

Introduction to HCI Research

CS6501: Human-Computer Interaction

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Fall 2020, Department of Computer Science

Video Recording

- **All zoom classes will be video-recorded** for students who cannot join live meetings
- Recorded videos will be uploaded to Collab and only enrolled students will be able to access them
- We will have student presentations and discussions – so you may appear on the video. If you want your video to be masked or removed, please tell me after class

**Feel free to jump in and ask me any questions or
give any feedback to your peers**



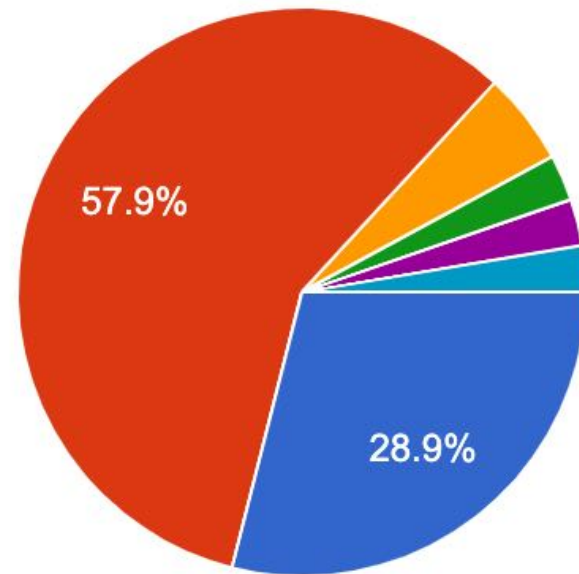
**Tip: Press and hold space bar key to temporarily
unmute your microphone**

Thanks for taking time to fill the survey

- About 18% of us are PhD students
- About 8% of us are from
Computer Engineering or Systems Engineering

Have you taken any HCI or related courses before?

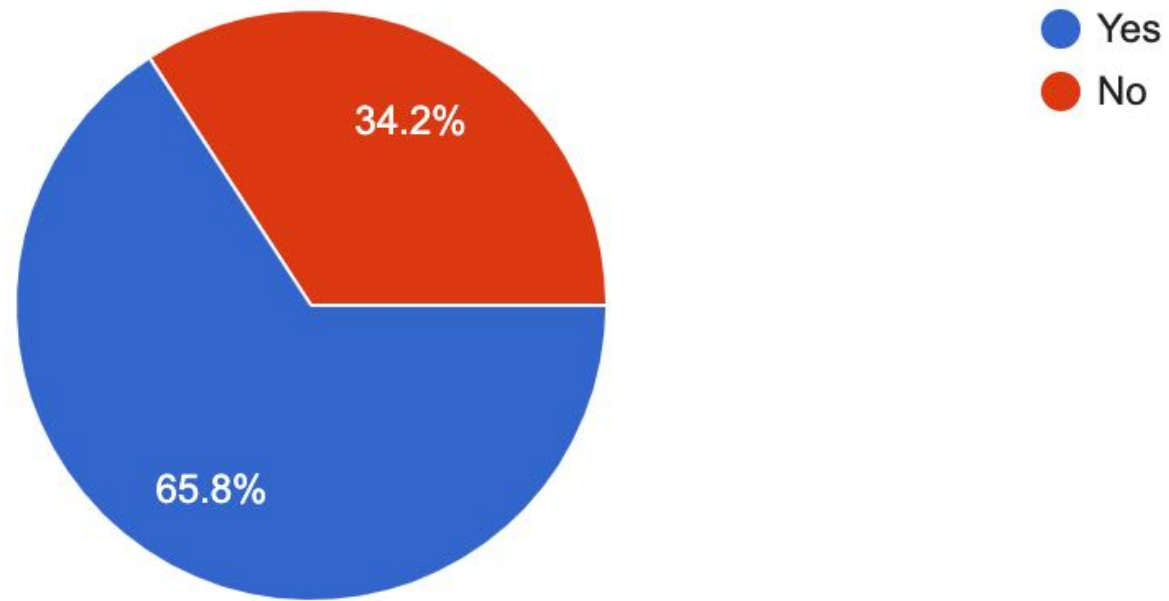
38 responses



- Yes
- No
- I took several lectures in the last semester
- EIT
- Undergraduate "Interactive Design"
- My undergraduate degree was in Cognitive Science (and Chemistry), where I studied both Cognitive Psychology and Computer Science. AI...

Have you written any research papers before?

38 responses



What motivated you to take this course?

38 responses

“The Professor is nice :) I'm interested in learning how to make machine learning tools more accessible”

“My previous research project requires some HCI user studys, and I want to strengthen my skills in this area. Also I am very interested in some of the HCI topics as well.”

“Want to build some cool project by the end of the semester.”

“I am fascinated by and highly interested in how humans interact with technology, and how to make those interactions better.”

What motivated you to take this course?

38 responses

“I want to get more involved with web development.”

“Trying to have some basic knowledge of HCI.”

“Being a web developer myself, I want to get a sense of designing user friendly websites”

“I've uses many unintuitive interfaces and would like to learn to create something better”

Anything you'd like to ask the instructor?

12 responses

“I like turtles” **????**

Is there a particular design you have seen that you find to be a great example of what HCI is about?

We'll see some great examples over the semester

Will you show lots of interesting demo like last semester?

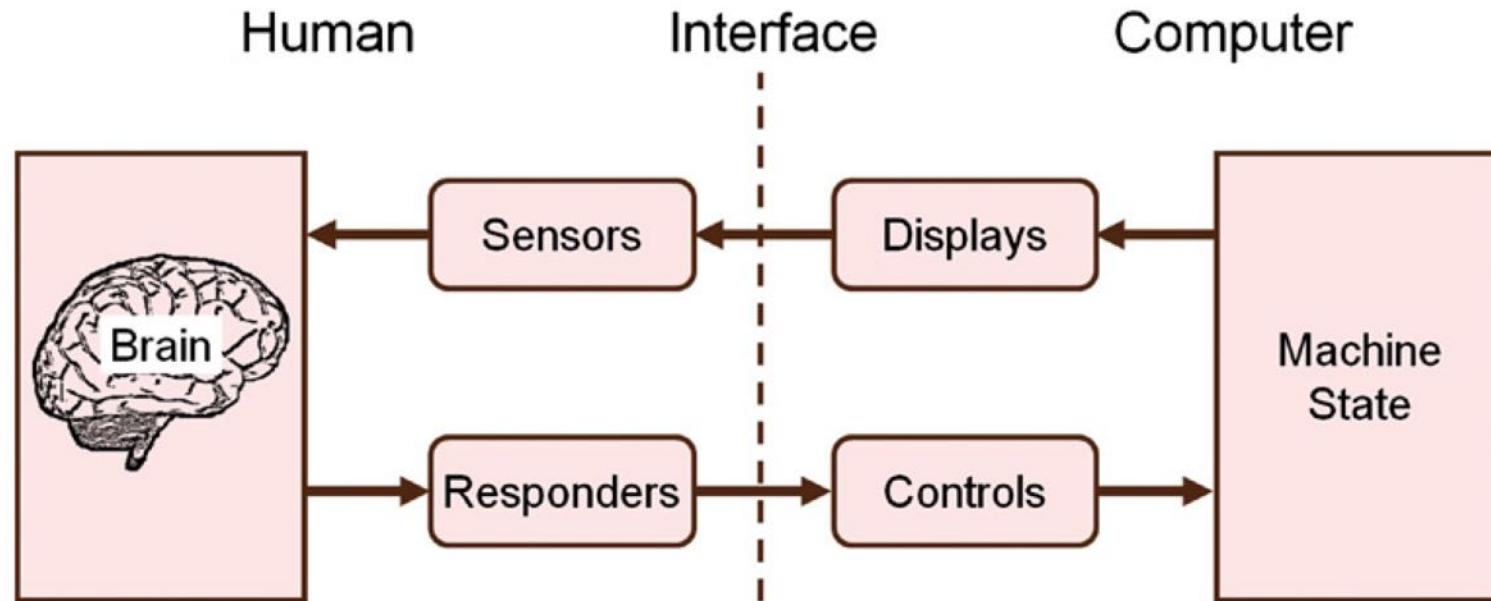
Maybe but there will be less of them

Which requirement does HCI course fill for Masters? Is it CPS/embedded systems? **YES**

Human-Computer Interaction?

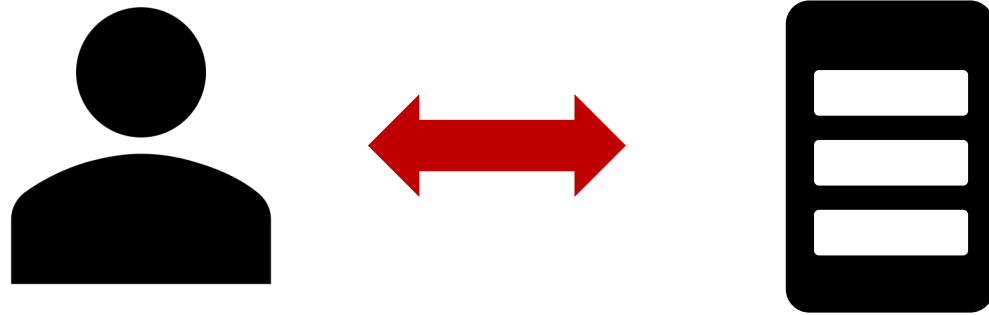
What is Human-Computer Interaction?

Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

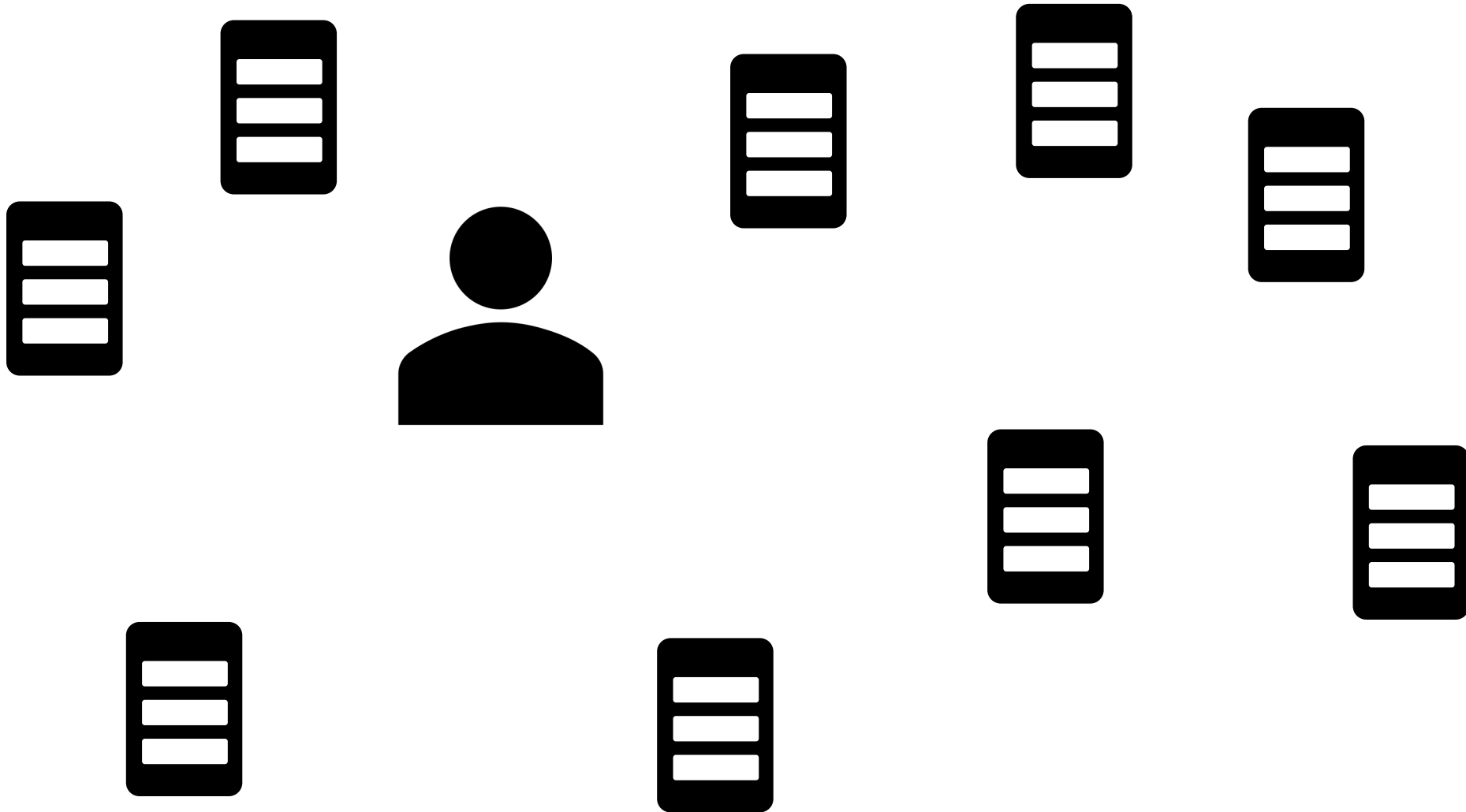


Kantowitz, B. H., & Sorkin, R. D. (1983).
Human factors: Understanding People-System Relationships

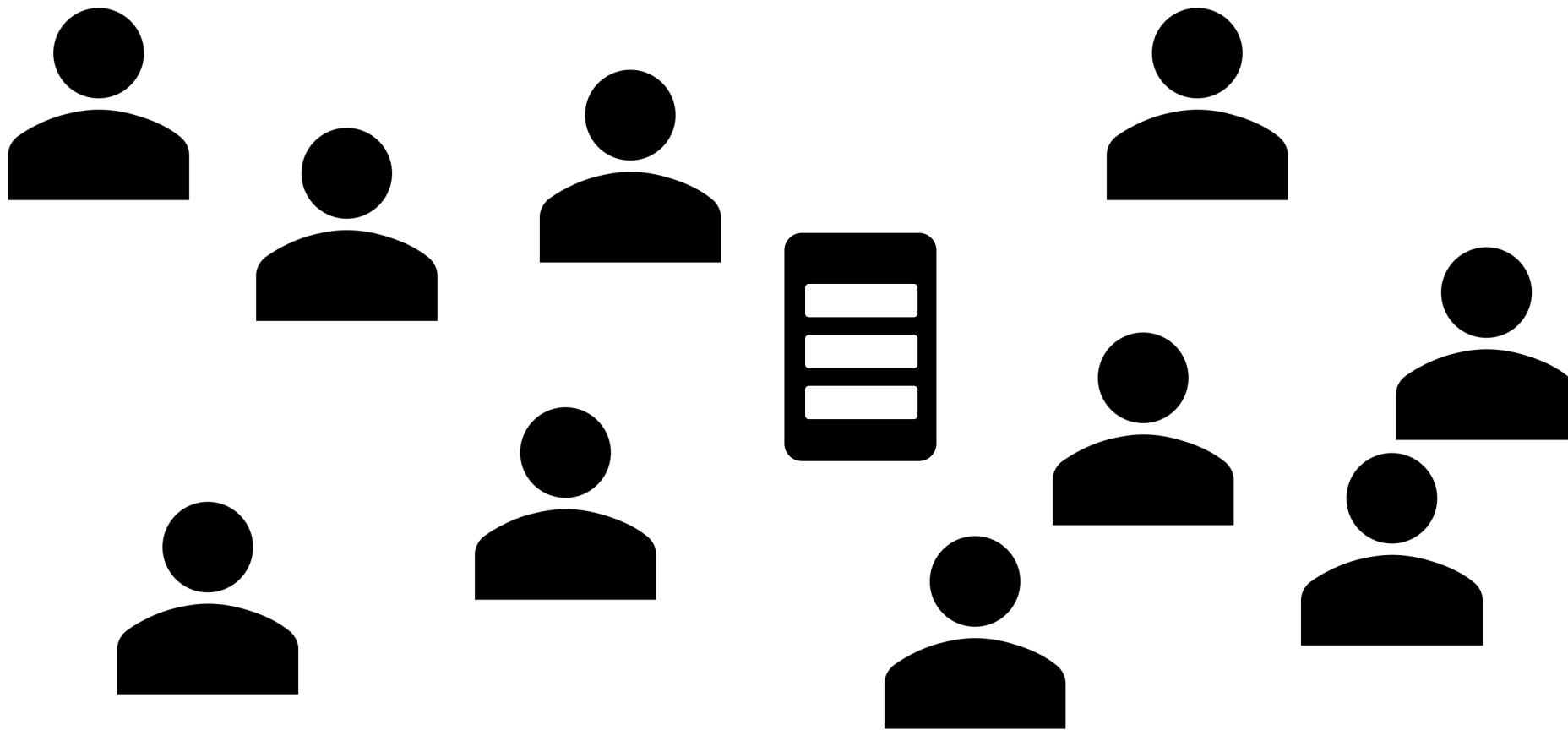
What is Human-Computer Interaction?



Ubiquitous Computing, Internet of Things



Social Computing, Crowdsourcing

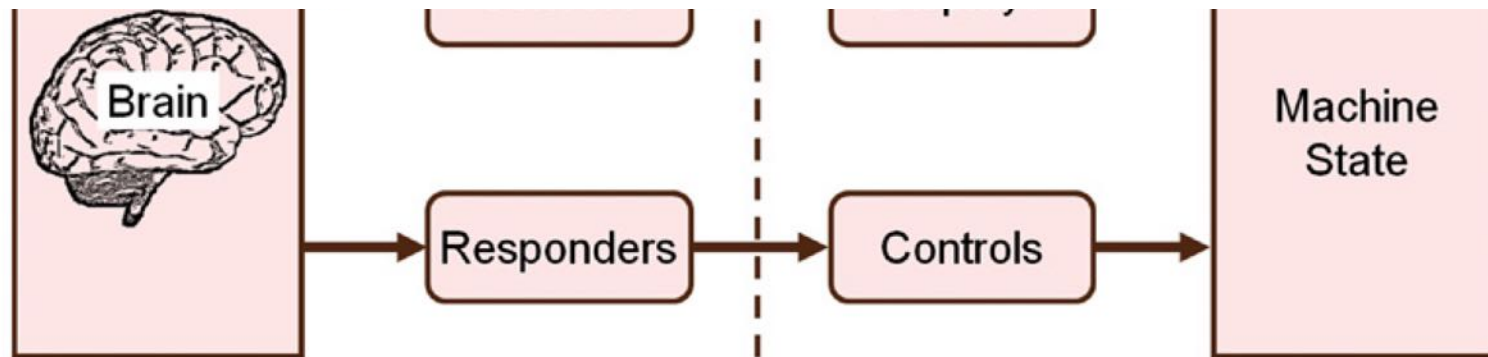


What is Human-Computer Interaction Research?

What is Human-Computer Interaction?

Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

Research is about creating knowledge

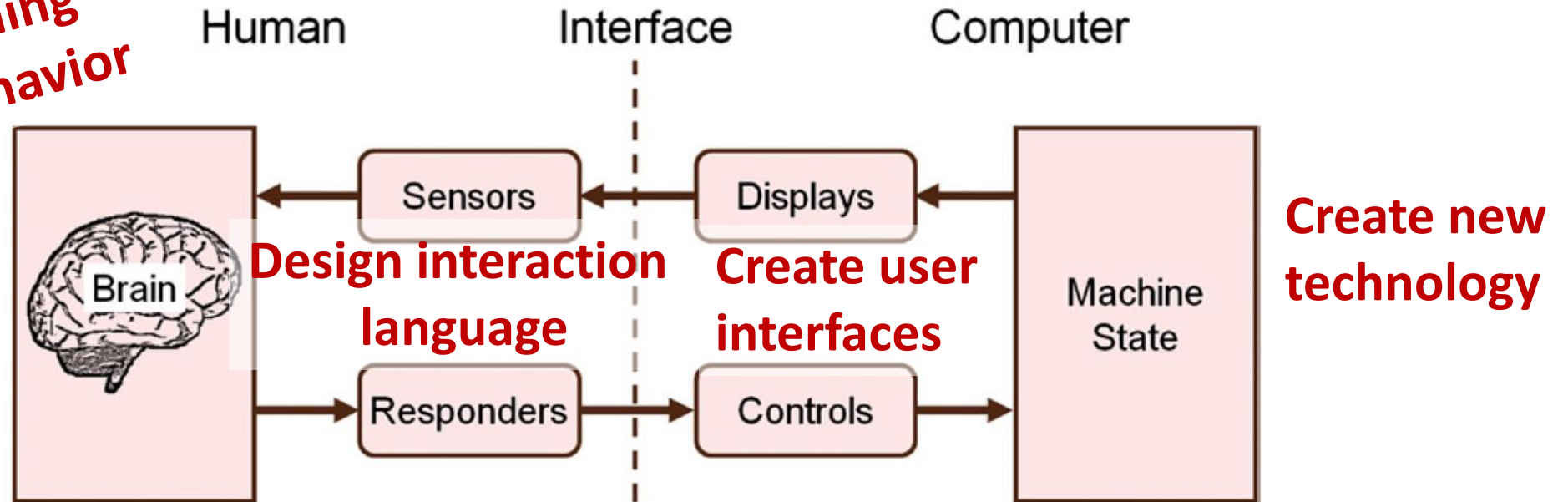


Kantowitz, B. H., & Sorkin, R. D. (1983).
Human factors: Understanding People-System Relationships

What is Human-Computer Interaction?

Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

**Understanding
human behavior**



Kantowitz, B. H., & Sorkin, R. D. (1983). *Human factors: Understanding People-System Relationships*. **Develop evaluation methods**

Seven Research Contributions in HCI

- Empirical Research Contributions
- Artifact Contributions
- Methodological Contributions
- Theoretical Contributions
- Dataset Contributions
- Survey Contributions
- Opinion Contributions

Jacob O. Wobbrock and Julie A. Kientz. 2016. Research contributions in human-computer interaction. *Interactions* 23, 3 (April 2016), 38-44.

Seven Research Contributions in HCI

- Empirical Research Contributions
- Artifact Contributions
- Methodological Contributions
- Theoretical Contributions

Jacob O. Wobbrock and Julie A. Kientz. 2016. Research contributions in HCI. *CHI 2016*, April 28–30, 2016, San Jose, CA, USA. 38–44.

CHI 2018 Paper

CHI 2018, April 21–26, 2018, Montréal, QC, Canada

You Watch, You Give, and You Engage: A Study of Live Streaming Practices in China

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ABSTRACT

Despite gaining traction in North America, live streaming has not reached the popularity it has in China, where live-streaming has a tremendous impact on the social behaviors of users. To better understand this socio-technological phenomenon, we conducted a mixed methods study of live streaming practices in China. We present the results of an online survey of 527 live streaming users, focusing on their broadcasting or viewing practices and the experiences they find most engaging. We also interviewed 14 active users to explore their motivations and experiences. Our data revealed the different categories of content that was broadcasted and how varying aspects of this content engaged viewers. We also gained insight into the role reward systems and fan group-chat play in engaging users, while also finding evidence that both viewers and streamers desire deeper channels and mechanisms for interaction in addition to the commenting, gifting, and fan groups that are available today.

Author Keywords

Live streaming; social media; user engagement; social network.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

In recent years, the proliferation of mobile devices equipped with high definition cameras and high-speed internet has led to a surge of individuals making live streams. These *live streams* are supported by software that enables anyone to share their experiences at live events,

popularity of Twitch.tv, live streaming in North America has only recently begun to enter into mainstream culture, through the advent of Facebook Live, YouTube Live, and Periscope [7,18,33]. Although a few research projects have focused on understanding the live streaming phenomenon, they have been largely confined to understanding North American usage [7,8,18,26,33]. The present work, however, casts a lens on a country and culture that has almost ubiquitous live streaming usage: China.

The continuous growth of live streaming in China has resulted in more than 200 million viewers watching streamers perform live each night on more than 200 live streaming platforms, creating an estimated 5-billion-dollar industry in 2017 [23]. Chinese live streams differ greatly in content, style, and form compared to those in North America and Europe. Previous studies of US and Canadian live streaming have found that live streaming was almost exclusively for live events [7,33] or sharing among close friends [18]. In contrast, Chinese users utilize live streaming for a wide array of uses, such as *pan-entertainment* (i.e. so-called “showroom performances” of singing, dancing, music instruments, and talk shows hosted and performed by individual streamers), e-commerce, personal knowledge sharing, and personal experience sharing [42]. Although differences in live streaming activities have been identified, there is little understanding as to why these differences exist, what makes live streaming activities so engaging and popular in China, and what we as the designers of live streaming platforms can learn from their use.

To better understand this socio-technological phenomenon,

Seven Research Contributions in HCI

- Empirical Research Contributions
- **Artifact Contributions**
- Methodological Contributions
- Theoretical Contributions

Jacob O. Wobbrock and Julie A. Kientz. 2016. Research on Mobile Interactions 23, 3 (April 2016), 38-44.

Sensing Techniques for Mobile Interaction

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ABSTRACT

We describe sensing techniques motivated by unique aspects of human-computer interaction with handheld devices in mobile settings. Special features of mobile interaction include changing orientation and position, changing venues, the use of computing as auxiliary to ongoing, real-world activities like talking to a colleague, and the general intimacy of use for such devices. We introduce and integrate a set of sensors into a handheld device, and demonstrate several new functionalities engendered by the sensors, such as recording memos when the device is held like a cell phone, switching between portrait and landscape display modes by holding the device in the desired orientation, automatically powering up the device when the user picks it up the device to start using it, and scrolling the display using tilt. We present an informal experiment, initial usability testing results, and user reactions to these techniques.

Keywords

Input devices, interaction techniques, sensing, context-awareness, mobile devices, mobile interaction, sensors

INTRODUCTION

The rapidly growing market for mobile devices such as personal information managers (PIM's: tablet, pocket, and credit-card sized), cellular telephones, pagers, watches, and wearable computers offers a tremendous opportunity to introduce interface design innovations to the marketplace. Compared to desktop computers, the use of PIM's is more intimate because users often carry or even wear PIM's throughout their daily routine, so they present HCI design opportunities for a more intimate user experience.

People also use mobile devices in many different and changing environments, so designers don't have the luxury of forcing the user to "assume the position"¹ to work with a device, as is the case with desktop computers. For example, the user must accept qualities of the environment such as

detect these important events and properties of the physical world can be viewed as missed opportunities, rather than the basis for leveraging deeper shared understanding between human and computer. Indeed, Buxton has observed that much technological complexity results from forcing the user to explicitly maintain the context of interaction [3].

Proximity range sensor:

Infrared (IR) receiver

IR emitter (below receiver to right)

Touch sensitivity:

Screen bezel
On sides & back of device

Tilt sensor:

Inside device, in plane of the display
2-axis linear accelerometer



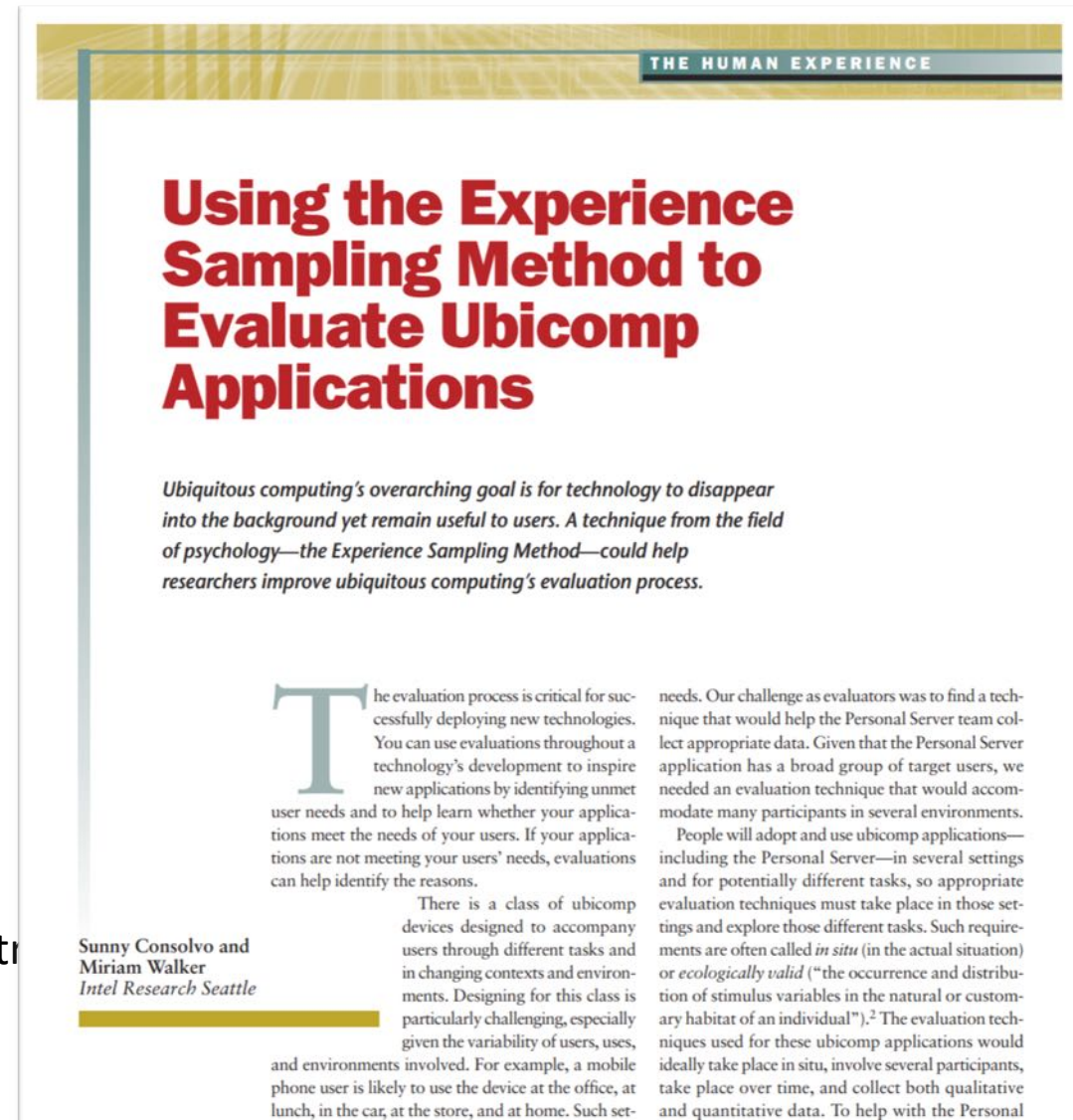
Fig. 1 Our prototype device, a Cassiopeia E105 Palm-sized PC. It is augmented with a proximity range sensor, touch sensitivity, and a two-axis tilt sensor.

