User Interface Software & Technology

Overview

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Day 1: Overview Day

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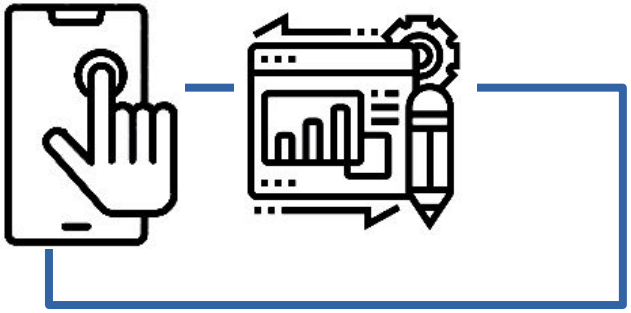
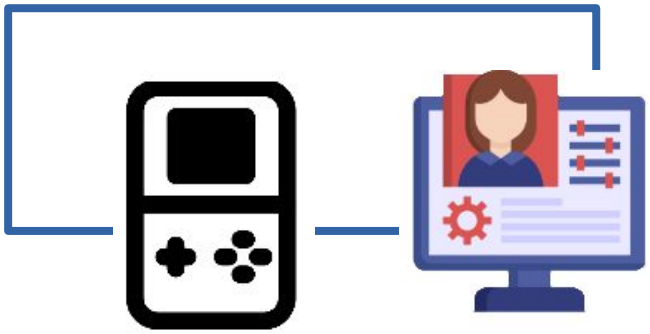


Topics and Subject Areas



Framing Paper 1

[Brad Myers, Scott E. Hudson, and Randy Pausch.
Past, Present, and Future of User Interface Software Tools. TOCHI 7, 1 (2000)]

Why are tools so important and successful?

Framing Paper 1

Brad Myers, Scott E. Hudson, and Randy Pausch. Past, Present, and Future of User Interface Software Tools. TOCHI 7, 1 (2000).

Why are tools so important and successful?

- Help reduce the amount of code that programmers need to produce when creating a user interface
- Allow user interfaces to be created more quickly
- Enables more rapid prototyping and, therefore, more iterations of iterative design that is a crucial component of achieving high-quality user interfaces [Nielsen 1993].
- Help achieve a consistent look and feel, since all user interfaces created with a certain tool will be similar.

Framing Paper 1

Brad Myers, Scott E. Hudson, and Randy Pausch. Past, Present, and Future of User Interface Software Tools. TOCHI 7, 1 (2000).

- What worked
- What didn't work
- **Future Prospects and Visions**

Framing Paper 1

Brad Myers, Scott E. Hudson, and Randy Pausch. Past, Present, and Future of User Interface Software Tools. TOCHI 7, 1 (2000).

Future Prospects and Visions

1. Computers as Commodities
2. Ubiquitous Computing
3. Varying Input and Output Capabilities.
4. Tools to Rapidly Prototype Devices, not Just Software.
5. Tools for Coordinating Multiple, Distributed Communicating Devices.
6. Recognition-Based User Interfaces
7. Three-Dimensional Technologies
8. End-User Programming, Customization, and Scripting

Framing Paper 2

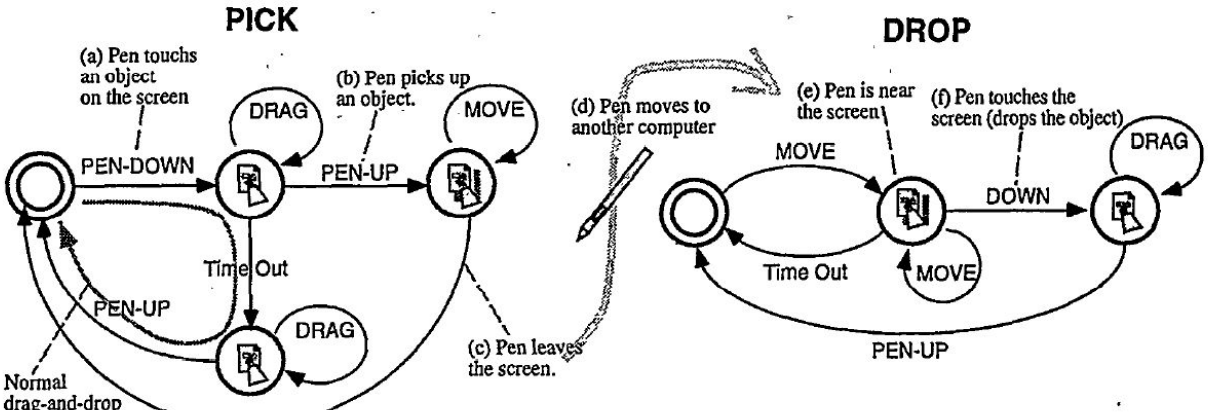
Jun Rekimoto. Pick-and-drop: a Direct Manipulation Technique for Multiple Computer Environments. UIST (1997).

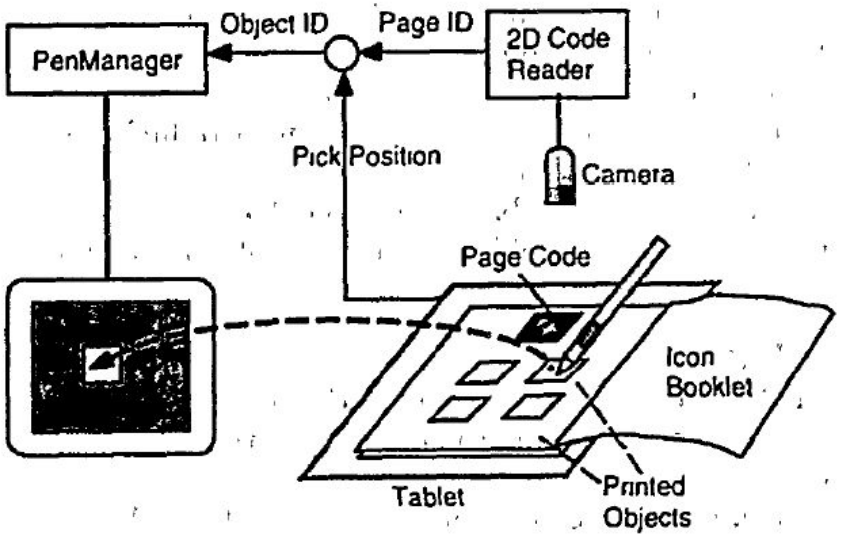
Main Argument/Points and Takeaway

- **Problem**: There is restriction of today's input devices (e.g. device not sharable across multiple computers or devices) & lack of easy direct data transfer user interfaces between different but nearby computers
- **Solution**: The pick-and-drop technique, a pen based direct manipulation technique that can be used for data transfer between different computers as well as within the same computer is proposed as part of the Multi-computer director manipulation user interface

Framing Paper 2

Jun Rekimoto. Pick-and-drop: a Direct Manipulation Technique for Multiple Computer Environments. UIST (1997).





