Evaluation #3
Monday, April 16th, 2012
Instructor: Jon Froehlich
TA: Kotaro Hara
Fame/Shame

Scenario: a friend contacted me and I wanted to add his cell number to my iPhone address book

1. Received incoming phone call from friend
2. Open recent call list and see number. Click on top number.
3. Info screen for phone number opens. Scroll down to contact management area.
4. Not sure if friend is already a contact (I have his email); Click “Add to Existing Contact”
5. Start typing in friend’s name to see if it is in contact list.

6. Instead, I get this screen.

7. So, we have to go back to this screen and click on “Create new contact” (and the info I just typed is lost)

8. Finally, I can add my friend by retyping the name.
I'm a fifth year Ph.D. student in the Human-Computer Interaction Institute at Carnegie Mellon University advised by Scott Hudson. I'm also a Microsoft Research Ph.D. Fellow and editor-in-chief of XRDS, ACM's flagship magazine for students.

My research focuses on mobile interaction techniques and input technologies - especially those that allow people to interact with small devices in big ways. Please see my research brief for more details. I've also begun a new thread of research called instinctive interaction. I use this site as a repository for my research and other projects.

March 6
March 2
February 29
February 26
February 25
February 24
February 22
February 20
February 18
February 15
February 14
February 11
February 8
February 6
January 31
January 23
January 21
January 17
January 16

Microsoft TechFest kicks off; demo OmniTouch to public.
Renovation continues: order kitchen cabinetry.
Give talk at NASA. Very interesting facilities tour.
Wedding planning. Venue, food, Airbender props, etc.
Birthday party for Emily.
Leave for DC, Amy at NSF, hang with Parag.
CBC interview about on-body computing and natural interaction.
Present Armura work at TEI; win best student paper.
Kitchen renovation continues. Drywalling galore.
Motorcycle tuned-up.
AIP crew films TapSense, interview.
Lunch with Brad Burnham. Begin kitchen renovation.
Coffee with Allen Hahn. DynaTAC 8000M arrives; mobile collection expands.
Pure java implementation of ARTags works surprisingly well.
Propose dissertation research. Now ABD.
Supercharge OmniTouch with Benko for live TechFest demos.
Finalize and send off proposal document to committee.
Nasty flu takes me down for a week. Blah.
Dinner with Mune before he departs.

#inspiration
Ph.D. Research

On-Body Interaction: Armed and Dangerous

We consider how the arms and hands can be used to enhance on-body interactions, which is typically finger input centric. To explore this opportunity, we developed Armura, a novel interactive on-body system, supporting both input and graphical output. Using this platform as a vehicle for exploration, we prototyped a series of applications and interactions. This helped to confirm chief use modalities, identify fruitful interaction approaches, and in general, better understand how interfaces operate on the body. This paper is the first to consider and prototype how conventional interaction issues, such as cursor control and clutching, apply to the on-body domain. Additionally, we bring to light several new and unique interaction techniques. Published at TET 2012.

TapSense: Enhancing Finger Interaction on Touch Surfaces

TapSense is an enhancement to touch interaction that allows conventional screens to identify how the finger is being used for input. Our system can recognize different finger locations - including the tip, pad, nail and knuckle - without the user having to wear any electronics. This opens several new and powerful interaction opportunities for touch input, especially in mobile devices, where input bandwidth is limited due to small screens and fat fingers. For example, a knuckle tap could serve as a "right click" for mobile device touch interaction, effectively doubling input bandwidth. Published at UIST 2011.
OmniTouch
Wearable Multitouch Interaction Everywhere

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Hrvoje Benko
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Andrew Wilson
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Microsoft
Carnegie Mellon University

[http://www.chrisharrison.net/index.php/Research/OmniTouch]
Genres of Assessment

**Inspection-Based Methods**
Based on the skills and experience of evaluators:

1. **Heuristic Evaluation**
2. **Walkthroughs**

**Automated Methods**
Usability measures computed by software

**Formal Methods**
Models and formulas to calculate and predict measures semi-automatically

**Empirical Methods**
Evaluation assessed by testing with real users
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Walkthroughs are an alternative approach to heuristic evaluation for predicting users’ problems without doing user testing. They involve walking through a task with an interface/product and noting problematic usability features.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Cognitive Walkthroughs

One type of walkthrough that involves simulating a user’s problem-solving process at each step of interaction with an interface.

