CSE 440: Introduction to HCI
User Interface Design, Prototyping, and Evaluation

Lecture 08: Human Performance

James Fogarty
Eunice Jun
David Wang
Elisabeth Chin
Ravi Karkar

Tuesday / Thursday
10:30 to 11:50
Today

Some example models of human performance

Visual System
Model Human Processor
Fitts’s Law
Gestalt Principles

Biological Model
Higher-Level Model
Model by Analogy
Predict Interpretation
“Beating” Fitts’s law

It is the law, right?

\[ MT = a + b \log_2(A / W + 1) \]

So how can we reduce movement time?

Reduce A
Increase W
Fitts’s Law Related Techniques

Put targets closer together

Make targets bigger

Make cursor bigger
  - Area cursors
  - Bubble cursor

Use impenetrable edges
Fitts’s Law Related Techniques

Gravity Fields
  Pointer gets close, gets “sucked in” to target

Sticky Icons
  When within target, pointer “sticks”

Constrained Motion
  Snapping, holding Shift to limit degrees of movement

Target Prediction
  Determine likely target, move it nearer or expand it
Fitts’s Law, Edge Targets, and Touch
Fitts’s Law, Edge Targets, and Touch

Avrahami finds edge targets are actually slower with touch devices, at same physical location.

Are people border cautious?
<table>
<thead>
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Gestalt Psychology

Described loosely in the context of this lecture and associated work, not a real definition

Perception is neither bottom-up nor top-down, rather both inform the other as a whole
Gestalt Psychology

You can still see the dog...
Gestalt Psychology

You can still see the dog...
Spinning Wheel

Follow the red dots vs follow the yellow dots
Blind Spot Interpolation

Use right eye, look at letters
Painful Image Warning
Difficult to Reconcile
Proximity

Objects close to each other form a group
Proximity

Using Lies in Research
By Nate Bolt  •  March 8, 2011

While it might be an uncomfortable topic, uncovering the lies behind a product or interface can be one of the most effective ways to turn ailing projects around.

Considerations for Mobile Design (Part 2): Dimensions
By David Leggett  •  March 1, 2011

In part two of this series, David helps readers adapt their design regimes to the (typically) small screens of mobile devices. Using responsive design, our experiences adapt to a variety of conditions.

A Simple, Usable Review
By Paul Seys  •  February 24, 2011

In this detailed review, Paul Seys describes an up-and-coming UX title that's jam-packed with lessons for designers both new and established. Follow along to learn how author Giles Colborne's teaches his readers the essence of great design.
Proximity

1. Tell us about yourself...
   My Name: First Name
   Gender: - Select One -
   Birthday: - Select Month - Day Year
   I live in: United States
   Postal Code

2. Select an ID and password
   Yahoo! ID and Email: @ yahoo.com
   Password
   Re-type Password

3. In case you forget your ID or password...
   Alternate Email
   1.Security Question: - Select One -
   Your Answer
   2.Security Question: - Select One -
   Your Answer
Similarity

Objects that are similar form a group
Similarity
Proximity and Similarity
After discovering that one of these accesses a menu, people will expect they all access a menu. They are the same.
Closure

Even incomplete objects are perceived as whole

Increases regularity of stimuli
Closure

The Sims

Rainbow 6
Symmetry

Objects are perceived as symmetrical and forming around a center point.

If you fight symmetry, be sure you have a reason.
Continuity

Objects perceived as grouped when they align
Remain distinct even with overlap
Preferred over abrupt directional changes

what most people see
not this
Continuity
Models from Different Perspectives

Some example models of human performance

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Project Status

Looking Forward

2g: Design Review (1x2) Due Thursday
2h: Getting the Right Design Report Due Monday
2i: Presentations next Thursday / Friday
3a: Paper Prototype due Monday 2/13
   (bring to class on Tuesday 2/14)

Other Assignments

Reading 3 Posted, Due Friday
CSE 440: Introduction to HCI
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Lecture 09:
Paper Prototyping and Testing

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Is My Design Good?

This is not a meaningful question
  It can and will be answered with “Yes”
At least consider asking:
  “What are three good things about this design?”
  “What are three bad things about this design?”

