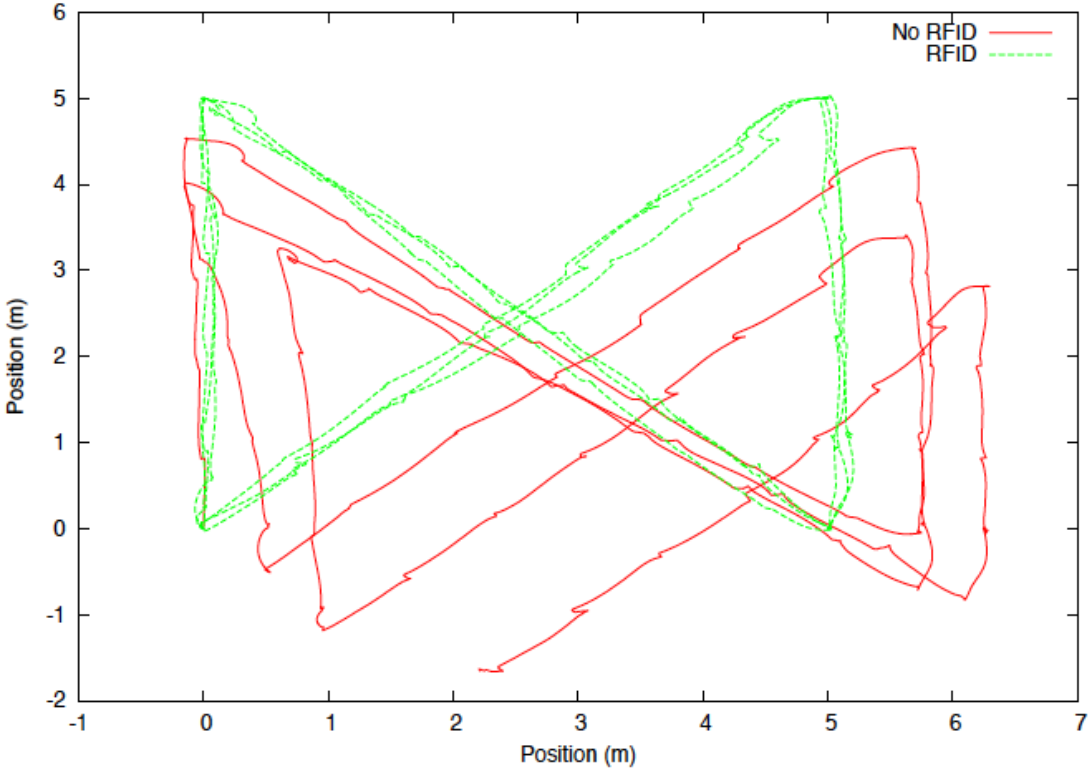
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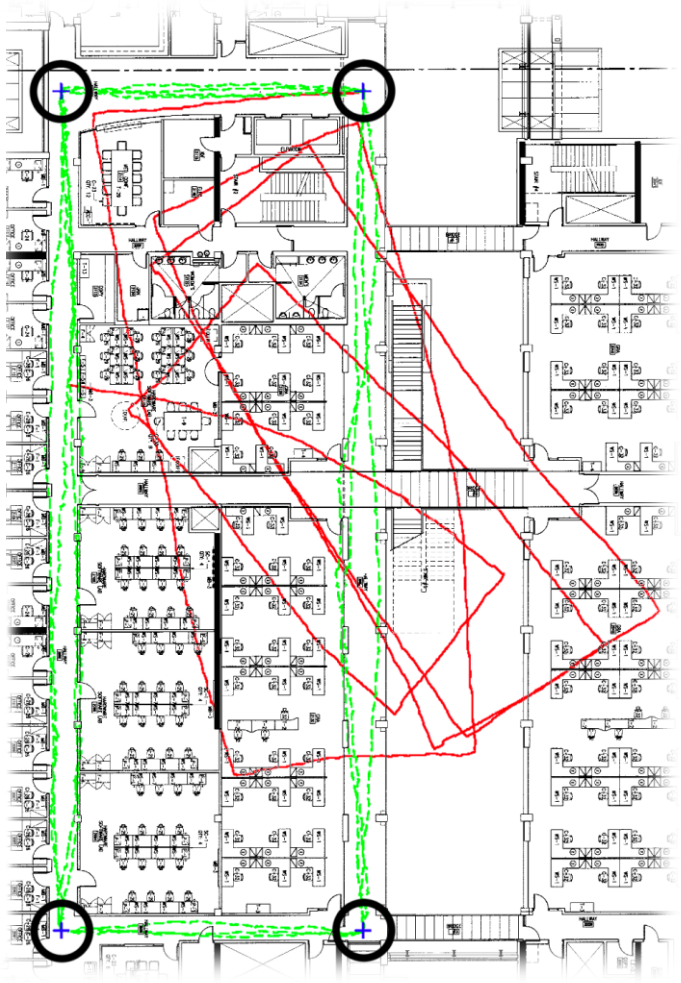
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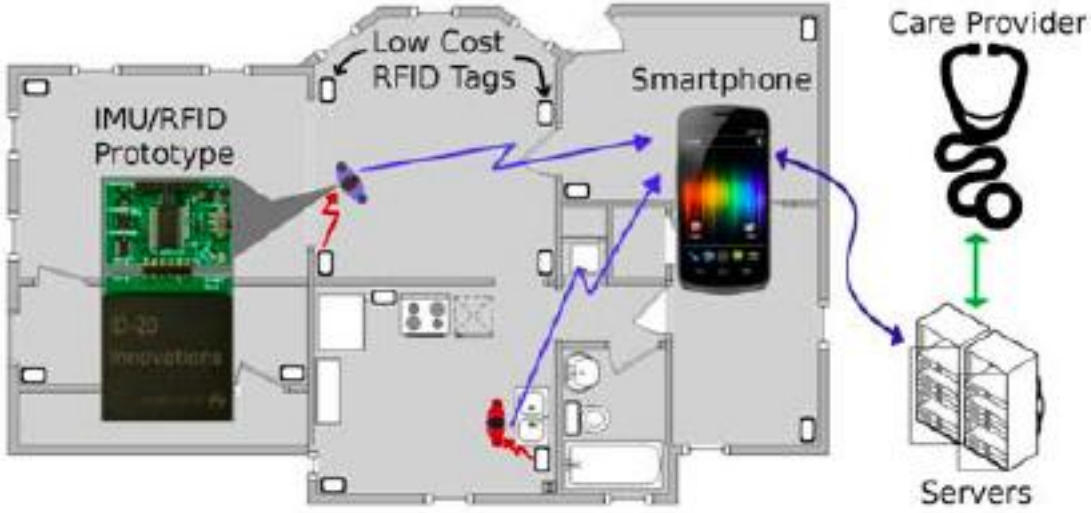