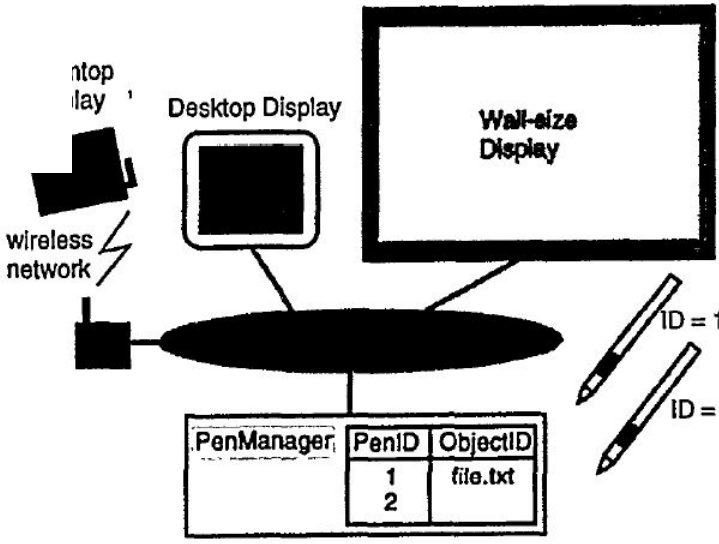


Figure 3: System configuration

Framing Paper 3

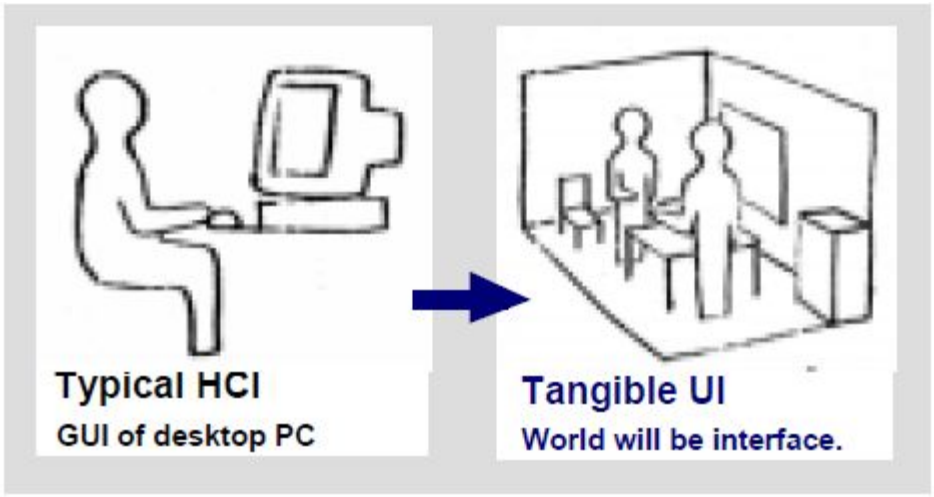
Hiroshi Ishii and Brygg Ullmer. Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. CHI (1997).

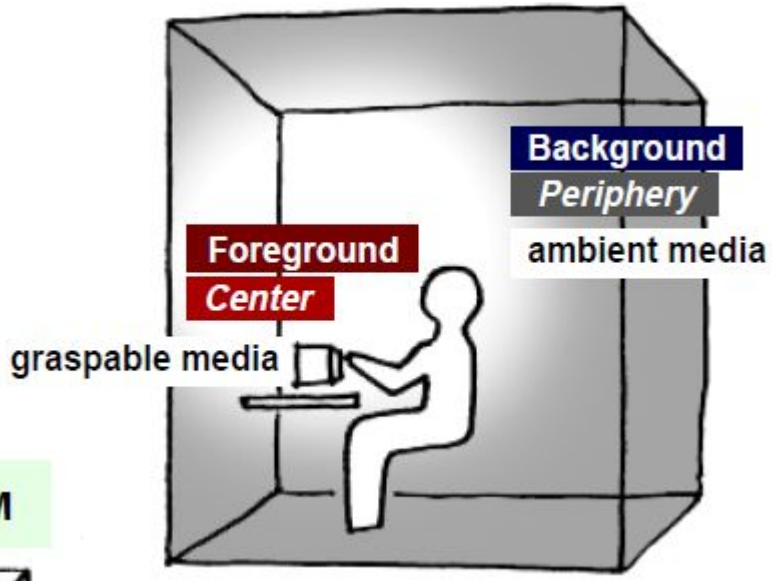
Main Argument/Points and Takeaway

- **Problem**: The current model GUI (Graphical User Interface) is bound to computers with a flat rectangular display, windows, a mouse and a keyboard which restricts our imagination and senses and also removes the physical artifacts we used to relish before the advent of computers
- **Solution**: Presents a new (at that time) HCI vision called Tangible Bits allows users to "grasp & manipulate" bits in the center of users' attention by coupling the bits with everyday physical objects and architectural surfaces.

Framing Paper 3

Hiroshi Ishii and Brygg Ullmer. Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. CHI (1997).