Whereas heuristic evaluation takes a holistic view to catch problems, cognitive walkthroughs are task specific.

Cognitive Walkthroughs

The defining feature of [cognitive walkthroughs] is that they focus on evaluating designs for ease of learning—a focus that is motivated by observations that users learn by exploration.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Performing Cognitive Walkthroughs

1. **Pre-study Step:** characteristics of typical users are identified; sample tasks are created; a clear sequence of the actions needed to accomplish task are documented.

2. **Walkthrough Step:** Designer and one or more evaluators come together to perform analysis; evaluators walk through each step and try to answer these questions:

[Rogers et al., Interaction Design, Chapter 15, 2011]
Performing Cognitive Walkthroughs

1. **Pre-study Step:** characteristics of typical users are identified; sample tasks are created; a clear sequence of the actions needed to accomplish task are documented

2. **Walkthrough Step:** Designer and one or more evaluators come together to perform analysis; evaluators walk through each step and try to answer these questions:

   1. Will the user know what to do to achieve the task?
   2. Will the user notice that the correct action is available?
   3. Will the user interpret the response from action correctly?

[Rogers et al., Interaction Design, Chapter 15, 2011]
Performing Cognitive Walkthroughs

1. **Pre-study Step:** characteristics of typical users are identified; sample tasks are created; a clear sequence of the actions needed to accomplish task are documented.

2. **Walkthrough Step:** Designer and one or more evaluators come together to perform analysis; evaluators walk through each step and try to answer these questions:

3. **Information Recording:** As the walkthrough occurs, critical information is compiled about: assumptions, problems, etc.

4. **Design Revision:** The recorded information is analyzed, design improvement suggestions are made, and design is iterated upon.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Pluralistic Walkthroughs

1. Each evaluator asked to assume the role of a typical user (recall personas and role-playing).

2. Prototype screens and scenarios of use are provided to each evaluator independently; each evaluator writes down sequence of actions to accomplish scenario.

3. Evaluators come together to discuss their actions steps / troubles before moving on to next scenarios independently.

[Rogers et al., Interaction Design, Chapter 15, 2011]
PRO's

Walkthroughs

> Strong focus on tasks
> Compared with HE, more detail on moving through an interaction w/system
> Perhaps most useful for applications involving complex operations

CON's

Walkthroughs

> Time-consuming and laborious
> Evaluators do not always have a good understanding of users
> Only a limited number of tasks/scenarios can be explored

[Rogers et al., Interaction Design, Chapter 15, 2011]
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Models and formulas to calculate and predict measures semi-automatically
1. GOMS Model
2. Keystroke Level Model (KLM)

**Empirical Methods**
Evaluation assessed by testing with real users
Formal Methods

Similar to inspection methods and analytics, **predictive models** (formal methods) evaluate a system **without users being present**.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Formal Methods

Similar to inspection methods and analytics, **predictive models** (formal methods) evaluate a system **without users being present**. Rather than involving expert evaluators or tracking usage, **predictive models use formulas** to derive various **measures of performance**.

[Rogers et al., Interaction Design, Chapter 15, 2011]
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**Empirical Methods**
Evaluation assessed by testing with real users
A GOMS model, as proposed by Card, Moran, and Newell (1983), is a *description of the knowledge* that a user must have *in order to carry out tasks* on a device or system; it is a representation of the "how to do it" knowledge that is required by a system in order to get the intended tasks accomplished.

An attempt to model the knowledge and cognitive processes involved when a user interacts with a system

1. **Goals** refers to a particular state the user wants to achieve

2. **Operators** refers to the cognitive processes and physical actions that need to be performed to achieve those goals

3. **Methods** are learned procedures for accomplishing the goals

4. **Selection** rules are used to determine which method to select when there is more than one available.
**GOMS Model Example**

1. **Goal:** find a website about GOMS
2. **Operators:** Decide to use search engine, decide which search engine to use,
Goal: find a website about GOMS

Operators: Decide to use search engine, decide which search engine to use, think up and enter keywords.

Methods: I know I have to type in search terms and then press the search button.

Selection: Do I use the mouse button or hit the enter key?
GOMS Models: An Approach to Rapid Usability Evaluation

This project is a set of technology transfer activities concerned with moving the research results in human-computer interaction into practical methods for designing computer system interfaces that are in fact easy to learn and easy to use. The research results of interest are those from earlier and ongoing projects concerned with modeling and evaluating computational models of human cognition and performance in the context of humans interacting with systems.