Furthermore, the set of natural and effective gestures—the tokens that form the building blocks of the interaction design—may be very different for mobile devices than for desktop computers. Over the course of a day, users may pick up, put down, look at, walk around with, and put away (pocket/case) their mobile device many times; these are naturally occurring “gestures” that can and perhaps should become an integral part of interaction with the device.

Seven Research Contributions in HCI

- Empirical Research Contributions
- Artifact Contributions
- **Methodological Contributions**
- Theoretical Contributions

Jacob O. Wobbrock and Julie A. Kientz. 2016. Research contributions in HCI. *CHI 2016*. ACM, New York, NY, 38-44.



Seven Research Contributions in HCI

- Empirical Research Contributions
- Artifact Contributions
- Methodological Contributions
- **Theoretical Contributions**

Jacob O. Wobbrock and Julie A. Kientz. 2016. Research contributions in HCI. *Interactions* 23, 3 (April 2016), 38-44.

CHI '90 Proceedings

April 1990

THE DESIGN SPACE OF INPUT DEVICES

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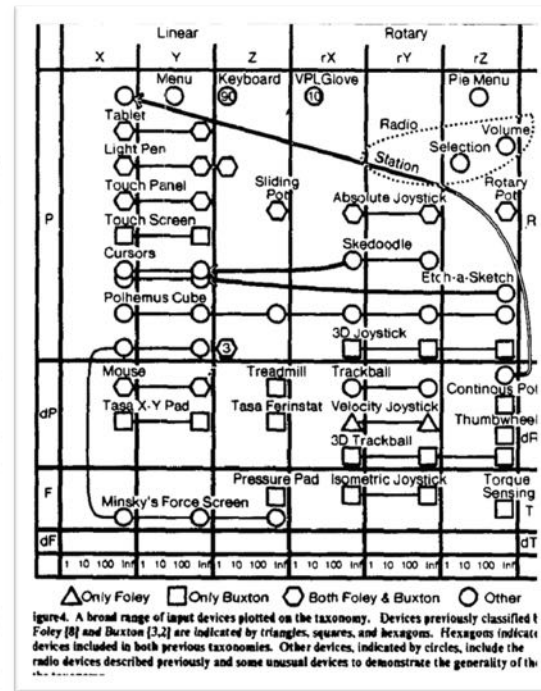
ABSTRACT

A bewildering variety of devices for communication from humans to computers now exists on the market. In order to make sense of this variety, and to aid in the design of new input devices, we propose a framework for describing and analyzing input devices. Following Mackinlay's semantic analysis of the design space for graphical presentations, our goal is to provide tools for the generation and test of input device designs. The descriptive tools we have created allow us to describe the semantics of a device and measure its *expressiveness*. Using these tools, we have built a taxonomy of input devices that goes beyond earlier taxonomies of Buxton & Baecker and Foley, Wallace, & Chan. In this paper, we build on these descriptive tools, and proceed to the use of human performance theories and data for evaluation of the *effectiveness* of points in this design space. We focus on two figures of merit, footprint and bandwidth, to illustrate this evaluation. The result is the systematic integration of methods for both generating and testing the design space of input devices.

KEYWORDS: Input devices, semantics, design knowledge systematization.

INTRODUCTION

Human-machine interface technology has developed to the point where it is appropriate to systematize existing research results and craft into a body of engineering and design knowledge. A case in point is the design of input devices. A bewildering variety of such devices now exist on the market, including typewriters, keyboards, mice,



Seven Research Contributions in HCI

Short Talk: Fitt's Law & Text Input

CHI 2003: NEW HORIZONS

Phrase Sets for Evaluating Text Entry Techniques

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ABSTRACT

In evaluations of text entry methods, participants enter phrases of text using a technique of interest while performance data are collected. This paper describes and publishes (via the internet) a collection of 500 phrases for such evaluations. Utility programs are also provided to compute statistical properties of the phrase set, or any other phrase set. The merits of using a pre-defined phrase set are described as are methodological considerations, such as attaining results that are generalizable and the possible addition of punctuation and other characters.

TEXT ENTRY EVALUATIONS

Among the desirable properties of experimental research are *internal validity* and *external validity*. Internal validity is attained if the effects observed are attributable to controlled variables. External validity means the results are generalizable to other subjects and situations. Simple as this seems, these attributes are typically at odds with one another. That is, too strictly attending to one tends to compromise the other. This paper pertains to one such point of tension between internal and external validity: the text entered by the participants in evaluations of text entry techniques.

Text entry research typically pits one entry method against another. Thus, *entry method* is the controlled variable, and it is manipulated over two or more levels, for example, *Multitap* vs. *Letterwise* in an experiment comparing text entry techniques for mobile phones [2], or *Qwerty* vs. *Opti* in an experiment comparing soft keyboard layouts [3].

Allowing participants to freely enter “whatever comes to mind” seems desirable, since this mimics typical usage. Such a procedure improves external validity since the results are generalizable. Although of unquestionable

text with which to compare the entered text. Also, the lack of control means performance measurements are coincident with spurious behaviours, such as *pondering* or *secondary tasks*. Thus, sources of variation are present in the dependent variables (e.g., speed or accuracy) that are not attributable to the controlled variable. This compromises internal validity because variations in measurements are, in part, due to other effects.

On balance, the preferred procedure – that used in the majority of research studies – is to present participants with pre-selected phrases of text. Phrases are retrieved randomly from a set and are presented to participants one by one to enter.

Creating a Phrase Set

In creating a phrase set, the goal is to use phrases that are moderate in length, easy to remember, and representative of the target language.

In a recent paper comparing two soft keyboards, MacKenzie and Zhang [3] used a set of 70 phrases. We recently expanded this set to 500 phrases. A few examples from the set follow:

```
video camera with a zoom lens  
have a good weekend  
what a monkey sees a monkey will do  
that is very unfortunate  
the back yard of our house  
I can see the rings on Saturn  
this is a very good idea
```

We have used the new phrase set with good results in recent studies [1, 5], and wish to share them with the community of text entry researchers via this paper.

The phrases contain no punctuation symbols, and just a few instances of uppercase characters. (Participants may

- ons
- Dataset Contributions
- Survey Contributions
- Opinion Contributions

Research contributions in human-computer interaction.

Seven Research Contributions in HCI

Finding Common Ground: A Survey of Capacitive Sensing in Human-Computer Interaction

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ABSTRACT

For more than two decades, capacitive sensing has played a prominent role in human-computer interaction research. Capacitive sensing has become ubiquitous on mobile, wearable, and stationary devices—enabling fundamentally new interaction techniques on, above, and around them. The research community has also enabled human position estimation and whole-body gestural interaction in instrumented environments. However, the broad field of capacitive sensing research has become fragmented by different approaches and terminology used across the various domains. This paper strives to unify the field by advocating consistent terminology and proposing a new taxonomy to classify capacitive sensing approaches. Our extensive survey provides an analysis and review of past research and identifies challenges for future work. We aim to create a common understanding within the field of human-computer interaction, for researchers and practitioners alike, and to stimulate and facilitate future research in capacitive sensing.

Author Keywords

survey; capacitive sensing; electric field sensing

ACM Classification Keywords

H.5.2. Information Interfaces and Presentation: User Interfaces - Graphical user interfaces; Input devices & strategies

INTRODUCTION

Capacitive sensing has become so ubiquitous that it is hard to imagine the world without it. We are surrounded by capacitive sensors—from the touchscreens and touchpads on our phones, tablets, and laptops, to the capacitive “buttons” frequently used on consumer electronics devices and com-

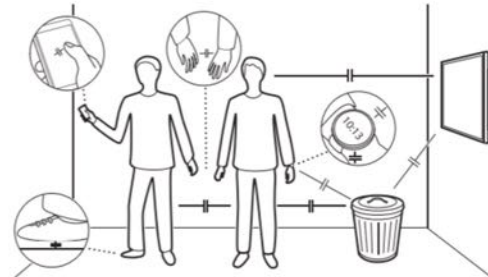


Figure 1. Capacitance (+) naturally exists between people, their devices, and conductive objects in the environment. By measuring it, capacitive sensors can infer the position and proximity of users and other objects, supporting a range of different applications. However, this inherent capacitive coupling between objects also increases ambiguity of sensor readings and adds noise.

products, the use of capacitive sensing is common in human-computer interaction research, with examples ranging from grasp detection to the estimation of human positioning.

As shown in Figure 1, a plethora of natural capacitances exist between the people, devices and objects in the environment. It is important to realize that the capacitances shown in the figure are not capacitor components purchased from an electronics supplier. Instead, they represent the natural *capacitive coupling* between various objects. By measuring these ever-changing values it is possible to infer relative position, motion and more—supporting a multitude of interaction techniques and applications. The small size, low cost, and low power aspects of capacitive sensing make it an appealing technology for both products and research prototypes. Furthermore, its ability to support curved, flexible, and stretchable surfaces has enabled interaction designers to work with non-rigid ob-

ons

- Dataset Contributions
- Survey Contributions
- Opinion Contributions

research contributions in human-computer interaction.

Seven Research Contributions in HCI

CHI 2008 Proceedings · Usability Evaluation Considered Harmful?