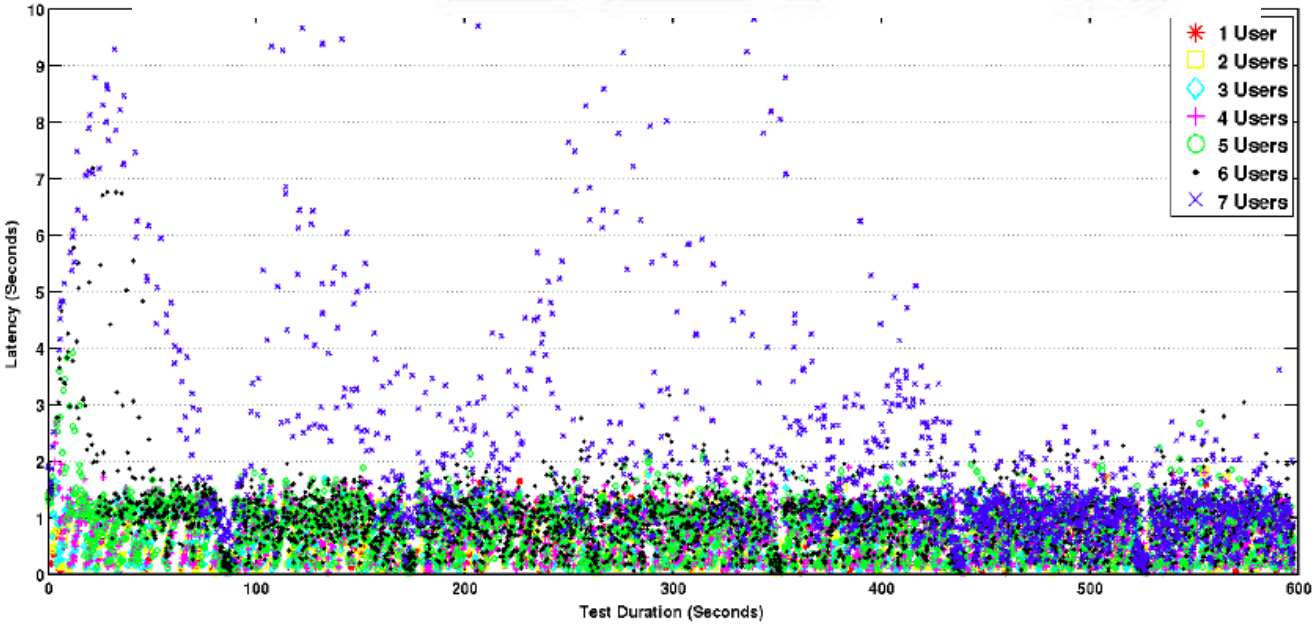

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PULSE

Hooker, Mejia, Metoyer, & Pham

How can we effectively study the behavioral and social mechanisms driving healthy aging processes using online measurement tools?

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PULSE Goals

Study linkages between personality processes and health using intraindividual variability design

- Self-regulation of goals

Engage participants through data visualization feedback

Explore temporal frame necessary for reliably capturing intraindividual variability (burst vs. daily over 100 days)

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Variability vs. Change

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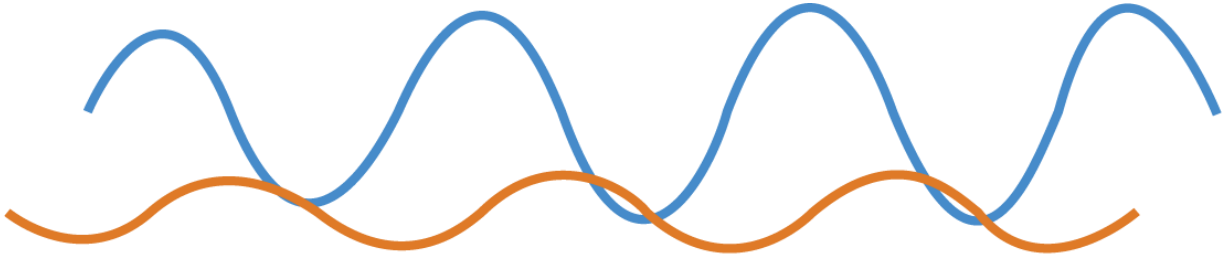
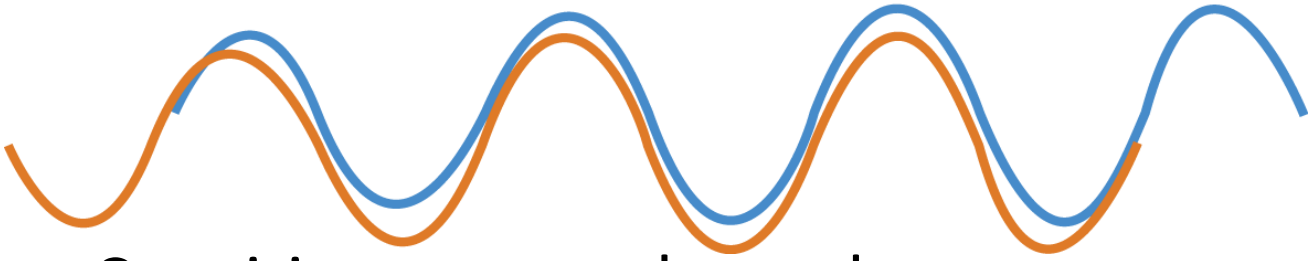
Dynamic Process coupling:
Cognitive functioning and stress