The payoff of applying these models to interface design results from the limitations in the standard human factors methods for developing usable systems. These methods are effective, but are slow and costly to apply because they are based on empirical user testing: In a scientifically controlled setting, actual human users perform an initial prototype system; their performance is recorded and analyzed, along with any apparent problems and difficulties. The system design is then revised, and prototyped, and the test repeated, until overall system performance is adequate, no further problems are noted, or time and money has run out.

The goal of this work is to radically reduce the time and cost of designing usable systems through developing analytic engineering models for usability. These models are computational models of human cognition and performance. These models take a specification for a user interface design and a description of the user, and carry out, and generate predictions of the time required to learn how to use the system, and the time required to carry out specific tasks. These predictions are based on empirically collected data for much of the design process, thus saving considerable resources. The current models address the procedural quality of the interface, its complexity, consistency, and speed of the procedures that the user must learn and execute in order to make use of the system. These models can help the designer design an interface that is reasonably usable, and then the slow and expensive empirical testing can be reserved for examining aspects of the interface not addressed by the theoretical prediction, or for a final check on the design.

The GOMS Model

Earlier research in HCI has resulted in a general concept, the GOMS model, which represents the procedural knowledge required to operate a system in terms of basic actions or Operators, Methods, which are sequences of operators that will accomplish goals, and Selection rules, which determine which method to use when a goal is reached. Research by Kieras and others has shown how this type of analysis can be used to obtain usefully accurate predictions of learning and execution time on using a production-system representation of human procedural knowledge; GOMS models can be constructed using production systems, and so the predictions of performance can be generated from GOMS models.

We are involved a variety of activities to extend and apply this framework, and turn it into a teachable, standard methodology that can be applied in industry. The first step was to encapsulate the earlier research on GOMS models into a task analysis method and model representation notation, called NGOMS, that makes it easier to understand and apply a GOMS model. After learning this notation and techniques, software developers can calculate estimated learning and executing times, and thus predict problems in an interface design. Accumulating experience and research shows that such models are indeed practical and effective in interface design situations.
The goal of this work [GOMS modeling] is to **radically reduce** the **time** and **cost** of designing usable systems through developing analytic engineering models for usability **based on validated computational models of human cognition** and performance.

**David Kieras**  
Professor in EECS and Psychology at the University of Michigan  
GOMS Advocate  

GOMS Model

GOMS is such a formalized representation that it can be used to predict task performance well enough that a GOMS model can be used as a substitute for much (but not all) of the empirical user testing needed to arrive at a system design that is both functional and usable.

David Kieras
Professor in EECS and Psychology at the University of Michigan
GOMS Advocate

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**Empirical Methods**
Evaluation assessed by testing with real users
The KLM (Keystroke Level Model) differs from the GOMS model in that it provides numerical predictions for performance. Tasks can be compared in terms of the [expected] time it takes to perform them when using different strategies.

[Rogers et al., Interaction Design, Chapter 15, 2011]
The KLM (Keystroke Level Model) differs from the GOMS model in that it provides numerical predictions for performance. Tasks can be compared in terms of the [expected] time it takes to perform them when using different strategies.

The main benefit of making a quantitative prediction is that different features of an interface can be easily compared to see which might be the most effective for performing specific kinds of tasks.

[Rogers et al., Interaction Design, Chapter 15, 2011]
The KLM (Keystroke Level Model) differs from the GOMS model in that it provides numerical predictions for performance. Tasks can be compared in terms of the [expected] time it takes to perform them when using different strategies.

For Example

The main benefit of making a quantitative prediction is that different features of an interface can be easily compared to see which might be the most effective for performing specific kinds of tasks.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Converting Temperature

Let’s imagine we need to design an efficient interface for converting temperatures (e.g., from F to C)

How long will it take the user to complete a conversion task?

How could we find out?

[Raskin, J., The Humane Interface, Chapter 4, 2000]
Experiment

Or...
Experiment

Model
In-Class Activity Part 1

**Design** and **sketch** a temperature converter interface for converting Fahrenheit to Celsius and Celsius to Fahrenheit.