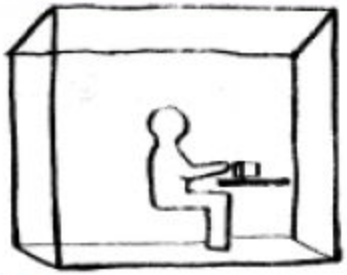




metaDESK

transBOARD

ambientROOM



Foreground Objects on Interactive Surface

Ambient Media in Background

Major Topics in UIST (Personal Classification)

Modalities

Purpose Driven:

Solving Problem

Purpose Driven:

Extract Insights

Purpose Driven:

Enabling

Modalities

Senses, 2D/3D/4D, AR, VR, Input, Output, Recognition

- LaserOrigami: Laser-Cutting 3D Objects
- Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality
- In-Depth Mouse: Integrating Desktop Mouse into Virtual Reality
- SensaBubble: A Chrono-Sensory Mid-Air Display of Sight and Smell

Purpose Driven: Solve problem

overcome, solve,
address, barrier, hindrance

- SmartVoice: A Presentation Support System For Overcoming the Language Barrier
- Addressing Misconceptions About Code with Always-On Programming Visualizations

Purpose Driven: Enabling

Improving pre-existing product, design or operation;
Make something easier to do;
Empowerment of End Users (allowing for more customization from users);
Make prototyping easier

- WatchConnect: A Toolkit for Prototyping SmartWatch-Based Cross-Device Applications
- NewsViews: An Automated Pipeline for Creating Custom Geovisualizations for News
- ModelTracker: Redesigning Performance Analysis Tools for Machine Learning

Purpose Driven: Extract Insights

use, understand, explore, mine

- Mining Human Behaviors from Fiction to Power Interactive Systems
- Using and Exploring Hierarchical Data in Spreadsheets

How would we characterize framing papers 2 and 3?

In most cases, papers fall under multiple categories….!

Jun Rekimoto. Pick-and-drop: a Direct Manipulation Technique for Multiple Computer Environments. UIST (1997).

Hiroshi Ishii and Brygg Ullmer. Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. CHI (1997).

How would we characterize framing papers 2 and 3?

Jun Rekimoto. Pick-and-drop: a Direct Manipulation Technique for Multiple Computer Environments. UIST (1997).

Modalities

Purpose Driven: Enabling

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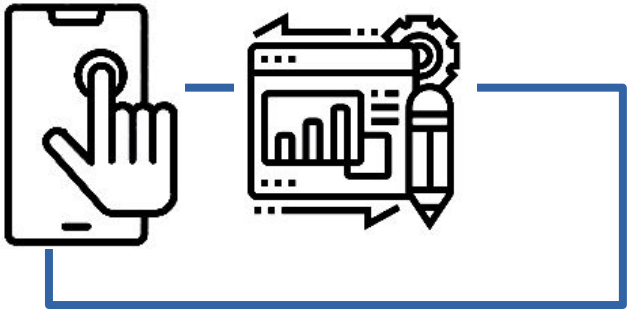
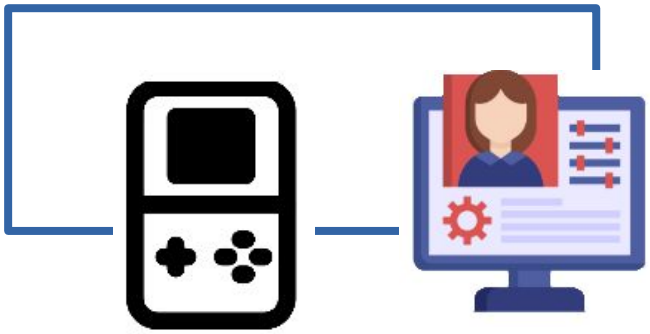
Modalities

Purpose Driven: Extract Insights



The History



How long has this area been its own a subcommittee?

History of Subcommittees

Community: Engineering
Before 2009

Engineering Interactive Systems and Technologies
Interaction Techniques and Devices
2009 - 2021

Building Devices: Hardware, Materials, and Fabrication
Blending Interaction: Engineering Interactive Systems & Tools
Interacting with Devices: Interaction Techniques & Modalities
2022 - 2023

Engineering Interactive Systems and Technologies 2009 - 2021

This subcommittee is suitable for papers which present and describe **novel interactive systems and technologies, as well as the technical development of resources which will facilitate and inspire future interface design explorations.** This includes both **software and hardware technologies** that enable and demonstrate novel interactive capabilities, and "enabling" contributions, such as datasets, tools, methods, and languages which will directly support the construction, engineering or validation of interactive systems. Engineering contributions should clearly explain **how they address interactive systems concerns such as scalability, reliability, interoperability, testing, and performance.** They can be targeted at end users, offering novel interaction capabilities or supporting improved interactions. They can also be targeted at developers, improving or facilitating the construction of innovative interactive systems. "Enabling" contributions must specify how they can impact HCI research, or how they can support HCI practitioners in the design or implementation of future interactive systems.

How has the subcommittee's description of what makes a contribution changed over time?

Blending Interaction: Engineering Interactive Systems & Tools 2022 - 2023

This subcommittee focuses on the development of novel interactive systems and "enabling" contributions, which are resources that facilitate the development of future interactive systems and inspire future interface design explorations. Interactive systems combine multiple technical components of hardware, algorithms, artificial and human intelligence, and interaction techniques. Their contributions will be judged by **how well they enable and demonstrate novel interactive capabilities. "Enabling" contributions include datasets, tools, libraries, infrastructure, and languages.** These contributions will be judged by how well they support the construction, engineering or validation of interactive systems and how well they can be shared among the research community to design future interactive systems.

Subcommittee Chairs | 2023: Jessica Cauchard, Ben Gurion University of the Negev, Israel
Bjoern Hartmann, University of California Berkeley, USA

Building Devices: Hardware, Materials, and Fabrication

2022 - 2023

This subcommittee focuses on advances in interactive hardware, new sensing, display, and actuation approaches, developments in materials that lead to novel interactive capabilities, and new fabrication techniques. Contributions will be judged based on the **novelty of the resulting hardware prototype, the quality of the implementation, and the demonstrated improvements over existing hardware through a technical evaluation and where appropriate a user study.** In addition, work in this subcommittee covers design tools that extend the type of interactive hardware we can build today.