Cognitive resilience

cognition

= stress



Cognitive context dependency

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PULSE Design

Initial Survey
- Goals Populate Daily
- Social Contacts Populate Daily

Daily Survey
- 75% 100 Daily Surveys
- 25% Four 7-day Measurement Bursts

Post Survey (Project Feedback)

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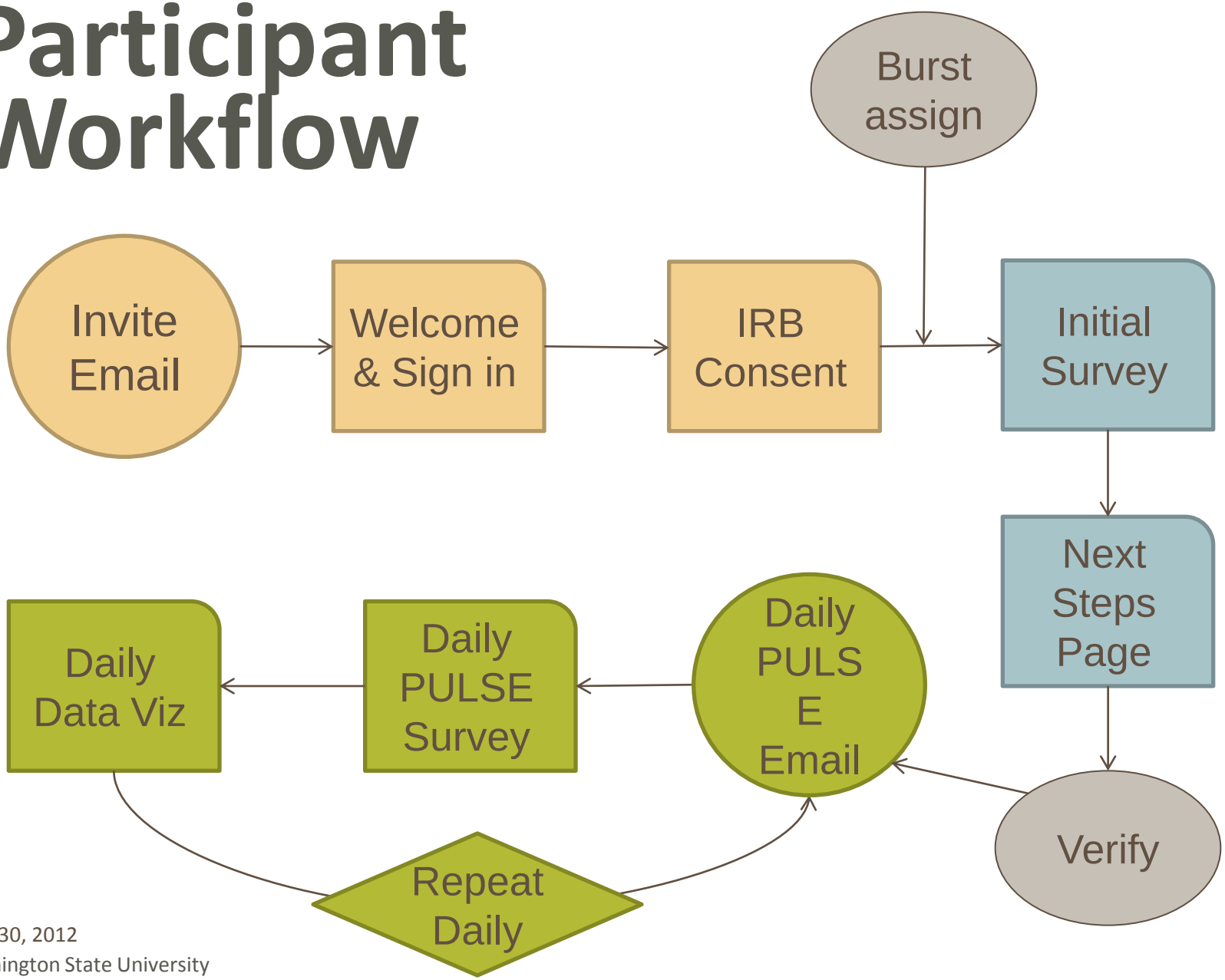
Participant Workflow



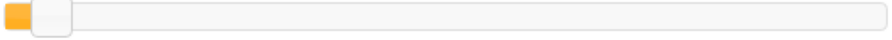
1. Rate your progress towards your goal of maintaining healthy weight

No Progress Much Progress

1.1. Did you receive any practical or emotional assistance towards your health goal today?

Not at all Very much

1.2. Did anyone in your social network create tension, arguments, or time constraints that impeded progress towards your health goal today?