1. **Break** into groups of 2-3
2. **Spend ~5 minutes** coming up with an interface to convert a temperature to Fahrenheit or Celsius
3. **Be prepared** to discuss the thought process you used in your design
4. **Analyze your design** in terms of how long you think it will take a user to use your interface

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*(Based, in part, on activity from Professor Bederson at UMD)*
In-Class Activity Part 2

1. In your same groups of 2-3
2. Spend ~5 minutes coming up with a model for how long it will take to convert 92.5°F to Celsius.
3. How does this interface compare to your design? Which is faster?
4. Note:
   i. Dialog box is top level window and has focus (so typing goes directly into the textbox)
   ii. You must press enter to see result

[Raskin, J., The Humane Interface, Chapter 4, 2000; Based on activity from Professor Bederson at UMD]
In-Class Activity

How did we do?
What strategies did you use?
How did you “model” the task?
How accurate is your model?
How could we check it?

In-Class Activity Part 2

Temperature Converter
Choose which conversion is desired, then type the temperature and press Enter.
○ Convert F to C
○ Convert C to F

1. In your same groups of 2-3
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[Raskin, J., The Humane Interface, Chapter 4, 2000. Based on activity from Professor Bederson at UMD]
When developing the KLM, Card *et al.* (1983) analyzed the findings of many empirical studies of user performance in order to derive a standard set of approximate times for the main kinds of operators used during a task (e.g., key presses, mouse clicks).
Proposed KLM Times

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Time(s)</th>
</tr>
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<tbody>
<tr>
<td>K</td>
<td>Pressing a single key of button</td>
<td>0.35 (avg)</td>
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[Rogers et al., Interaction Design, Chapter 15, 2011; Card et al., The Psychology of Human-Computer Interaction, 1983]
The **wide variability** of each measure explains why we **cannot use this simplified model** to obtain absolute timings with any degree of certainty; by using typical values, however, we usually obtain the **correct ranking** of the **performance** times of two interface designs.


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<tr>
<td>P</td>
<td>Pointing w/a mouse or other device to a target on the display</td>
<td>1.10</td>
</tr>
<tr>
<td>P₁</td>
<td>Clicking the mouse or similar device</td>
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[Rogers et al., Interaction Design, Chapter 15, 2011; Card et al., The Psychology of Human-Computer Interaction, 1983]
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<td>0.40</td>
</tr>
<tr>
<td>D</td>
<td>Draw a line using a mouse</td>
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<td>Mentally prepare to do something</td>
<td>1.35</td>
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<td>R(t)</td>
<td>System response time—counted only if it causes the user to wait</td>
<td>t</td>
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[Sources: Rogers et al., Interaction Design, Chapter 15, 2011; Card et al., The Psychology of Human-Computer Interaction, 1983]
Performing **KLM**

The predicted time it takes to execute a task is then a sum of the performance times of each operator used.

\[
T_{\text{executed}} = T_K + T_P + T_H + T_D + T_M + T_R
\]

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[Rogers et al., Interaction Design, Chapter 15, 2011; Card et al., The Psychology of Human-Computer Interaction, 1983]
Applying KLM to our Example

Task: How long will it take to convert 92.5F to Celsius

[Card et al., The Psychology of Human-Computer Interaction, 1983; Raskin, J. The Humane Interface, 2000]

Temperature Converter

Choose which conversion is desired, then type the temperature and press Enter.

☐ Convert F to C
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1. **Move** hand to the graphical input device: \( H \)
2. **Point** to the textbox: \( HP \)
3. **Click** on the textbox: \( HPP₁ \)
4. **Move** hands back to the keyboard: \( HPP₁H \)
5. **Type** the four characters (“92.5”): \( HPP₁HKKKK \)
6. **Tap** Enter: \( HPP₁HKKKK \)
7. **Convert** to time:

\[
0.4 + 1.1 + 0.2 + 0.4 + (0.28 \times 5) = 3.5s
\]
Applying KLM to our Example

Task: How long will it take to convert 92.5°F to Celsius

Temperature Converter
Choose which conversion is desired, then type the temperature and press Enter.

○ Convert F to C
○ Convert C to F

1. Move hand to the graphical input device: $H$
2. Point to the textbox: $HP$
3. Click on the textbox: $HPP_1$
4. Move hands back to the keyboard: $HPP_1H$
5. Type the four characters (“92.5”): $HPP_1HKKKK$
6. Tap Enter: $HPP_1HKKKK$
7. Convert to time:
   
   $0.4 + 1.1 + 0.2 + 0.4 + (0.28 \times 5) = 3.5s$

[Card et al., The Psychology of Human-Computer Interaction, 1983; Raskin, J. The Humane Interface, 2000]
Heuristics for Placing M Operators

TABLE 4.1. HEURISTICS FOR PLACING MENTAL OPERATORS

Rule 0 Initial insertion of candidate M s
Insert Ms in front of all K s (keystrokes). Place Ms in front of all P s (acts of pointing with the GID) that select commands, but do not place Ms in front of any P s that point to arguments of those commands.