Subcommittee Chairs | 2023: Alexandria Ion, Carnegie Mellon University, USA
Alanson Sample, University of Michigan, USA

Interaction Techniques, Devices, and Modalities 2009 - 2021

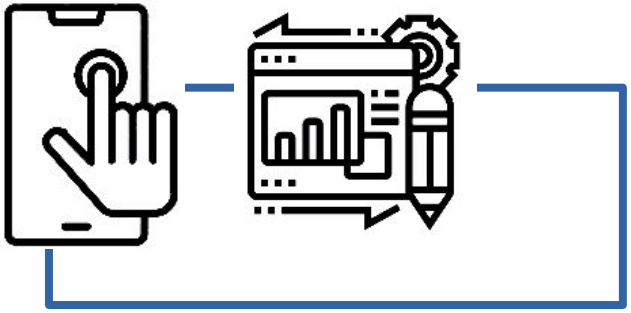
This subcommittee focuses **on advances in interaction and enabling technologies as well as explorations of emergent computing domains and experiences.** It welcomes contributions that are fundamentally new, those that examine capabilities/modalities that have not yet been fully exploited, and those which describe substantive improvements on prior work that open new interactive possibilities. Contributions will be judged in part based on their novelty or on their demonstrated improvements. Areas of interest include, but are not limited to: **software interaction techniques, touch and gestural input, haptic and tangible interfaces, interaction with and around digital fabrication, 3D interaction, augmented/mixed/virtual reality, wearable and on-body computing, sensors and sensing, displays and actuators, muscle- and brain-computer interfaces, and auditory and speech interfaces.**

How has the subcommittee's description of what makes a contribution changed over time?

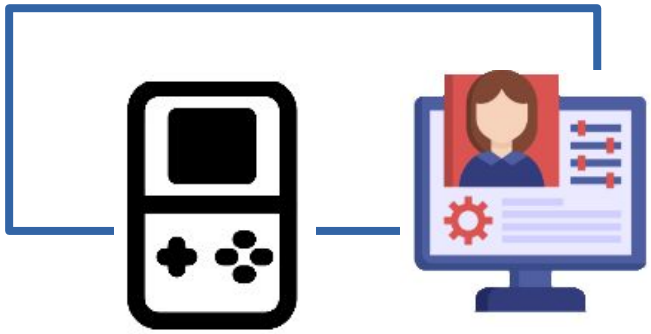
Interacting with Devices: Interaction Techniques & Modalities 2022 - 2023

This subcommittee focuses on enabling interactions using different modalities, such as touch, gestures, speech & sound, haptics & force feedback, gaze, smell, and physiological signals (e.g., heart rate, muscle tension, brain waves, and breath), on different devices (hand-held, stationary, head-mounted, wrist-mounted, in midair, on-body) and for different domains (on 2D screens, in 3D environments, as tangibles). Contributions will be judged based on the **novelty of the interaction, its design rationale, and the demonstrated improvements over existing interaction techniques through evaluations.**

Subcommittee Chairs | 2023: Eve Hoggan, Aarhus University, Denmark
Diego Martinez Plasencia, University College London, UK



Other Disciplines UIST Draws from



Other Disciplines

Blending Interaction: Engineering Interactive Systems & Tools

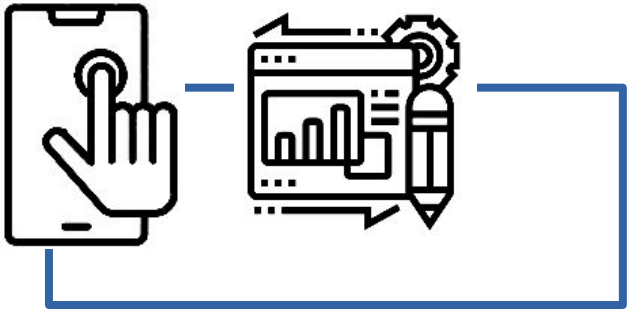
Electrical and Mechanical Engineering | Materials Science | Manufacturing

Building Devices: Hardware, Materials, and Fabrication

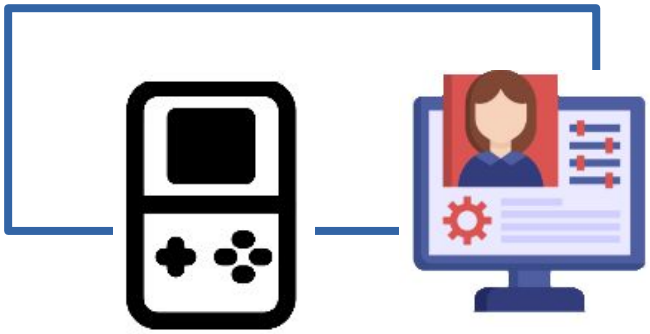
Computer Science | Software Engineering | Human factors engineering | Information Science

Interacting with Devices: Interaction Techniques & Modalities

Psychology | Cognitive Science | Human factors engineering | Design



Venues



User Interface Software and Technology

CHI — Conference / Subcommittees

TOCHI — Journal

UIST — Conference

SIMILARITIES

- General Topics
- Audience

DIFFERENCES

- Specific application field
- User studies VS Implications
- Novelty Concern
- Typical Contribution

CHI: Conference on Human Factors in Computing Systems

- **Blending Interaction: Engineering Interactive Systems & Tools**
  - Novel interactive systems and “enabling” contributions
- **Building Devices: Hardware, Materials, and Fabrication**
  - Advances in interactive hardware
- **Interacting with Devices: Interaction Techniques & Modalities**
  - Interaction: different modalities, devices, domains

CHI: Conference on Human Factors in Computing Systems

Blending Interaction	Building Devices	Interacting with Devices

A Toolkit for Prototyping SmartWatch-Based Cross-Device Applications	Blending Interaction
A Presentation Support System For Overcoming the Language Barrier	Blending Interaction
A Touchscreen that Senses Fingerprints	Building Devices
Integrating Desktop Mouse into Virtual Reality	Interacting with Devices

Tangible bits: towards seamless interfaces between people, bits and atoms

- Bridge the gap between cyberspace and the physical environment by making digital information (bits) tangible
- Interactive surfaces
- Ambient media for background awareness

What subcommittees do you think this paper belongs to? Why?