But really the answer is “it depends”
  Remember that designs are used for tasks
  We should ask this in the context of tasks
Fidelity in Prototyping

High Fidelity
Prototypes look like the final product

Low Fidelity
Designer sketches with many details missing

We have discussed the value of staying lightweight in sketching, but this also applies to prototyping
High-Fidelity Prototypes Warp

Time and creativity
- Require precision (e.g., must choose a font)
- Specifying details takes time
- Can lose track of the big picture

Perceptions of a person reviewing or testing
- Representation communicates “finished”
- Comments often focus on color, fonts, alignment
Low-Fidelity Prototypes

Traditional methods take too long

Sketches $\rightarrow$ Prototype $\rightarrow$ Evaluate $\rightarrow$ Iterate

Instead simulate the prototype

Sketches $\rightarrow$ Evaluate $\rightarrow$ Iterate

Sketches act as prototypes

A designer “plays computer”

Other design team members observe & record

Kindergarten implementation skills reduce barriers to participation in design and testing
Sketches
Paper Prototype
Basic Materials

Heavy, white paper
Index cards
Post-its
Tape, stick glue, correction tape
Pens and markers in many colors and sizes
Overhead transparencies
Scissors, X-Acto knife
Paper Prototype

Welcome to ESP.
Your Telebears session is Tues. Sept. 21 @ 10am
Your current schedule is empty. Please click on Add a course to continue.

“Screen” faked with pre-constructed pieces
Paper Prototype

New pieces added in response to interaction
Transparencies allow flexible use of text
Paper Prototype as Communication
Paper Prototype as Evaluation
Constructing the Prototype

Set a deadline
   Do not think too long
   Instead build it, then learn and iterate as you go

Put different screen regions on cards
   Anything that moves, changes, appears/disappears

Ready responses for actions
   Have those pull-down menus already made
   Planned tasks can guide this

Use photocopier to make many versions
Constructing the Prototype

Note the sketching continues
Constructing the Prototype

Planning what is needed given tasks
Constructing the Prototype

Prototyping physical form
Constructing the Prototype

Prototyping physical form
Constructing the Prototype

Remember your target platform constraints
Constructing the Prototype

Remember your target platform constraints
Why Usability Test?

Find and fix problems in a design

- Removes the expert blind spot
- Obtain data to unify team around changes
- Uncover unexpected behaviors

Results drive changes, sometimes innovations

In the long run, this is a win-win

- Both improves design and saves money
Deciding What Data to Collect

Process data
  Observations of what people do and think
  Focused on improving this process

Summary, statistical, or bottom-line data
  Summary of what happened
  (time, errors, success)
  Focused on measurement
Deciding What Data to Collect

Process data
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Summary, statistical, or bottom-line data
  Summary of what happened
  (time, errors, success)
  Focused on measurement

Focus on process data
  Gives overview of where the problems are
  More useful than “too slow” or “too many errors”
Not a Scientific Experiment

Focus is on improving the design

- Experimental control is not as necessary
- Data measurement is not as precise
- Number of participants is fairly small

Changes can be made

- Fix the obviously broken design
- Quickly explore alternatives
- Modify the focus of testing between participants
Task-Based Usability

Set up an overall context

“We are interested in improving people’s ability to save, update, and use contacts in their phones.”

Then prescribe tasks

1. Try to find the contacts list in the phone
2. View the contact information for John Smith
3. Change John Smith’s number to 555-555-5555

Tasks can be chained to naturally lead to next
Stages of a Usability Test

Preparation
Introducing the Test
Conducting the Test
Debriefing
Analyzing the Data
Creating the Report
Preparing for a Test

Select your participants
Friends and family are not your design targets
Understand background, consider recruiting questionnaire

Prepare tasks and paper prototype

Practice to avoid “bugs” in your prototype
Usability Test Proposal

A report that contains

Objective, Description of System, Environment and Materials, Participants, Methodology, Tasks, Test Measures

Work through it with colleagues to debug test

Reuse when presenting report of testing results
Introducing the Test

Address Feelings of Judgment

“Today we are interested in learning about X. That’s where you come in!”

“I did not develop X. I just want to know what the problems are with X.”