Rule 1 Deletion of anticipated Ms
If an operator following an M is fully anticipated in an operator just previous to that M, then delete that M. For example, if you move the GID with the intent of tapping the GID button when you reach the target of your GID move, then you delete, by this rule, the M you inserted as a consequence of rule 0. In this case, PMK becomes PK.

Rule 2 Deletion of Ms within cognitive units
If a string of M s belongs to a cognitive unit, then delete all the Ms but the first. A cognitive unit is a contiguous sequence of typed characters that form a command name or that is required as an argument to a command. For example, Y, move, Helen of Troy, or 4364.25 can be examples of cognitive units.

Rule 3 Deletion of Ms before consecutive terminators
If a K is a redundant delimiter at the end of a cognitive unit, such as the delimiter of a command immediately following the delimiter of its argument, then delete the M in front of it.

Rule 4 Deletion of Ms that are terminators of commands
If a K is a delimiter that follows a constant string—for example, a command name or any typed entity that is the same every time that you use it—then delete the M in front of it. (Adding the delimiter will have become habitual, and thus the delimiter will have become part of the string and not require a separate M.) But if the K is a delimiter for an argument string or any string that can vary, then keep the M in front of it.

Rule 5 Deletion of overlapped Ms
Do not count any portion of an M that overlaps an R—a delay, with the user waiting for a response from the computer.
Inserting Mental Operators

Task: How long will it take to convert 92.5°F to Celsius

Temperature Converter
Choose which conversion is desired, then type the temperature and press Enter.

- Convert F to C
- Convert C to F

1. **Move** hand to the graphical input device: \( H \)
2. **Point** to the textbox: \( HP \)
3. **Click** on the textbox: \( HPP_1 \)
4. **Move** hands back to the keyboard: \( HPP_1H \)
5. **Type** the four characters (“92.5”): \( HPP_1HKKKK \)
6. **Tap** Enter: \( HPP_1HKKKK \)
7. **Convert** to time:
   \[
   0.4 + 1.1 + 0.2 + 0.4 + (0.28 \times 5) = 3.5s
   \]

[Card et al., The Psychology of Human-Computer Interaction, 1983; Raskin, J. The Humane Interface, 2000]
Inserting Mental Operators

Task: How long will it take to convert 92.5°F to Celsius

1. Move hand to the graphical input device:
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2. Point to the textbox:
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3. Click on the textbox:
   \( HPP_1 \)

4. Move hands back to the keyboard:
   \( HPP_1H \)

5. Type the four characters (“92.5”):
   \( HPP_1HKKKK \)

6. Tap Enter:
   \( HPP_1HKKKK \)

7. Apply mental operators using Raskin’s heuristics:
   \( HMPP_1HMKKKKMK \)

8. Convert to time:
   \[ 0.4 + 1.35 + 1.1 + 0.2 + 0.4 + 1.35 + (0.28 \times 4) + 1.35 + 0.28 = 7.55s \]

[Card et al., The Psychology of Human-Computer Interaction, 1983; Raskin, J. The Humane Interface, 2000]
Which is a better design?

A more efficient interface is possible by taking advantage of character-at-a-time interaction and by performing both conversions at once...

Perhaps, however, the cognitive load to use this interface is higher. How about learnability?

[Raskin, J. The Humane Interface, 2000, Chapter 4]
Researchers wanting to use the KLM to predict the efficiency of key & button layout on devices have adapted it to meet the needs of these new products. For example, today, mobile device and phone developers are using KLM to determine the optimal design for keypads.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Keystroke-Level Model for Advanced Mobile Phone Interaction

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Abstract

The design of applications using mobile devices needs a different quality assurance than those known for desktop applications. Of the many aspects that have to be taken into account, one important criterion is the average user’s performance. Without using a keyboard, mouse, or touch screen, there exists models that predict interaction times, such as Fitts’ law or the Keystroke-Level Model (KLM). This paper shows how to extend these models for advanced interactions using mobile phones, as well as providing new field data for the evaluation of existing models. Mobile phones are increasingly used to enhance productivity and throughout in a variety of fields such as security or ticket sale.