TOCHI: Transactions on Computer-Human Interaction

- Peer-reviewed scientific **journal** covering research on HCI.
- Covers the software, hardware and human aspects of interaction with computers.
- CHI Journals: TOCHI and TCS (Transactions on Social Computing)

Topics

Hardware and software architectures; interactive techniques, metaphors, and evaluation; user interface design processes; users and groups of users

Past, present, and future of user interface software tools

What's the difference between this TOCHI paper and CHI/UIST papers?

Past, present, and future of user interface software tools

- Literature review and survey contributions
- Future prospects and visions
- Long paper (26 pages)

Keywords

User Interface, Human Factors, User interface management systems, Windowing systems, Event languages, Interface builders, Scripting languages, Toolkits, User interface development environments, User interface software

UIST: Symposium on User Interface Software and Technology

- The premier **forum** for innovations in human-computer interfaces
- Brings together people from diverse areas
- Novelty concern
- User Studies Are Not Required

Areas

Graphical & web user interfaces, tangible & ubiquitous computing, virtual & augmented reality, multimedia, new input & output devices, and CSCW

Pick-and-drop: a direct manipulation technique for multiple computer environments

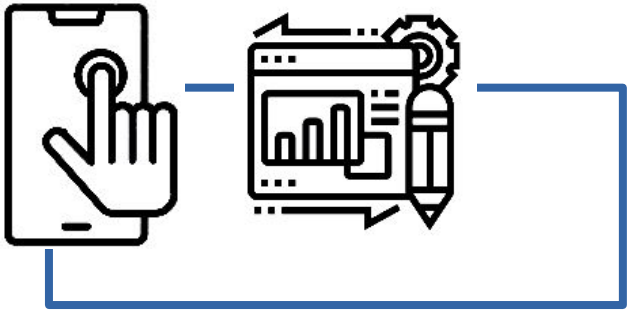
What's the difference between this UIST paper and CHI/TOCHI papers?

Pick-and-drop: a direct manipulation technique for multiple computer environments

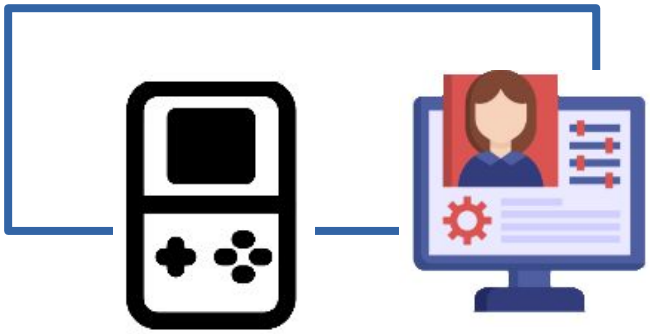
- A new field of user interfaces
- Designing and application examples
- No user test or evaluation

Keywords

Direct manipulation, Graphical user interfaces, Input devices, Stylus interfaces, Pen interfaces, Drag-and-drop, Multi-computer user interfaces, Ubiquitous computing, Computer augmented environments



Contributions



Contributions

Past, present, and future of user interface software tools

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considered cases of both success and failure in past user interface tools.

From these cases we extract a set of themes which can serve as **lessons for future work**.

Contributions

Tangible bits: towards seamless interfaces between people, bits and atoms

---

Tangible Bits: the use of graspable objects and ambient media will lead us to a much richer multi-sensory experience of digital information, suggesting to us a direction for the **next generation of HCI**

Contributions

Pick-and-drop: a direct manipulation technique for multiple computer environments

multi-computer direct manipulation, a pen-based direct manipulation technique: a new field of user interfaces; built several experimental applications; considered the importance of physical artifacts in designing user interfaces **in a future computing environment.**

Similar Patterns for these three papers

Are there any common patterns or themes for the contributions of these three papers?

What do you think are the typical contributions for these subcommittees?

CHI

Building Devices: Hardware, Materials, and Fabrication

CHI

Interacting with Devices: Interaction Techniques & Modalities

CHI

Blending Interaction: Engineering Interactive Systems & Tools

Typical contributions for UIST

What do you think are the typical contributions for UIST?

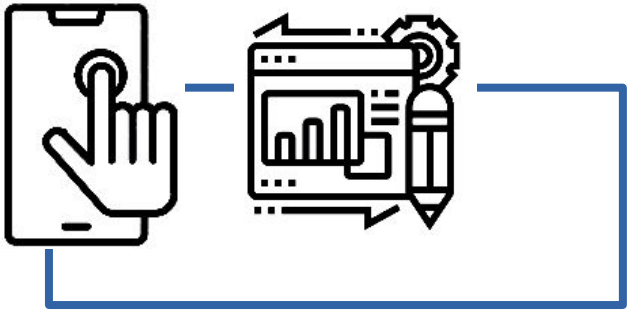
Day 2: Discussion Day

Mengqi Gao
Seungjun (Josh) Kim
Hazel Chiang
Fernanda Ventorim
Matthew Dressa

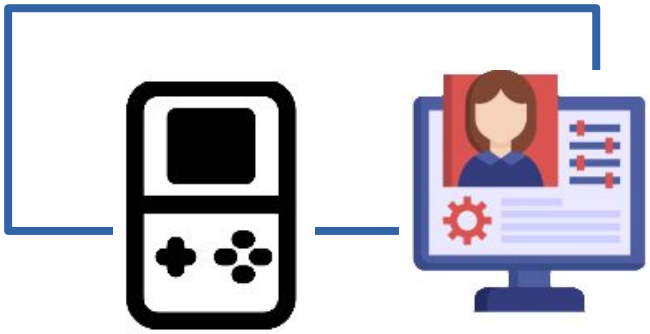
Discussion Papers

- Integrating Real-World Distractions into Virtual Reality
- CodeToon: Story Ideation, Auto Comic Generation, and Structure Mapping for Code-Driven Storytelling