April 5-10, 2008 · Florence, Italy

Usability Evaluation Considered Harmful (Some of the Time)

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ABSTRACT

Current practice in Human Computer Interaction as encouraged by educational institutes, academic review processes, and institutions with usability groups advocate usability evaluation as a critical part of every design process. This is for good reason: usability evaluation has a significant role to play when conditions warrant it. Yet evaluation can be ineffective and even harmful if naively done 'by rule' rather than 'by thought'. If done during early stage design, it can mute creative ideas that do not conform to current interface norms. If done to test radical innovations, the many interface issues that would likely arise from an immature technology can quash what could have been an inspired vision. If done to validate an academic prototype, it may incorrectly suggest a design's scientific worthiness rather than offer a meaningful critique of how it would be adopted and used in everyday practice. If done without regard to how cultures adopt technology over time, then today's reluctant reactions by users will forestall tomorrow's eager acceptance. The choice of evaluation methodology – if any – must arise from and be appropriate for the actual problem or research question under consideration.

Author Keywords

Usability testing, interface critiques, teaching usability.

ACM Classification Keywords

H5.2. Information interfaces and presentation (e.g., HCI): User Interfaces (Evaluation/Methodology).

In 1968, Dijkstra wrote 'Go To Statement Considered Harmful', a critique of existing programming practices that eventually led the programming community to adopt structured programming [8]. Since then, titles that include the phrase 'considered harmful' signal a critical essay that

INTRODUCTION

Usability evaluation is one of the major cornerstones of user interface design. This is for good reason. As Dix et al., remind us, such evaluation helps us "assess our designs and test our systems to ensure that they actually behave as we expect and meet the requirements of the user" [7]. This is typically done by using an evaluation method to measure or predict how effective, efficient and/or satisfied people would be when using the interface to perform one or more tasks. As commonly practiced, these usability evaluation methods range from laboratory-based user observations, controlled user studies, and/or inspection techniques [7,22,1]. The scope of this paper concerns these methods.

The purpose behind usability evaluation, regardless of the actual method, can vary considerably in different contexts. Within product groups, practitioners typically evaluate products under development for 'usability bugs', where developers are expected to correct the significant problems found (i.e., iterative development). Usability evaluation can also form part of an acceptance test, where human performance while using the system is measured quantitatively to see if it falls within an acceptable criteria (e.g., time to complete a task, error rate, relative satisfaction). Or if the team is considering purchasing one of two competing products, usability evaluation can determine which is better at certain things.

Within HCI research and academia, researchers employ usability evaluation to validate novel design ideas and systems, usually by showing that human performance or work practices are somehow improved when compared to some baseline set of metrics (e.g., other competing ideas), or that people can achieve a stated goal when using this system (e.g., performance measures, task completions), or that their processes and outcomes improve.

- Dataset Contributions
- Survey Contributions
- Opinion Contributions

arch contributions in human-computer interaction.

Seven Research Contributions in HCI

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Jacob O. Wobbrock and Julie A. Kientz. 2016. Research contributions in human-computer interaction. *Interactions* 23, 3 (April 2016), 38-44.

How to Conduct HCI Research?

Research Methods

- Observational Method
- Experimental Method
- Correlational Method

Research Methods

- Observational Method
 - Observe humans interacting with computers in a natural setting
 - Using interviews, field investigations, case studies, focus groups, etc.
 - Tends to be qualitative
 - High relevance, but sacrifices precision
- Experimental Method
- Correlational Method

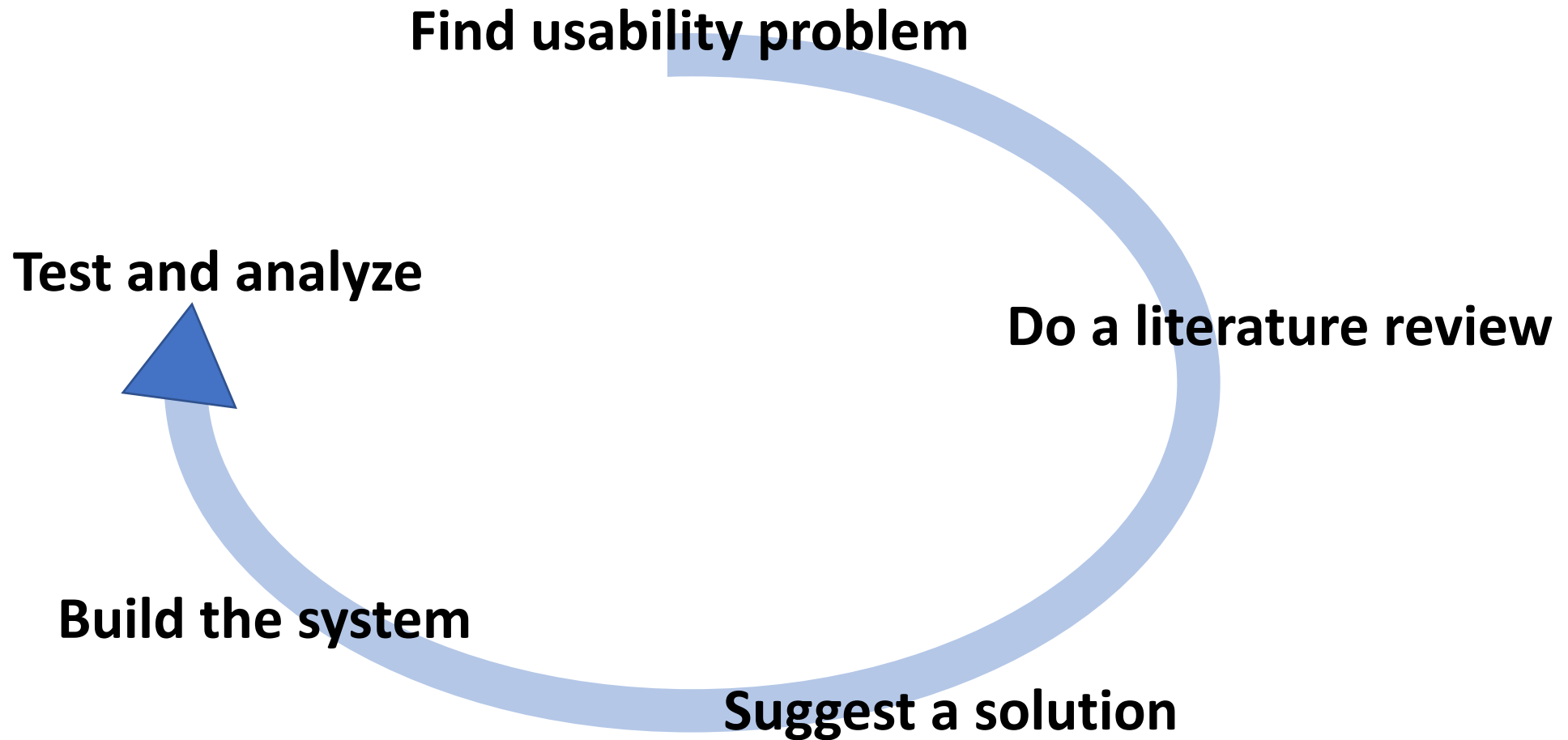
Research Methods

- Observational Method
- Experimental Method
 - Acquire knowledge through controlled lab experiments.
 - Tests if changes to a manipulated variable result in changes to a response variable.
 - High precision, low relevance.
- Correlational Method

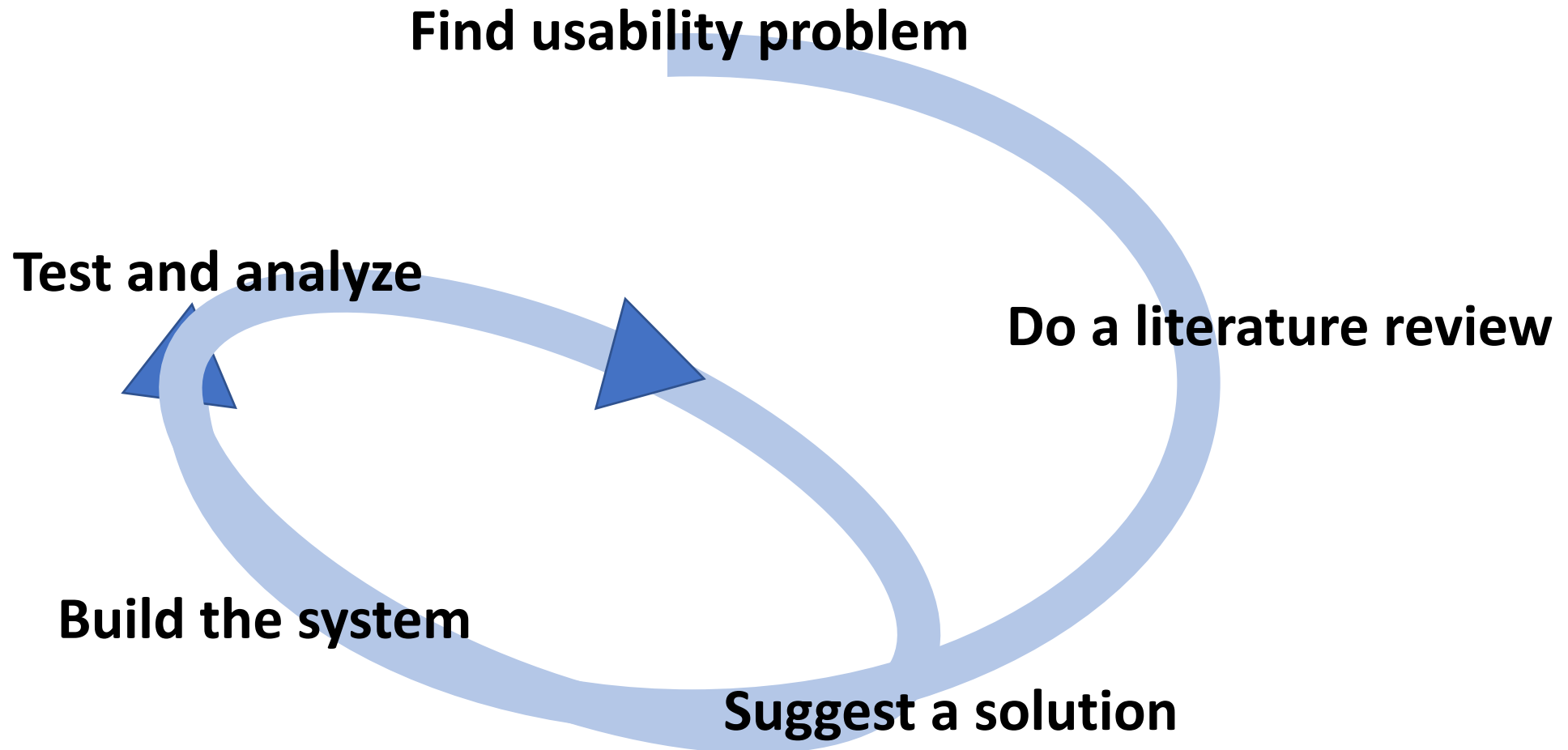
Research Methods

- Observational Method
- Experimental Method
- Correlational Method
 - Look for relationships between variables.
 - Uses data collected through variety of methods, e.g., interviews, surveys, questionnaires, etc.
 - Provides a balance between relevance and precision