In this paper we focus on time-prediction functions for the evolution of models that predict interaction times in the CHI environment using KLM in a variety of emerging application domains. Many projects in cognitive modelling such as ACT-R [2] rely on such data in the domain of mobile applications, which cannot be tested in a lab and that are too complex to model with the current methods. We did not find literature on the interaction performance of a newly designed interaction system would have been doable with the same system. This was possible without having to actually build and test the new system at all.

Introduction

Experts have shown that it is essential to involve designers and applications early in the development phase. The phone company Nynex used the Keystroke-Level Model (KLM) to predict the performance of a newly designed interaction system would have been doable with the same system. This was possible without having to actually build and test the new system at all.

Although it sometimes seems that a lack of a lack of depth, there is a need for expert user interaction analysis. Keystroke-Level Model (KLM) shows remarkable precision in interaction times in several projects (e.g., [5, 14, 23, 24, 25]). Even in cases where experimental evidence indicated that factors were considerably off the mark, differences between the measured interaction times were still a relevant and interesting factor.

This allows the evaluation of different components of the interaction model in order to improve the overall performance of the system.

Table 1: Overview of the proposed times for all operations

<table>
<thead>
<tr>
<th>Operation</th>
<th>Time (sec)</th>
<th>Motion (cm)</th>
<th>Input (bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key press</td>
<td>0.04</td>
<td>0.03</td>
<td>4</td>
</tr>
<tr>
<td>Key release</td>
<td>0.02</td>
<td>0.01</td>
<td>2</td>
</tr>
<tr>
<td>Key down</td>
<td>0.01</td>
<td>0.01</td>
<td>1</td>
</tr>
<tr>
<td>Key up</td>
<td>0.01</td>
<td>0.01</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 2: Regions of a standard mobile phone: keypad, hotkeys, and display. The Δlm operator measures eye movements between these regions.

Figure 3: Attention shift (Δlm) between the mobile phone and objects in the real world.

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Thus, a new Attention Shift operator models the time needed to shift the focus between the contents on the screen (e.g., a poster) and the real world and vice versa. The original KLM could not be used to consider this case since it assumes that the whole interaction session takes place on one single screen.

This allows the evaluation of different components of the interaction model in order to improve the overall performance of the system.

KLM Prediction

KLM predicts 122.77 seconds for the first variant of the scenario and is based on the shortest time for a given task. The model of the presented approach is based on the shortest time for a given task. The model of the presented approach is based on the shortest time for a given task. The model of the presented approach is based on the shortest time for a given task. The model of the presented approach is based on the shortest time for a given task.
**PRO's**

- Main benefit: can comparatively analyze different interfaces / prototypes easily
- No reliance on users!
- Easy to rerun on iterated interfaces
- A number of researchers reported its success for comparing efficacy

---

**CON's**

- Not as easy as HE and Cognitive Walkthroughs
- Limited scope: can only model interactions that involve a small set of highly routine data-entry type tasks
- Intended to be used only to predict expert performance
- Does not model errors, which can substantially impact performance
- Does not capture readability, learnability, aesthetic, etc.

---

[Rogers et al., Interaction Design, Chapter 15, 2011]
Genres of Assessment

**Inspection-Based Methods**
Based on the skills and experience of evaluators

**Automated Methods**
Usability measures computed by software

**Formal Methods**
Models and formulas to calculate and predict measures semi-automatically

**Empirical Methods**
Evaluation assessed by testing with real users
Genres of Assessment

- **Inspection-Based Methods**
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  Models and formulas to calculate and predict measures semi-automatically

- **Empirical Methods**
  Evaluation assessed by testing with real users
Empirical Method Questions

What sort of user study are we going to run?

Where is the study going to take place?

What is the experimental design?

What factors are to be investigated?

Who are our participants?

How many participants do we need?

How long must each study session be?

What equipment is necessary?
Most professional societies, universities, government, and other research offices require researchers to provide information about activities in which human participants will be involved. They do this to protect participants by ensuring that they are not endangered physically or emotionally and that their right to privacy is protected.

[Rogers et al., Interaction Design, Chapter 15, 2011]
Nazi Experimentation
Stanley Milgram’s Famous Obedience Experiment

[Video from ABC Primetime, Basic Instincts: The Science of Evil, 2007]
Replicating Milgram

Milgram’s work was conducted in the early 1960s before the current system of professional guidelines and IRBs was in place. It is often held up as the prototypic example of why we need policies to protect the welfare of research participants.