Integrating Real-World Distractions into Virtual Reality

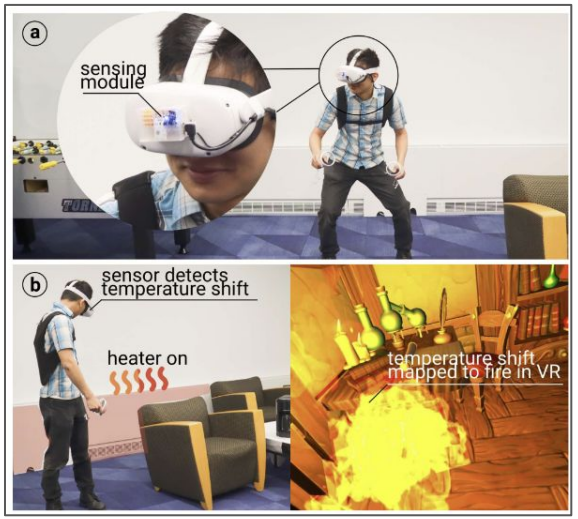


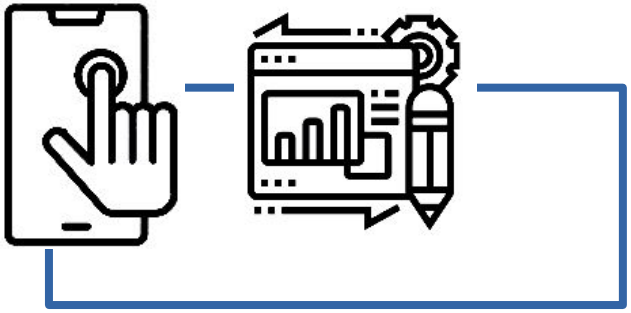
Overview



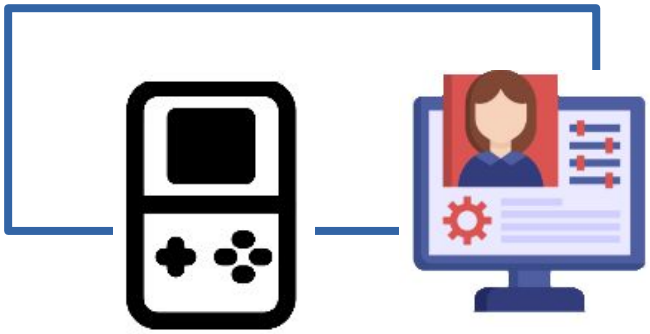
Broad Summary

- Sought to understand user perspectives on distraction and immersion using a custom sensor module to map external stimuli to VR experiences (temperature, airflow, noise)
- They categorized stimuli in two ways
  - Direct mapping: Stimuli has a clear and direct sensorial influence on the game experience (wind blowing makes curtains move in VR)
  - Stretch mapping: Stimuli has an indirect sensorial influence on the game experience (hammering sound displayed as an explosion in VR environment)
- Study #1: User perspectives on VR immersion (baseline (without stimuli), stretch, & direct mapping)
- Study #2: Accuracy of System & Out of Lab User Study (human ground truth (cafe, residence, bus stop))
- Study #3: VR designer perspectives of custom interactions



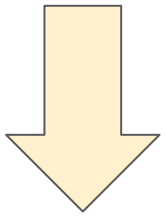


Why is this worthy of studying?



Why is it important

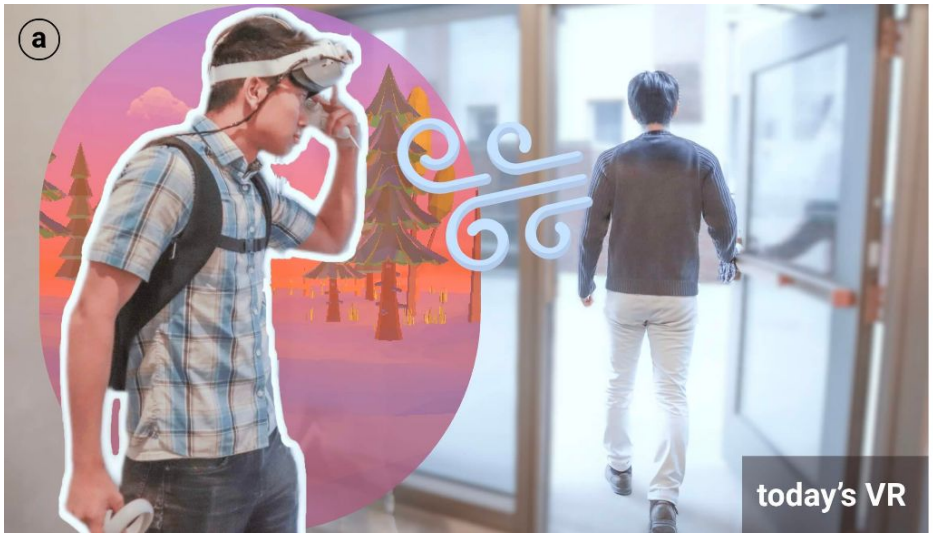
- Virtual reality (VR) enables users to experience being in an environment beyond where they physically are. The emergence of **portable VR hardware** (e.g., Oculus Quest 2, VIVE Focus 3) further allows users to **experience virtual reality anywhere and anytime**.

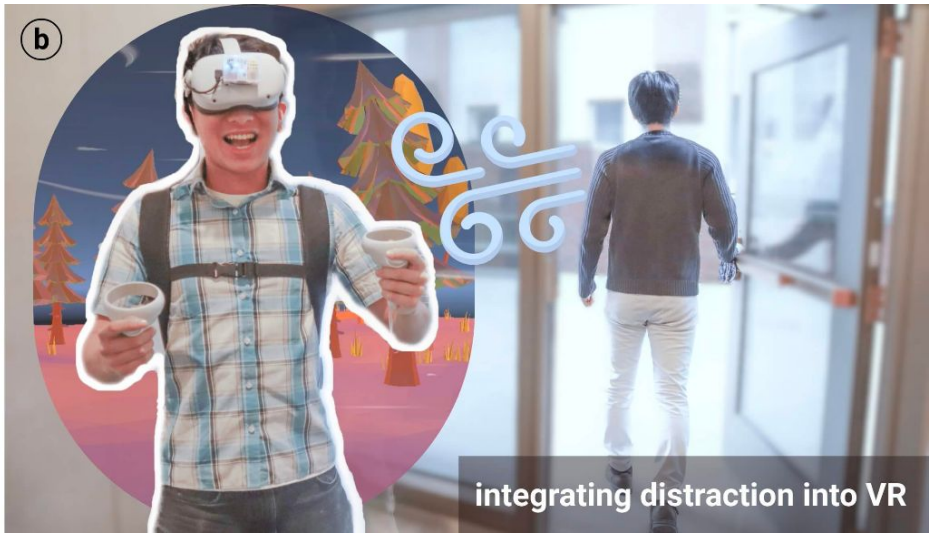


- **Break in the Presence:** a user experiencing VR constantly receives two streams of sensory information, one from VR and one from the physical surroundings. Many real-world cues (e.g., background noises, wind, smell, cold air, etc.) can intrude into or contradict the virtual experience