Not at all Very much

2. Rate your progress towards your goal of my new daughter

No Progress Much Progress

2.1. Did you receive any practical or emotional assistance towards your social goal today?

Not at all Very much

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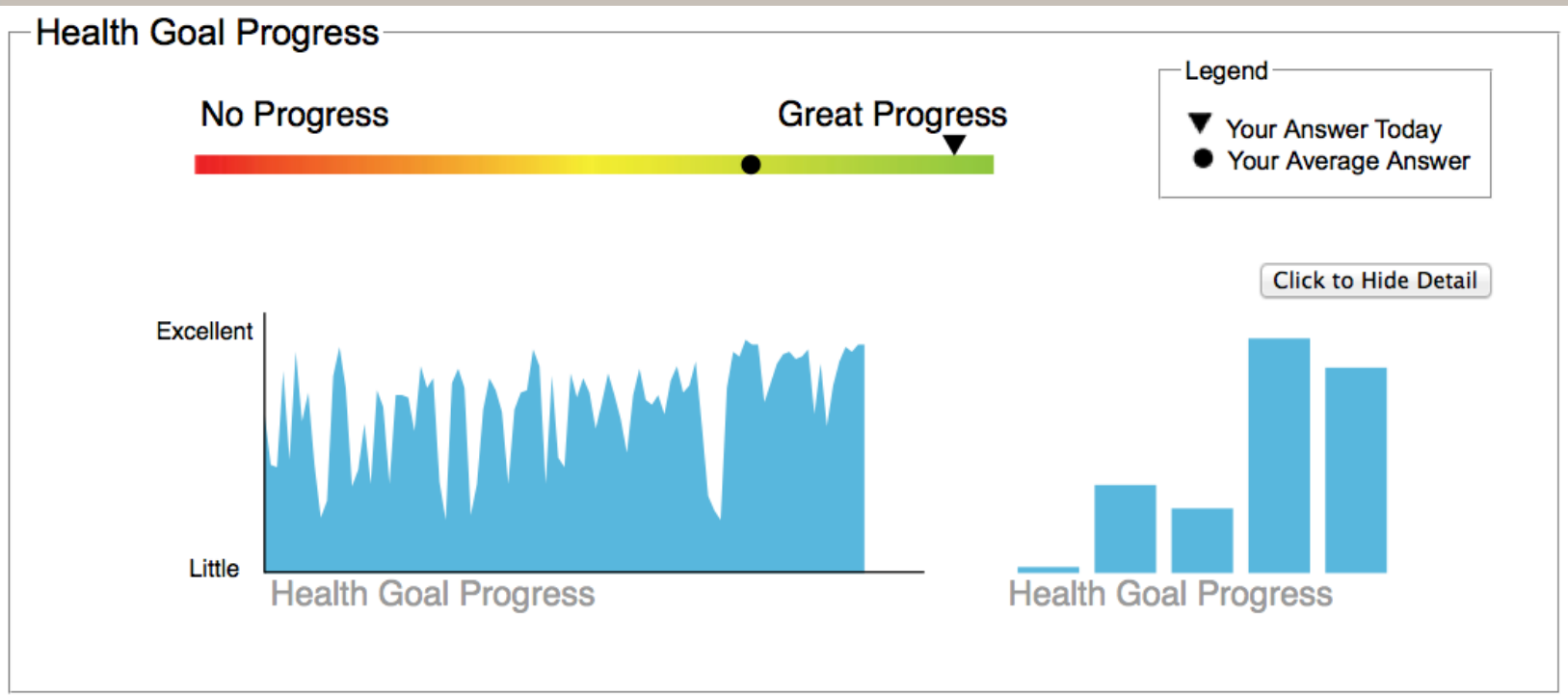

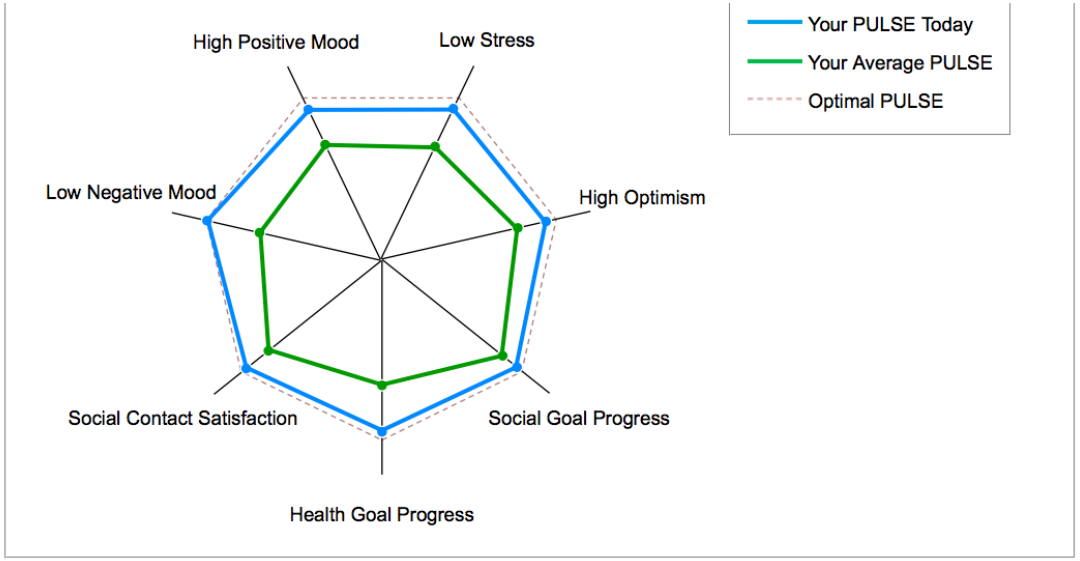

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Effects of Visualization

Q1 What is the association between today's goal progress and using the personal feedback portal?