Jerry Bruger, Ph.D.
Professor of Psychology
Santa Clara University

[Bruger, J., Replicating Milgram, Association for Psychological Science’s Observer, 2007]
Milgram’s participants were placed in an emotionally excruciating situation in which an experimenter instructed them to continue administering electric shocks to another individual despite hearing that person’s agonizing screams of protest. The research became, as I often told my students, the study that can never be replicated.

Jerry Bruger, Ph.D.
Professor of Psychology
Santa Clara University

[Bruger, J., Replicating Milgram, Association for Psychological Science’s Observer, 2007]
HUMAN SUBJECTS DIVISION (HSD)

Search HSD

Enter keyword, doc title, or doc #

Determine
- Do my activities need IRB review?
- Is the UW the right IRB for review?
- Which application should I use?

Prepare
- Prepare an IRB Application
- Request a determination
- Develop Consent Form and process
- See list of forms

Manage
- Prepare a Status Report
- Check status
- Prepare a Modification to change your research
- Report a problem
- Close a study

New to IRB Review at UW?
HSD supports and facilitates review and approval by the Institutional Review Board (IRB), required before starting research involving human subjects.

Get Started >>

Announcements


eNews re: IRB Review, March 16, 2012 Mar 16, 2012 at 10:00am


Treatment for TB can be Guided by Patients' Genetics Feb 23, 2012 at 3:09pm


More [...]

UW Human Subjects Research

GWAS dbGSP: HSD's nationally recognized system for accessing and adding to the database of Genotypes and Phenotypes.

See the poster created by and presented at PRIM&R...
When is IRB Review Required?

All proposed research that involves (1) intervention or interaction with human subjects, (2) the collection of identifiable private data on living individuals and/or (3) data analysis of identifiable private information on living individuals requires review and approval by the IRB prior to the initiation of the research.

What is a Human subject?

A living individual about whom an investigator (whether professional or student) conducting research obtains

(1) data through intervention or interaction with the individual, or

(2) identifiable private information (45 CFR 46)

What is Research?

Research is defined by the U.S. Department Health and Human Services as “a systematic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge.” (45 CFR 46)

When in doubt, contact the IRB Manager to help determine whether a particular project is “research” as defined by the University of Maryland and by federal regulations.

When is IRB Request for Determination of Non-Human Subject or Non-Research form required?
You will be using this template for the next (last!) team assignment.
UNIVERSITY OF WASHINGTON
CONSENT FORM

MOB: COMPARING AREA POINTING AND GOAL CLOSING WITH A COMPUTER MOUSE

Researcher

Jacob O. Wobbrock, Ph.D. | Assistant Professor | The Information School
wbbrocks@uw.edu | (206) 616-2441

*Please note that we cannot ensure the confidentiality of information sent via email.

Researcher's Statement

We are asking you to be a research study. The purpose of this consent form is to give you the information you need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called "informed consent." We will give you a copy of this form for your records.

PURPOSE OF THE STUDY

The purpose of this study is to improve the accessibility of desktop computers by improving how people use the mouse in graphical user interfaces (GUIs). By studying how people use these interfaces, we are able to improve their design. Note that it is not you who is being tested in this study, but the user interface itself. You only need to do your best with each interface.

STUDY PROCEDURES

This study will ask you to perform some simple tasks using a mouse or a trackball. The tasks involve clicking on targets or moving them with a mouse cursor. You only need to do your best in each task. Remember, it is the user interface that is being tested, not you.

The time commitment for this study will be no more than 45 minutes, and may be less, depending on the user interface you are using and the exact nature of the tasks you are to perform. You may quit at any time without forfeiting your compensation for being in the study.

Before or after you use the same interface(s) we are evaluating, you will be asked to fill out a questionnaire. The questionnaire will not ask you any questions of a sensitive nature. Instead, the questions will pertain to your familiarity with computers, particular use interface(s), after you perform certain tasks with the user interface(s) under investigation, we may ask you for your opinions about the user interface(s). At any time, you may choose to answer any questions or fill in any test, inventory, questionnaire, or interview without forfeit of compensation for being in the study.

PHOTOGRAPHS OR VIDEO

We may want to photograph or video record you as you do the study tasks. We do not intend to take identifiable images of you. For example, we will record what you are doing and not record your face. If we record identifiable information about you -- for example, an image of your face or a unique tattoo -- you will have a chance to review the recording and to edit it before giving us your separate written permission to keep or to publish the identifiable information.