Why is it important

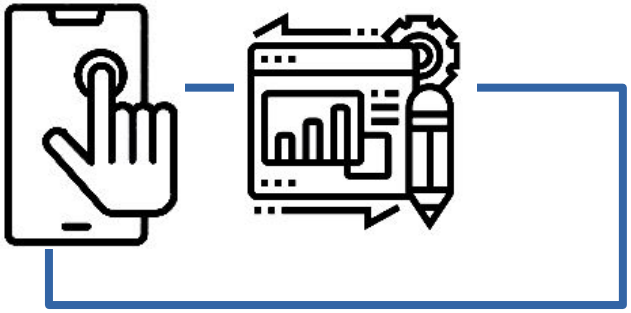
- Rather than blocking or ignoring distractive signals from the outside environment, **we propose integrating them into virtual reality to improve the sense of presence**.



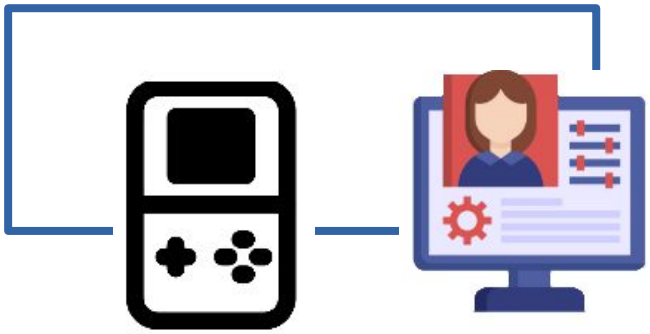


Why is it important

Do you think Integrating Real-World Distractions into Virtual Reality would serve as a good solution to the problem discussed in this paper? Why or why not?



Typical Contributions



What of the typical HCI research contributions is this paper making? And why?

What of the typical HCI research contributions is this paper making?

Empirical Research

Artifact

Methodological Research

Theoretical Research

Dataset

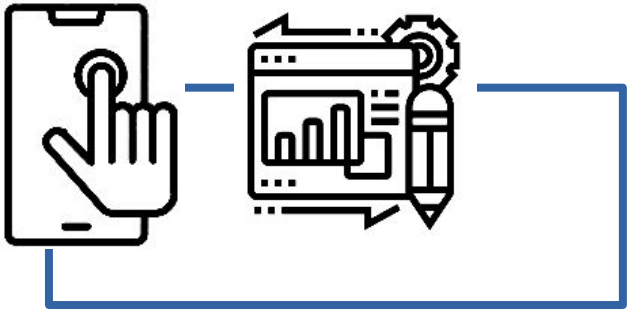
Survey

Opinion

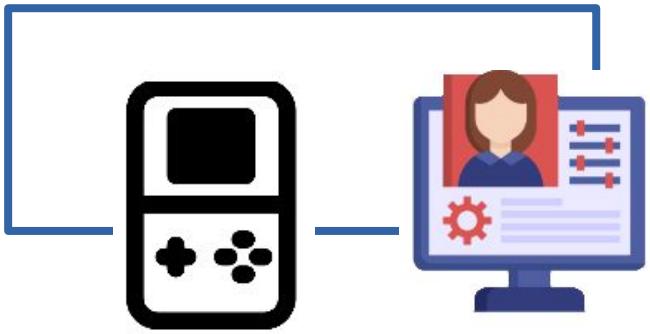
What of the typical HCI research contributions is this paper making?

Empirical Research | Artifact | Methodological Research | Theoretical Research | Dataset | Survey | Opinion

- The study conducted three **user studies** and a **technical evaluation** with 12 participants
- They created a **prototype system** (RealWorldVR) comprised of: (1) a sensor module, (2) a user interface to be integrated into the VR experience, and (3) a simple Unity3D script.
- They incorporated **real-world** distractions into **virtual reality** simulations.