Q2 Is below-average goal progress on the previous day related to current goal progress?

Q3 Is the lag-effect of poor goal progress yesterday attenuated when participants interact with their personal feedback portal?

T. Pham, S. Mejía, R. Metoyer, K. Hooker, "The Effects of Visualization Feedback on Promoting Health Goal Progress in Older Adults", Short Paper in *Proceedings of Eurographics Conference on Visualization (EuroVis)*, 2012.

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Feedback
Association of Progress to Visual

On days when you do poorly, you are more likely to use the feedback visualization

What is the association between today's goal progress and using the personal feedback portal?

Q1

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Feedback
Lag Effect

If you did poorly yesterday, you more than likely did poorly today as well

Q2

Is below average goal progress on the previous day related to current goal progress?

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Feedback
Moderation Effect

Today's goal progress is linked to yesterday's goal progress. Those who did poorly yesterday are likely to also do poorly today, however, the effect is weakened when the visualization is used

Q3

Is the lag effect of poor goal progress yesterday attenuated when participants interact with the feedback portal?

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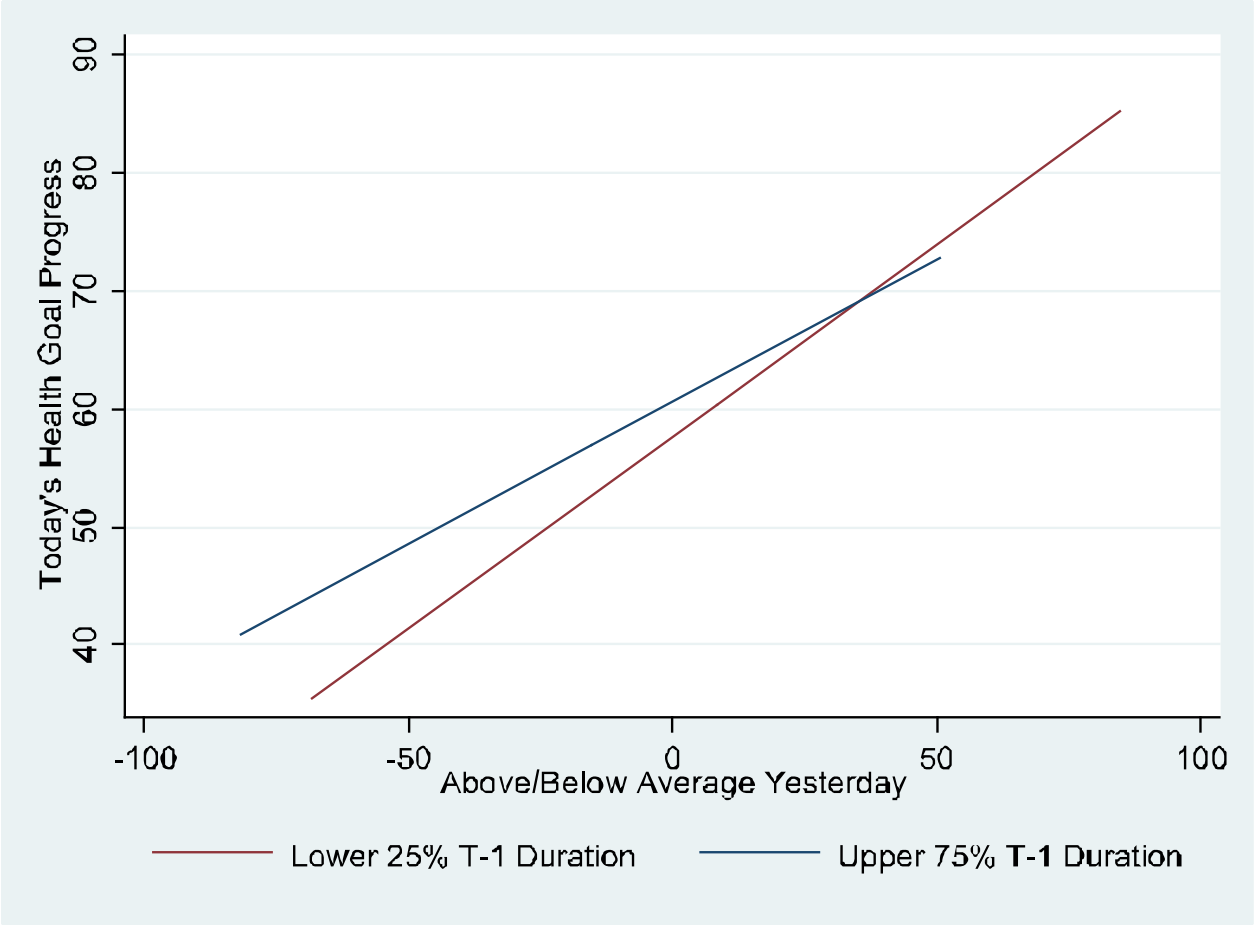
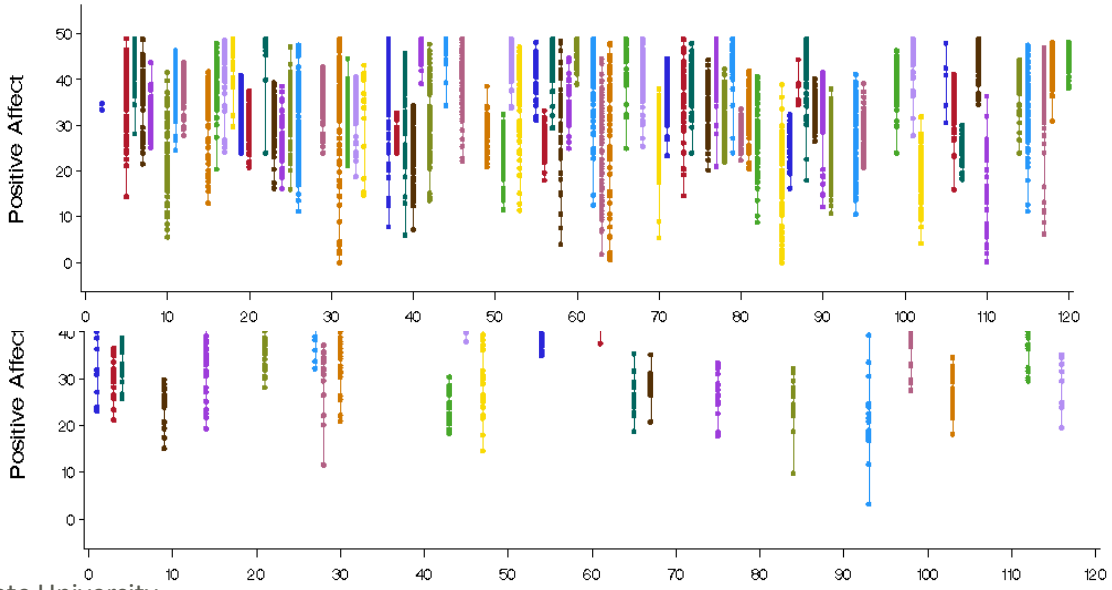
Feedback
Moderation Effect