Conducting HCI Research



Conducting HCI Research



Step-by-step guide with an example

Crowdsourcing Step-by-Step Information Extraction to Enhance Existing How-to Videos

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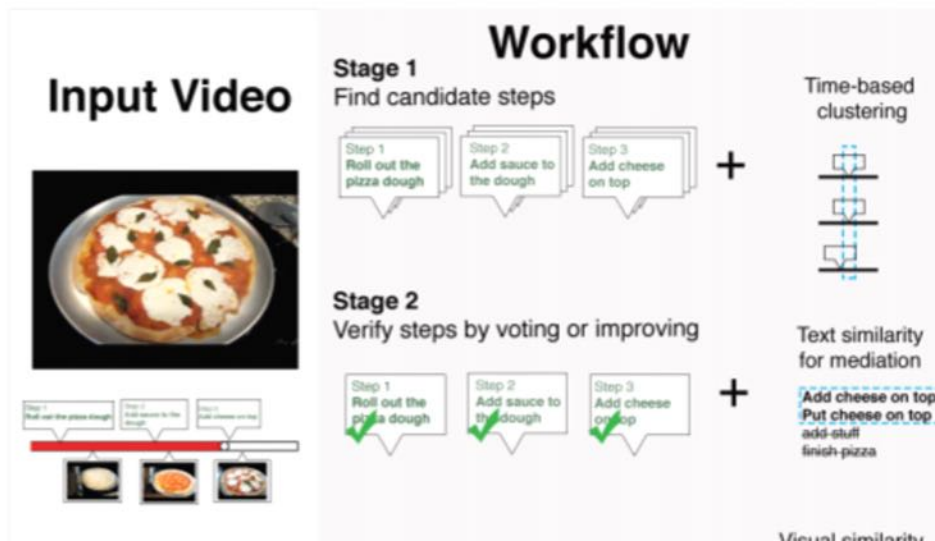
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ABSTRACT

Millions of learners today use how-to videos to master new skills in a variety of domains. But browsing such videos is often tedious and inefficient because video player interfaces are not optimized for the unique step-by-step structure of such videos. This research aims to improve the learning experience of existing how-to videos with *step-by-step annotations*.

We first performed a formative study to verify that annotations are actually useful to learners. We created ToolScape, an interactive video player that displays step descriptions and intermediate result thumbnails in the video timeline. Learners in our study performed better and gained more self-efficacy



Finding usability problem

- Find usability problems
- Can be found by observing people or reviewing literature
- Needs to be specific
 - Who is the target user
 - What is the task
- Make a problem statement
 - E.g. it is difficult for learners watching online how-to-videos to browse the video

Do a literature review

- Don't reinvent the wheel
Know what other researchers have done and build your work upon it.
- Survey papers can be helpful if there's one.
- Use keyword search or browse proceedings.
- Google Scholar is your friend.
<http://scholar.google.com>

**"If I have seen further it is by standing on the
shoulders of Giants."**

-Isaac Newton in 1675

Do a literature review

- Finding papers using Google Scholar:

Keywords

online video annotation

Google Scholar

Articles

About 261,000 results (0.09 sec)

Refine by time

Any time

Since 2019

Since 2018

Since 2015

Custom range...

Proceeding / journal name

Sort by relevance

Sort by date

☒ include patents

☒ include citations

☐ Create alert

VideoANT: Extending online video annotation beyond content delivery

B Hosack - TechTrends, 2010 - Springer

This paper expands the boundaries of **video annotation** in education by outlining the need for extended interaction in **online video** use, identifying the challenges faced by existing **video annotation** tools, and introducing **Video-ANT**, a tool designed to create text-based ...

Cited by 39 Related articles All 8 versions Web of Science: 12

Video scene retrieval using online video annotation

T Masuda, D Yaroslavski, J Gao - Annual Conference of the ..., 2007 - Springer

In this paper, we propose an efficient method for extracting scene tags from **online video annotation** (eg, comments about **video** scenes). To evaluate this method by applying extracted information to **video** scene retrieval, we have developed a **video** scene retrieval ...

Cited by 22 Related articles All 13 versions

Color-based and context-aware skin detection for online video annotation

C Liensberger, J Stottinger... - 2009 IEEE International ..., 2009 - ieeexplore.ieee.org

Paper metadata

Do a literature review

- Finding papers from a relevant paper

RELATED WORK

We review previous research in leveraging interaction history to improve user interfaces and video navigation.

Leveraging Interaction History

There is a rich thread of research in using interaction history data to analyze usage patterns and improve users' task performance. Interaction history data is automatically collected by applications during normal usage. Examples include Web browsers logging Web page visit history, search engines capturing query history, and video players storing video interaction clickstreams such as play and pause events. Read Wear [14] presented a visionary idea in this space to visualize users' read and edit history data in the scrollbar. Chronicle [12] captured and provided playback for rich, contextual user interaction history inside a graphical application. Dirty Desktops [16] applied magnetic forces to each interaction trace, which improved target selection for commonly used widgets. Patina [26] separated individual and collective history and added overlays on top of the GUI, to help people find commonly used menu items and discover new ways of completing desktop-related tasks. Causality [30] introduced an

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Do a literature review

- Top venues in HCI
 - CHI: Largest conference. All topics are covered
 - UIST: User interface software and technology
 - CSCW: Computer-supported collaborative work
 - Assets: Accessibility

Suggest a solution

- Create a hypothesis
- Brainstorming and discussion can be very helpful
- Find other research projects that solves problems with similar characteristics

Suggest a solution

Photoshop: Vintage Effect

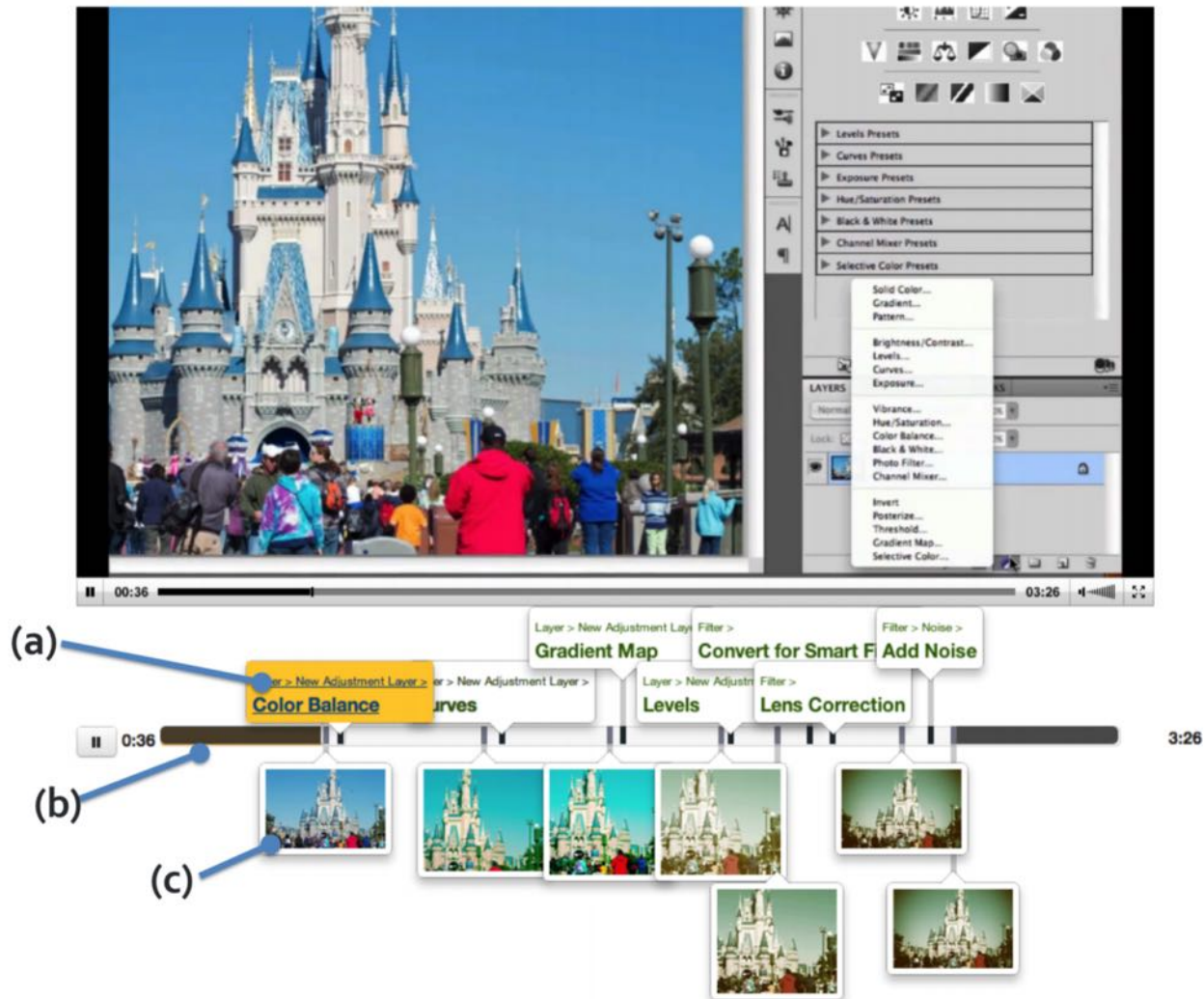


Figure 4. ToolScape augments a web-based video player with an interactive timeline. Annotations are shown above the timeline (a), screenshots of intermediate states are shown below the timeline (c), and the gray regions at both ends (b) show “dead times” with no meaningful progress (e.g., waiting for Photoshop to launch).