Even if we do not record your face or other identifiable information about you, you may review any photographs or video recordings that we make of you. You will need to request this type of review right after the session is over because images will not be linked to your name. After the session has passed, we will not be able to tell which images belong to you. Please indicate below whether or not you give your permission for the sessions to be photographed or video recorded. You may choose not to be photographed or recorded and still take part in this study.

RISKS, STRESS, OR DISCOMFORT

Subjects who participate in this study may experience some frustration, not unlike the kind of frustration many people experience from time to time when using computers. There is a possibility that this frustration may create some stress as subjects attempt to perform tasks with the user interface(s) under investigation. Also, some people feel that providing information for research is itself an invasion of privacy.

BENEFITS OF THE STUDY

You may not directly benefit from taking part in this study. Although you may not directly benefit, we hope that the findings of this study will help to develop new interfaces that will help more people be able to use desktop user interfaces on computers.

OTHER INFORMATION

Taking part in this study is voluntary. You can stop at any time. Choosing to take part in this study will not affect your career or employment standing.

Information about you is anonymous. The information you give me is not linked to your name.

The only place your name will be recorded is on the signature line below. Only researchers will have access to study information. If the findings of this study are published or presented, we will not use your name.

We will give you $ for taking part in this study.

Printed name of subject: _______________________________ Signature: _______________________________ Date: _____________

Subject's statement

This study has been explained to me. I volunteer to take part in this research. I have had a chance to ask questions. If I have questions later about the research, I can ask one of the researchers listed above. If I have questions about my rights as a research subject, I can call the Human Subjects Division at (206) 221-4088. I will receive a copy of this consent form.

I give the researchers permission to video record my hand(s) and portions of my arm(s) while using the mouse or trackball device to perform computer input. I understand that my face will not be captured, but that accidental portions of my shoulder, chest, or arms may be captured in the background. I understand that if I request it, I can receive the recordings individually after they are made and grant or deny final consent at that time.

__ Yes __ No

I give the researchers permission to video record my hand(s) and portions of my arm(s) while using the mouse or trackball device to perform computer input. I understand that my face will not be captured, but that accidental portions of my shoulder, chest, or arms may be captured in the background. I understand that if I request it, I can receive the photographs individually after they are made and grant or deny final consent at that time.

__ Yes __ No

Printed name of subject: _______________________________ Signature of subject: _______________________________ Date: _____________

Copy to: _______________________________ Researcher: _______________________________
Water Feedback Evaluation Survey

Consent Form

Hi, my name is Jon Froehlich and I'm a graduate student at the University of Washington. The survey you are about to take is for my PhD dissertation on water usage information systems. Your responses will help inform the design of future water conservation programs.

I appreciate you taking the time to fill out this survey.

Jon E. Froehlich
PhD Candidate
University of Washington

RESEARCHERS' STATEMENT
We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear by emailing jfroehl@uw.edu. After reading this form, you can decide if you want to be in the study or not. This process is called "informed consent." You can print a copy of this form for your records.

PURPOSE OF THE STUDY
We are studying how computer displays (interfaces) can help inform people about their energy, water, and gas usage in the home.

STUDY PROCEDURES
To participate in this study, you simply need to fill out the forthcoming online survey. Please try to answer each question carefully and honestly. The survey should take between 20-35 minutes to complete. At the end of the survey, we will ask you for your email address. You do not need to provide this information. Those respondents that do supply their email addresses will be entered in a raffle to win a $100 gift certificate to Amazon.com. We will not use your email for any other purpose or give out your email address to anyone for any reason.

RISKS, STRESS, OR DISCOMFORT
We do not expect any risks, stresses, or discomforts as a result of this research.

BENEFITS OF THE STUDY
Although you may not directly benefit from this study, we hope that the findings of this study will help to develop new technology that will help the environment.

OTHER INFORMATION
Taking part in this study is voluntary. You can stop filling out the survey at any time. Information about you is anonymous. The information you provide is not linked to your name.

SUBJECTS STATEMENT
This study has been explained to me. I volunteer to take part in this research. If I have questions later about the research, I can email one of the researchers listed above. If I have questions about my rights as a research subject, I can call the University of Washington Human Subjects Protection Program.

Thank you for your participation.

Jon E. Froehlich
PhD Candidate
University of Washington