Temporal Frame
Intraindividual Variability

The burst group statistical distributions were positively correlated with the continuous group



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Consumption Feedback

Metoyer & Riche

How do we effectively use monitored data as visual feedback to inform behavior change in home inhabitants

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How can
interactive systems
help people adopt more
sustainable
electricity consumption behaviors

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How can
interactive systems
help older adults adopt more
independent/maintainable
health behaviors

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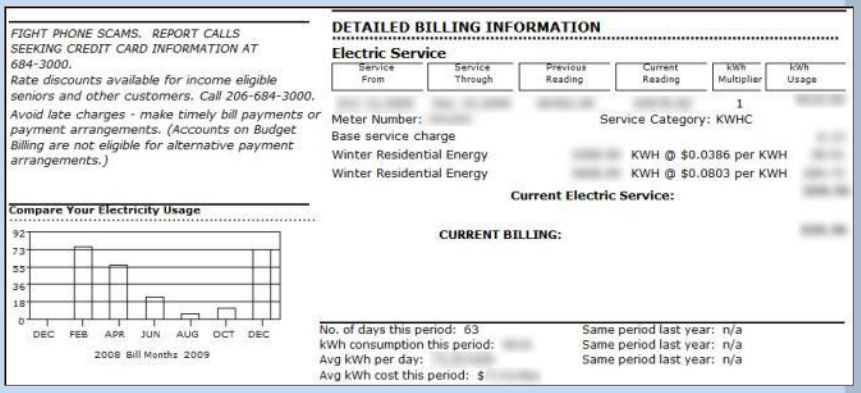
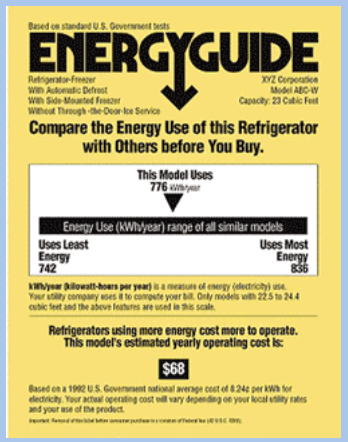
Whole home



Always-On

Intermittent



Appliance specific

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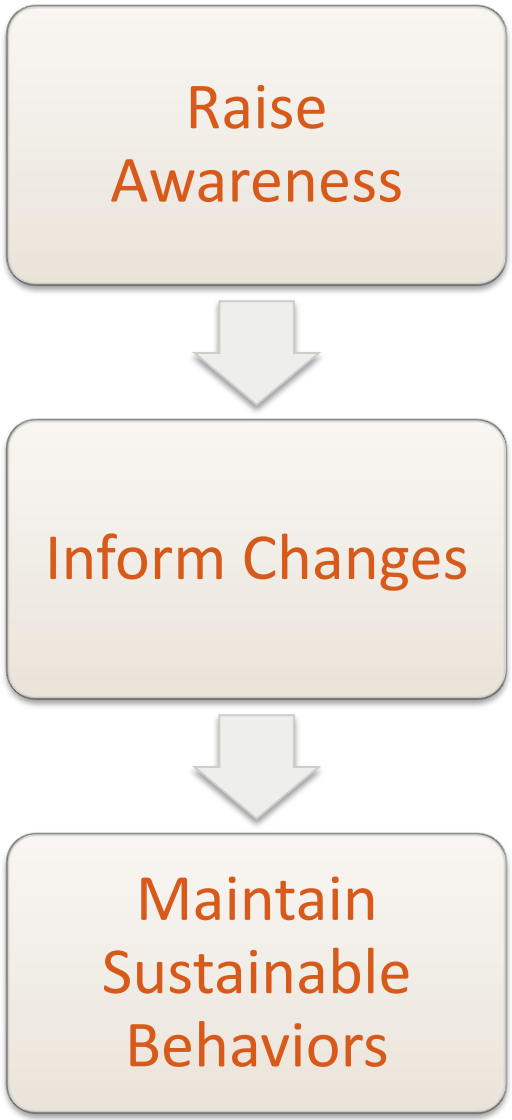
Effective aspects of feedback [Fisher 2008]