Suggest a solution

Task 1: Retro Effect

Retro effect makes a photo look dated or analog, with color effects such as color washes, light leaks, and blurs.



What to do

Your task is to apply Retro Effect to the image below.
You can use the video tutorial browsing interface during your work.
You have **20 minutes** to complete the task.

Make sure your Photoshop is open with the right image.



If you are ready to proceed, please click NEXT.

NEXT

Task 2: Photo to Sketch Effect

Convert a photo to look like a pencil-drawn sketch.



What to do

Your task is to apply Photo to Sketch Effect to the image below.
You can use the video tutorial browsing interface during your work.
You have **20 minutes** to complete the task.

Make sure your Photoshop is open with the right image.



If you are ready to proceed, please click NEXT.

NEXT

Formative Study Design

To assess the effects of step annotations, we ran a formative study on novice Photoshop learners watching how-to videos on image manipulation tasks. We compared the experiences of learners using ToolScape and a baseline video player without the interactive timeline. We hypothesized that interacting with step annotations provided by ToolScape improves both task performance and learner satisfaction. Specifically:

H1 Learners complete design tasks with a higher self-efficacy gain when watching how-to videos with ToolScape.

H2 Learners' self-rating of the quality of their work is higher when watching with ToolScape.

H3 Learners' designs when watching with ToolScape are rated higher by external judges.

H4 Learners show higher satisfaction with ToolScape.

H5 Learners perceive design tasks to be easier when watching with ToolScape.

Build the system

- Focus on the core feature that you want to test.
Product vs. Research prototype
- Don't make the complete version at first.
- Iteration is the key.

Build the system

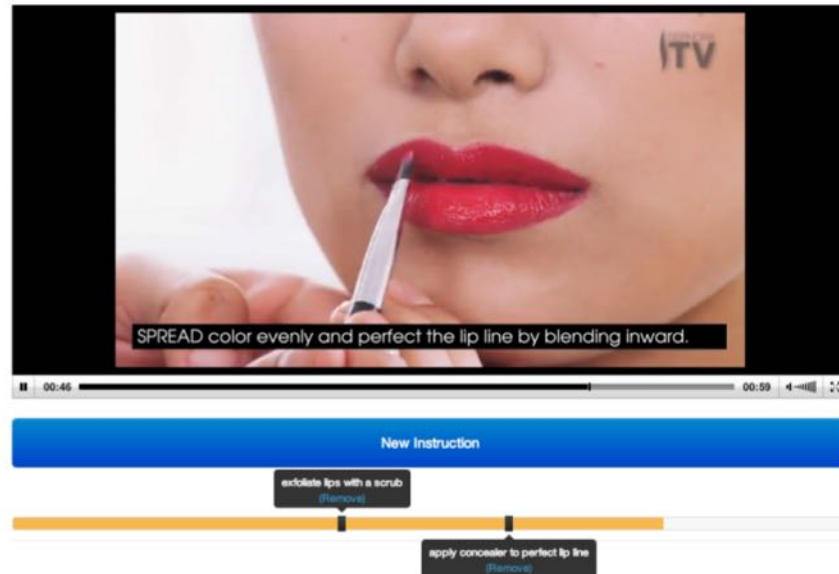


Figure 6. In the Find stage, the crowd worker adds new steps to the timeline by clicking on the “New Instruction” button.

Where was the instruction?

Please type a few words on what it was. Ex. “Curl eye lashes”

Close

Add Instruction

Figure 7. Upon clicking on the “New Instruction” button, a popup window asks the worker to describe what the step is about in free-form text.

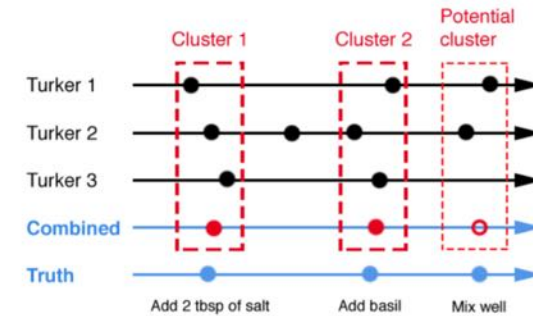


Figure 8. Our clustering algorithm groups adjacent time points into a candidate step. It further adds a potential cluster as a candidate, which might turn out to be a proper step once checked in the Verify stage. This inclusive strategy mitigates the effect of clustering errors.

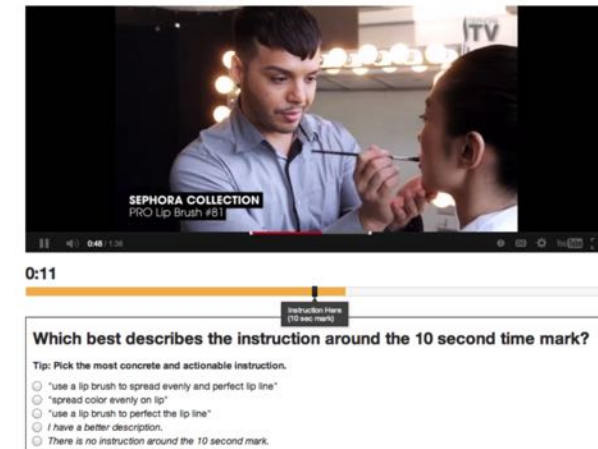


Figure 9. The Verify stage asks the worker to choose the best description of a candidate step. The options come from workers in the Find stage. Additional default options allow the worker to either suggest a better description or mark the step as invalid.

Test the system

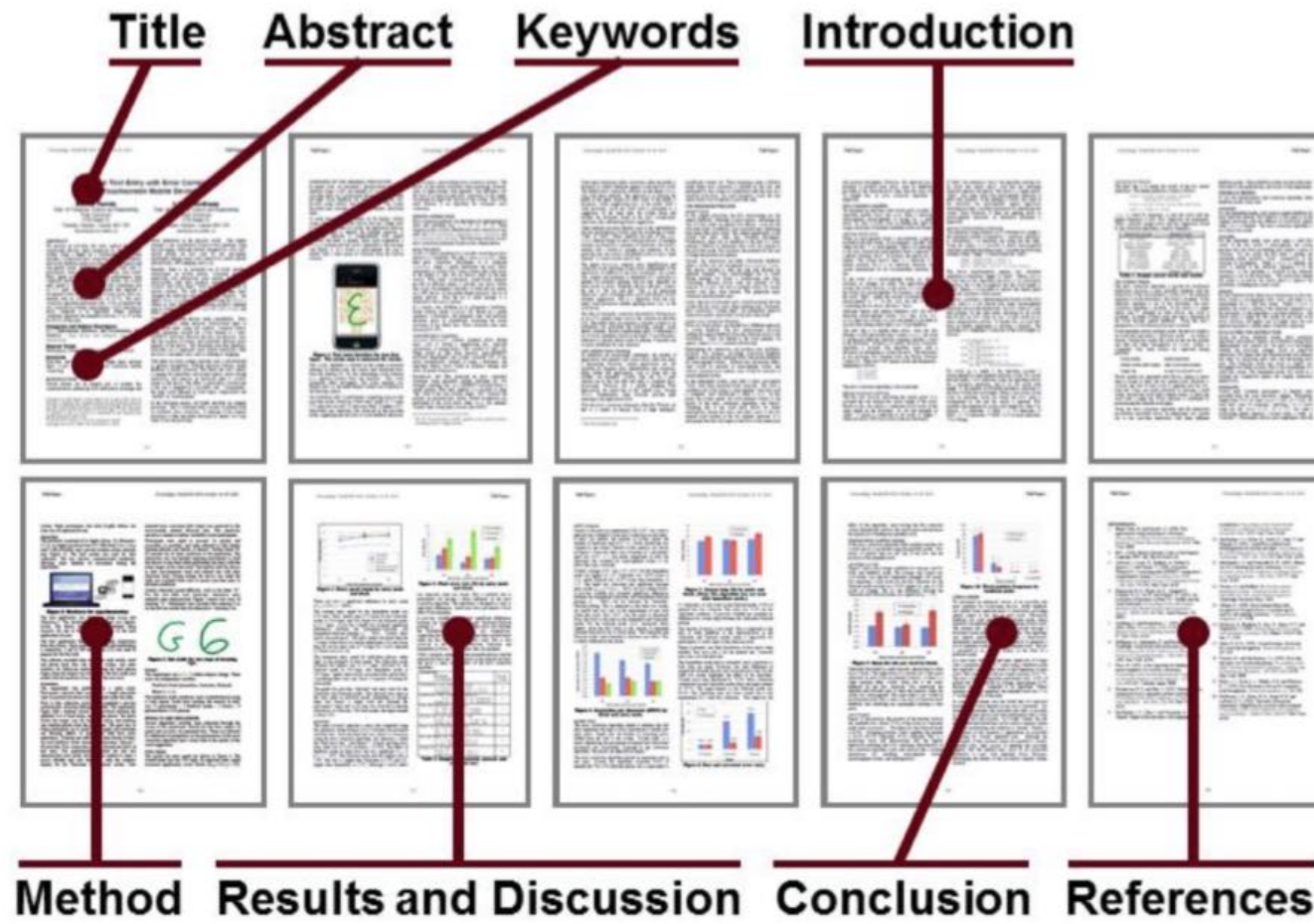
- Have a specific measure
 - How does it work? Is it any good?
 - Does the system extract similar number of steps from the video when used by untrained crowd workers to that extracted by experts?
 - Is typing with a new smartphone keyboard faster than QWERTY keyboard?