“It is X being tested here, not you.”
Introducing the Test
Set Expectations for Process

“It is essential you think out loud while working with X. Tell me constantly what you are thinking, looking for, wondering, confused about, surprised, and so on. If you stop talking, I will prompt you to talk.”

“I will not be able to answer your questions when you start using X. Do you have any questions now?”
Conducting a Test

See the Gommol reading tips on a test session

Rettig, 1994
Talk-Aloud Prompts

“Tell me what you are trying to do.”
“Please keep talking.”
“Tell me what you are thinking.”
“Are you looking for something? What?”
“What did you expect to happen just now?”
“What do you mean by that?”

“Talk-aloud” is similar but distinct from “think-aloud”

Most do not know or care about the difference, so you may see the terms used interchangeably.
Insight Problems

When people are trying to figure something out, talking aloud can prevent needed “insight”

If your participant is really baffled, it might not be the best time to prompt them to keep talking

Wait for a natural break, and then ask “What were you thinking just there?”

Retrospective talk-aloud

Record session, talk through immediately afterward
Answering Questions

Remember the purpose of this test

- You would not be there “in real life”
- You want to see if they can figure it out
- You want to see how hard it is
- You want to see how catastrophic the outcome is

But you do not want to punish the person or completely undermine the rest of the session

- Note any help you provide as a major failure
- Do not allow observing engineers to help
Debriefing

Give them more details about what you were interested in discovering, with their help

Answer any questions they have

Now you can show them how to accomplish the tasks, talk about what you learned from the test

Thank them for their time

Appropriate to give some compensation
Analyzing and Reporting the Results

Tests yield many forms of data

Quantitative counts
  time, success/failure
  confusions, errors, workarounds

Observations
  notes about when, where, why, how above occur

Participant comments and feedback
  during session of via a questionnaire
Analyzing and Reporting the Results

Summarize the data

Make a list of critical incidents
- can be positive and negative
- include references back to original data
- try to judge why each difficulty occurred

Sort and prioritize findings
- what does data tell you
- what are the important results
- anything missing from test
Careful Certain Temptations

- Take a photo of your wireframe sketch
- Add clickable areas and transitions between screens
- "Use" the prototype on your own device
Ethical Considerations

Testing is stressful, can be distressing
  people can leave in tears
You have a responsibility to alleviate
  make voluntary with informed consent
  avoid pressure to participate
  let them know they can stop at any time
  stress that you are testing the system, not them
  make collected data as anonymous as possible
Human Subjects Approvals

Research requires human subjects review of process

This does not formally apply to your design work

But understand why we do this and check yourself

Companies are judged in the eye of the public

Public Announcement

WE WILL PAY YOU $4.00 FOR ONE HOUR OF YOUR TIME

Persons Needed for a Study of Memory

*We will pay five hundred New Haven men to help us complete a scientific study of memory and learning. The study is being done at Yale University.

*Each person who participates will be paid $4.00 (plus $0.50 for carfare) for approximately 1 hour's time. We need you for only one hour; there are no further obligations. You may choose the time you would like to come (evenings, weekdays, or weekends).

*No special training, education, or experience is needed. We want:

Factory workers  Businessmen  Construction workers
City employees  Clerks  Salespeople
Laborers  Professional people  White-collar workers
Barbers  Telephone workers  Others

All persons must be between the ages of 20 and 50. High school and college students cannot be used.

*If you meet these qualifications, fill out the coupon below and mail it now to Professor Stanley Milgram, Department of Psychology, Yale University, New Haven. You will be notified later of the specific time and place of the study. We reserve the right to decline any application.

*You will be paid $4.00 (plus $0.50 for carfare) as soon as you arrive at the laboratory.

TO:
PROF. STANLEY MILGRAM, DEPARTMENT OF PSYCHOLOGY,
YALE UNIVERSITY, NEW HAVEN, CONN. I want to take part in this study of memory and learning. I am between the ages of 20 and 50. I will be paid $4.00 (plus $0.50 for carfare) if I participate.

NAME (Please Print) ..................................................

ADDRESS ..........................................................

TELEPHONE NO. ......................... Best time to call you ......

AGE ................ OCCUPATION .................. SEX ........

CAN YOU COME:

WEEKDAYS ........ EVENINGS ........ WEEKENDS ........
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