- Frequently updated,
- Interactive,
- Appliance-specific,
- Historical or normative comparisons, and
- Longitudinal feedback

A Three Step Approach



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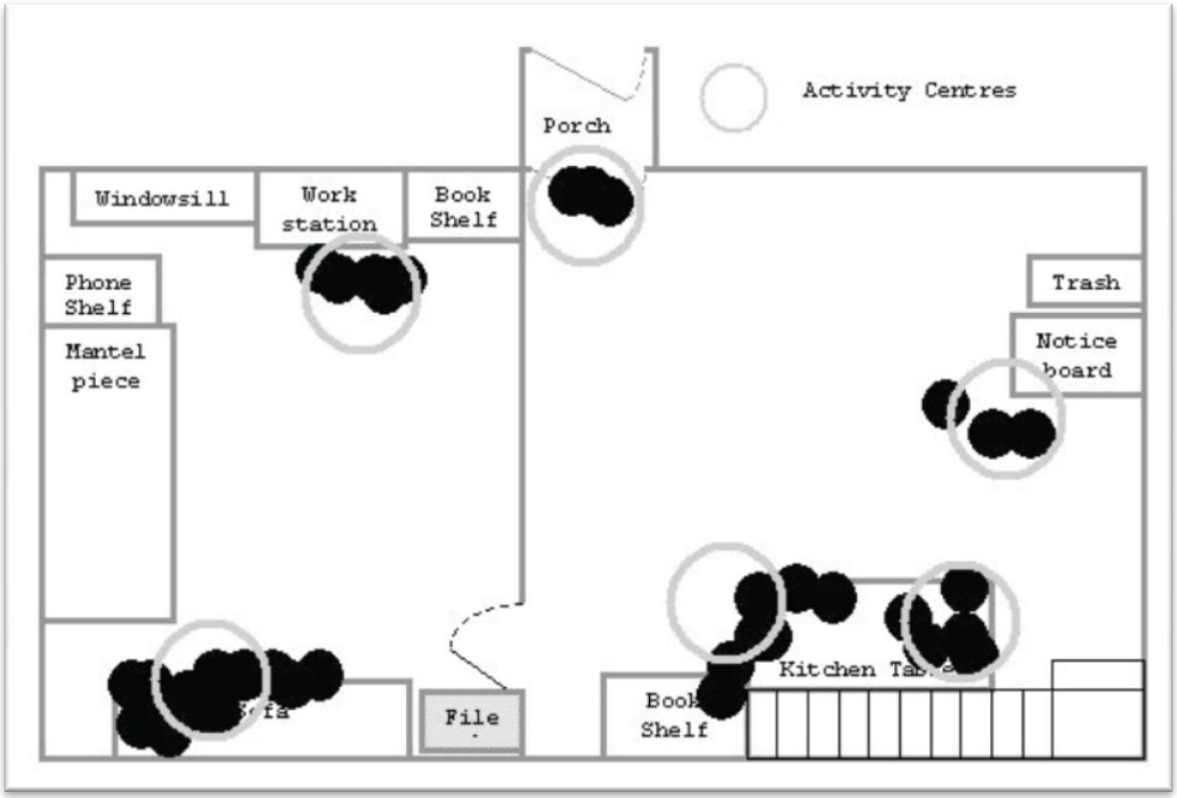
Location



Leverage people's intimate knowledge of what is happening in a location

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Always-On Interactive Information Visualization

Field Study

Always-On Feedback

What do you know about how electricity is consumed and how do we integrate an always on device into the home

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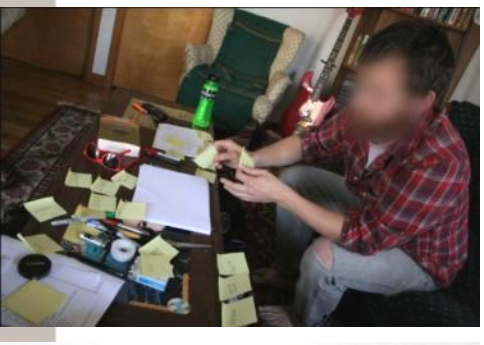

4 households

3 couples, 2 housemates

4 students and 4 professionals

Contextual Interviews

Electricity conservation practices

Current awareness of electricity consumption

Participatory design

Always-on visual feedback

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I don't really know what appliances really use…I'd like to think that I do, but I probably don't