Analyze and discuss

- Analyze the results
 - Test if the differences are statistically significant and how different.
 - Break down the results in smaller pieces to better understand the results.
 - E.g., time to complete typing = time to press keys + time to fix characters + (time to change modes)
- Discuss the results in your language

Reading and Writing Research Papers

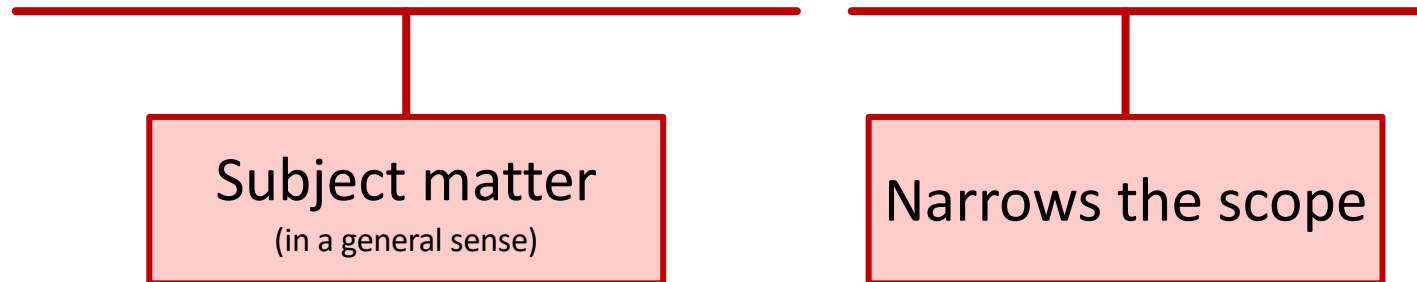
Anatomy of a research paper



Title

- Every word tells!
- The title must...
 - Identify the subject matter of the paper
 - Narrow the scope of the work
 - A title should be neither too broad nor too narrow
- Example:

Eyes-free Text Entry with Error Correction on Touchscreen Mobile Devices



Abstract

- Typically a word limit (e.g., 150 words)
- A single paragraph, no citations
- The abstract's mission is to tell the reader...
 - What you did
 - What you found
- Give the most salient finding(s)
- Common fault:
 - Treating the abstract as an introduction to the subject matter (don't!)

Introduction

- Opening section of the research paper
- Gives the context for the research
- Opening comments characterise the state of the art
- A UI problem or challenge is noted and the reader is alerted to the impending solution (which is developed and evaluated in the rest of the paper)
- Specific contributions are highlighted

Expected Content

- Contribution of the work
 - What is novel and interesting about the research?
- Literature review
 - Discuss related work (how it is similar and how it differs)
 - Include citations (with full information in reference section at end)
- Technical details of the proposed solution
- Sections and sub-sections
 - No rules (organize in any manner that seems reasonable)
 - It's your story to tell!
- Aids
 - Use formulae, photos, drawings, screen snaps, sketches, or any appropriate visual aide to help the reader

Conclusion, References

- Conclusion
 - Summarize what you did
 - Restate contribution and/or significant findings
 - Identify topics for further work (but avoid developing new ideas in the Conclusion section)
- Acknowledgment
 - Optional (thank people who helped, funding agencies)
- References
 - Full bibliographic information for papers cited
 - Format as required (details matter!)

Research Must Be Reproducible

- A high standard of reproducibility is essential
- The research write-up must be sufficiently detailed to allow a skilled researcher to replicate the research if he/she desired
- The easiest way to ensure reproducibility is to follow a standardized methodology

Video Break

RealitySketch


Embedding Responsive Graphics and Visualizations in AR
through Dynamic Sketching

Ryo Suzuki, Rubaiat Habib Kazi, Li-Yi Wei
Stephen DiVerdi, Wilmot Li, Daniel Leithinger

University of Calgary, Adobe Research, CU Boulder



Course Information

- Course website
 - <https://seongkookheo.com/cs6501-fall2020/>
 - Syllabus & Course materials
 - Collab for Recordings and Submitting Assignments
- Discussion & Announcement
 - Slack (cs6501hcifall20.slack.com) – You need virginia.edu email to join
 - Piazza for anonymous questions
- Course Material
 -  *Human-Computer Interaction: An Empirical Research Perspective* by I. Scott MacKenzie (Recommended, but you don't need to buy)
 - Selected papers from top HCI Venues (e.g., *CHI*, *UIST*, *CSCW*)

Course Objective

- **Learn to conduct HCI research**
- After this course, you will be able to
 - Understand key contributions of HCI research
 - Develop a good research question
 - Design and conduct user studies
 - Analyze study results

In this course, you will

Present

Read

Analyze

Design, Build, Test

Discuss

In this course, you will

Topic Presentations – 15%

Reading Responses – 10%

Assignments – 20% → 10 %

Course Project – 50% → 60 %

Participation – 5%

Topic Presentation

- You will present papers and lead discussions on the topic.
- Thoroughly read the papers and discuss within the team.
- Every member of the team should present.
- 25 min presentation, 10 min discussion.

Reading Response

- One-page report that you write about the reading material or one of the papers to be discussed in the class.
- One response per week
- Should include
 - A summary of the paper in your words.
 - Your reaction to the paper, e.g., your thoughts and critiques about it.
 - Three paragraphs should be enough.
- Reading responses will be shared within the class so that you can know what others thought about it.

Reading Response 1

- First reading response:
Check **Reading 2** on Course Webpage
- Write a three-paragraph reading response and submit to Collab
- By Tuesday noon (only for this week)
- It should be pledged

Assignments

- There will be two assignments for you to try the methods learned at class. → **One will be combined to the project**
- You will be collecting data, analyze them, submit reports.
- You will do this as a team.

Course Project

- You will find a usability problem / user need.
- You will set a research question and conduct a literature review.
- You will design and build an interactive system.
- You will evaluate the system through a user study.
- Connecting your ongoing research is encouraged.
- There will be three presentations, proposal, progress, and final.
- You may use any programming language or computing platform.

Course Project

- Theme: **Make people's lives better in this pandemic**
 - You will find target population and understand what difficulties they are experiencing
 - You will find teammates who have similar interests
 - You will design and implement a solution with your team
 - Your final report will be like a CHI paper
-
- Team of 3-5 students (may change based on the enrollment number)
 - Outstanding projects will have opportunities for further development and submission to CHI / UIST / CSCW

Late Policy

- Reading responses
 - By 11:59am (ET) on Mondays
 - No late submissions
 - Two lowest-graded reading responses will be removed
- Assignments and course project
 - By 11:59pm (ET)
 - You may submit reports until 3 days after the deadline, with 10%, 20%, 40% penalty

Am I ready to take this course?

- There are no prerequisites for this course.
- You should be prepared to read many papers, actively discuss with your peers in or outside classes.
- You should be willing to tackle hard problems.
- You should be ready to get your hands dirty: implementing high-fidelity interactive systems and running user studies with actual users.
- You need programming skills.

Web Programming Tutorial

- Aashik will give three web programming tutorial sessions
- Optional but highly recommended if you don't have web programming experiences
- Wednesdays at 7pm on Zoom → **Starting this Wednesday!**
- Topics
 - Sep 2: HTML and CSS
 - Sep 9: JavaScript
 - Sep 16: Database

Have Visual Studio Code installed on your computer

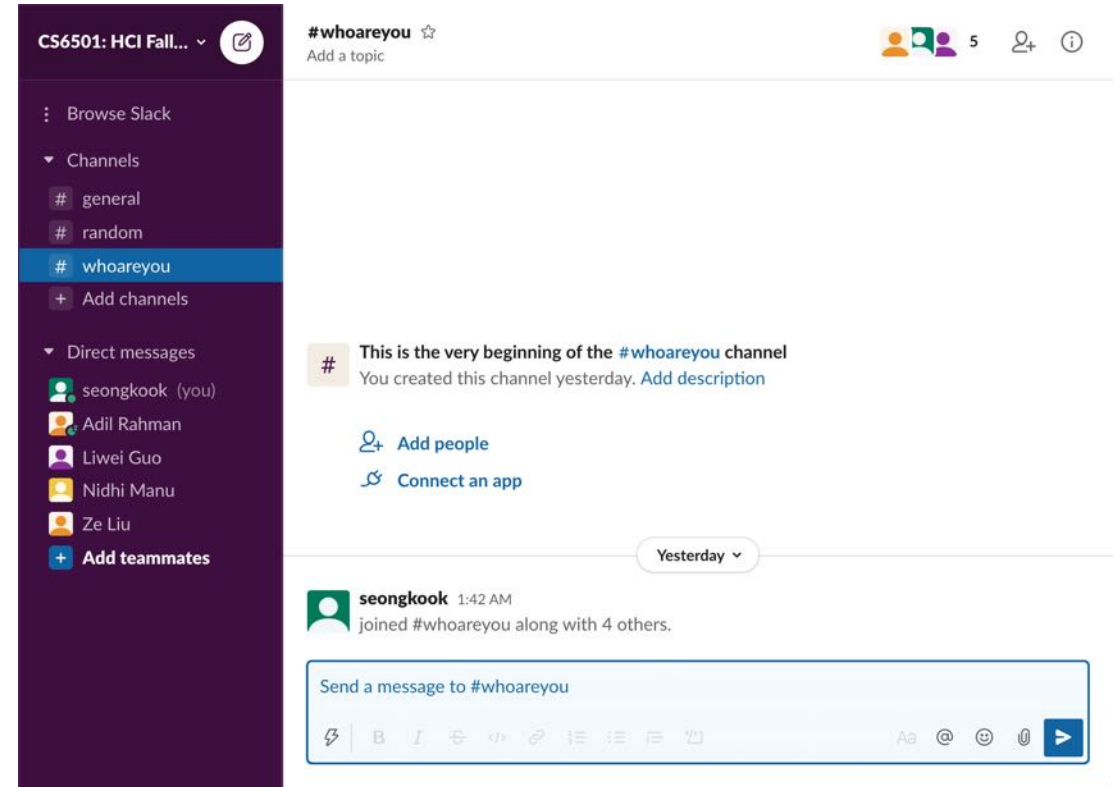
TODO items for you

- Check course website
 - <https://seongkookheo.com/cs6501-fall2020/>
- Sign up for course Slack
 - Announcements, Q&A, Discussions
- Reading response for the next week

Introduce yourself on Slack (#whoareyou)

- What's your name? What's do you study? What are you interested in?

Hi! I'm Seongkook and I am an assistant professor in Computer Science. I am very interested in creating new technologies that help people use computers more efficiently and effectively.



Acknowledgements

- Some of the materials are based on materials by
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 - Scott MacKenzie, Human-Computer Interaction: An Empirical Research Perspective

Thank you!