Reconcile household members' awareness of consumption

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Provide self-comparison

to motivate change

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Challenges for adoption

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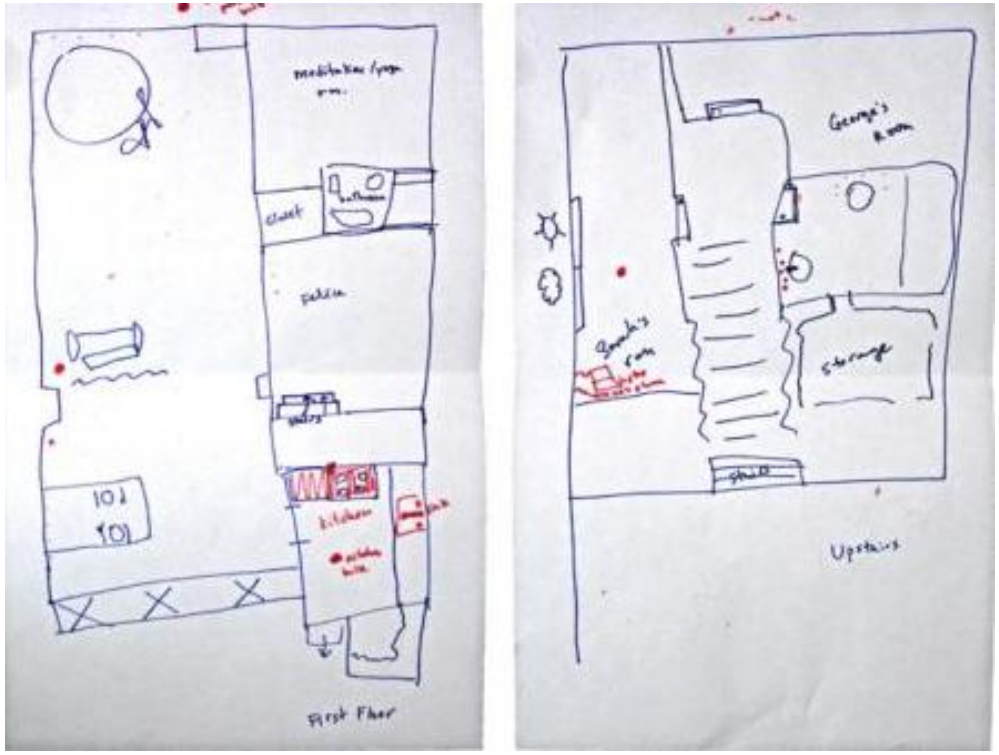

Personalization and Mental Models

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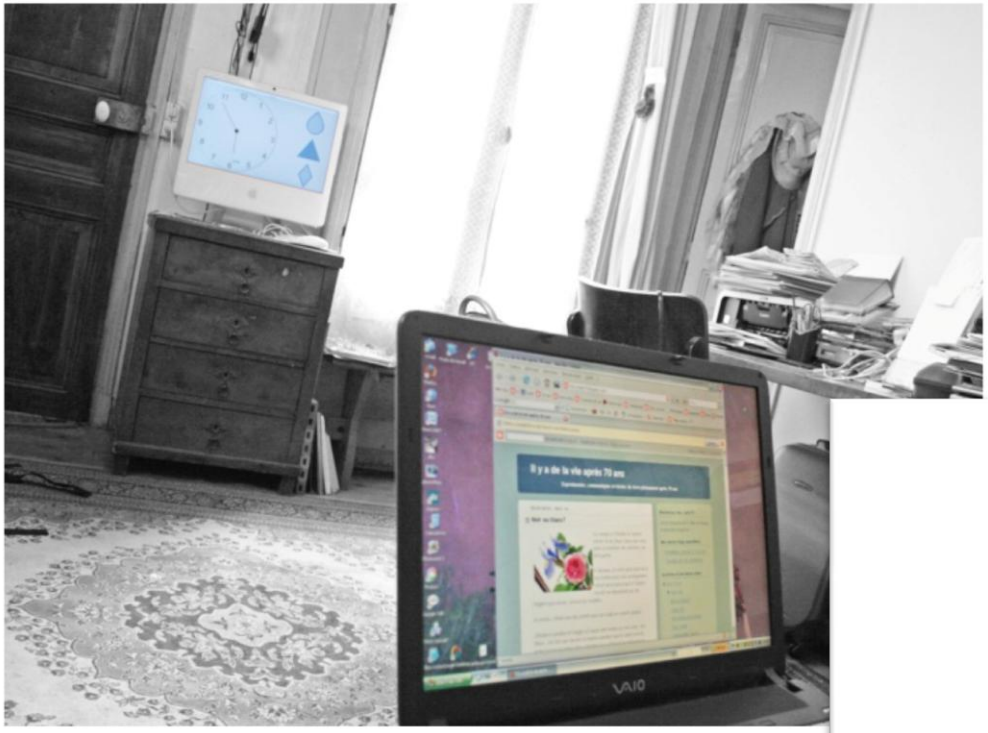
Integration in the Home



I would frame it, laminate it, and it would be color coded

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Energy Consumption
2-year NSF Project

Aesthetics	Comparisons	Goal setting
Privacy	Groups/Families	Routines
Location	Info Bandwidth	Play/Fun
Stages of change		

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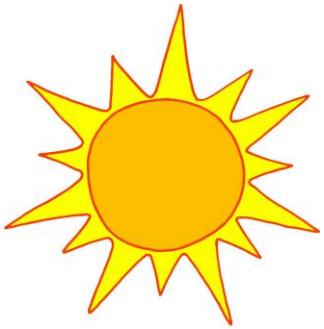
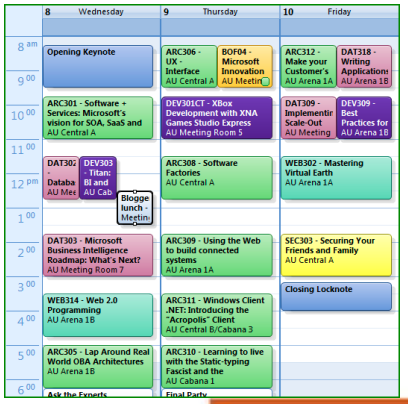
Time

An Analogy – An Architecture





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Summary

Awareness is necessary for self regulation

Technology can help promote awareness

Technology can inform behavior change

We need to understand how to build ecosystems to manage change based on data feedback

- Energy
- ADLs
- Social / Health goals, etc.

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Thank You

- NSF – DGE 0965820 IGERT Life in an Aging Society
- NSF-HCC 1018963 Supporting Self-Awareness in Everyday Data Consumers Through Appropriate Interactive Visualizations

Karen Hooker
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Karl Smeltzer
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Jonathan Dodge

Carmen Steggell
Laura Lien
Carlos Jensen
Jennifer Davidson
Patrick Chiang
Shannon Mejia

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