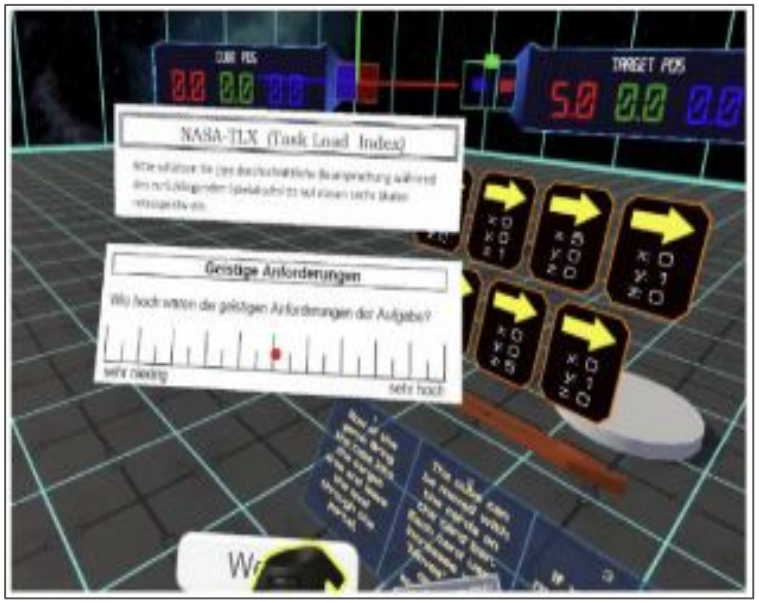


Areas the paper draw from

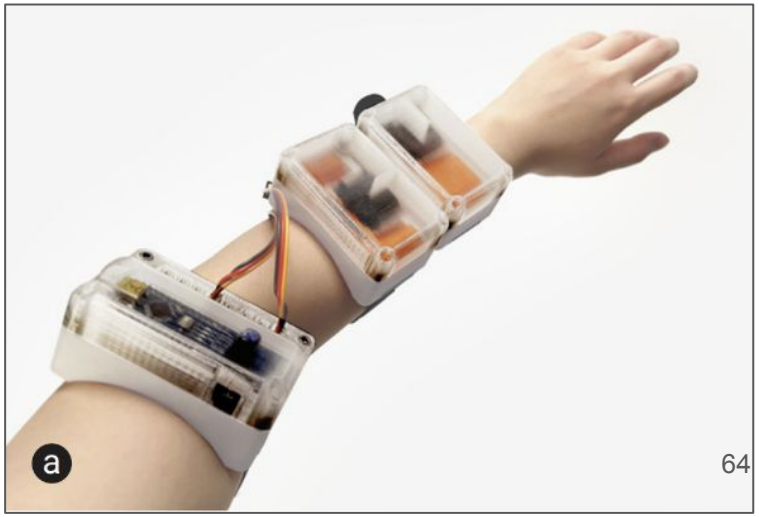


Areas the paper draws from

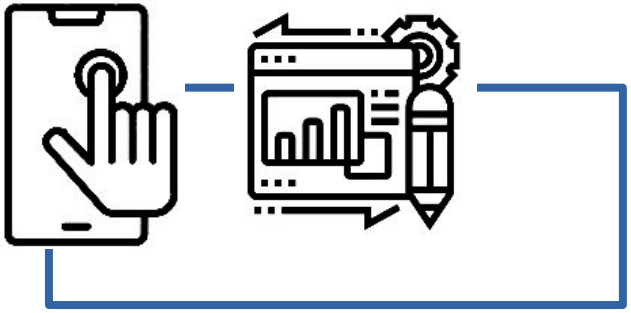
- **XR/MR Interface Design**
  - Multimodal Input/Controller Techniques (Voice, eye tracking, button clicks)
  - Visual & Spatial Environment design (virtual and physical spaces)



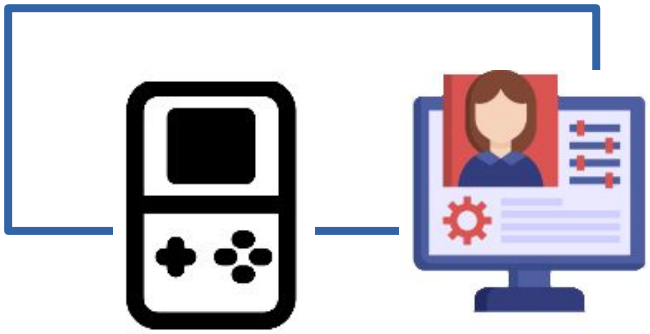
- **Wearable Prototyping & Computing**
  - Form factor based on body placement
  - Sensing inputs & Modules
  - Circuit Design
  - 3D printing parts



What other areas do you think this paper draws from?



Takeaways for HCI community



Takeaways

WHAT Design considerations

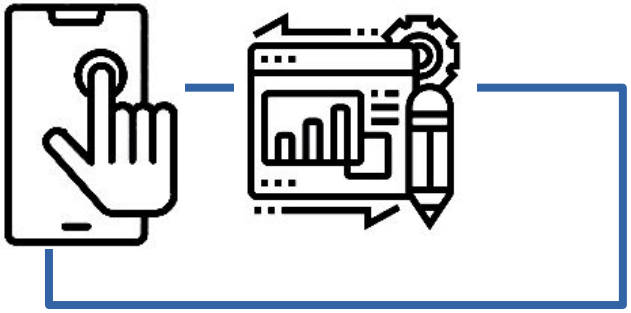
- Make mappings inconsequential to the VR experience
- Minimize work using one-to-many mappings
- Utilize alternative designs
- Do not overload the user with VR effects
- Consider impacts on VR narrative before designing mappings
- Handle false positives over false negatives
- Ethical considerations

Takeaways

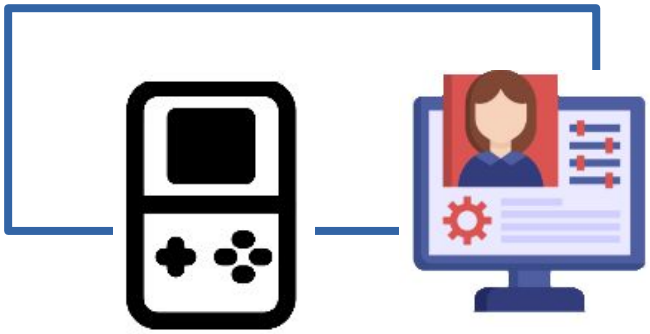
How can these design considerations help or be applied in HCI fields? Anything helps your own HCI research?

Takeaways

WHAT	Design considerations
WHO	HCI Researcher, VR/XR Designer
WHY	Increase immersive experience
WHERE	XR Application, Immersive Environment
WHEN	Less controlled (but relatively safe) environments
HOW	Effects balance, Game Narrative, Sensor improvement, Consider physical environment



Takeaways for non-HCI community



Discussion

What do you think are the takeaways and implications for other non-HCI related fields or communities?

Non-HCI Fields / Communities that maybe be impacted

Automotive

Healthcare

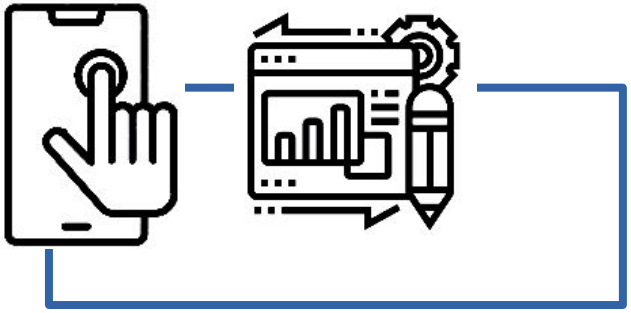
Tourism

Interior Design

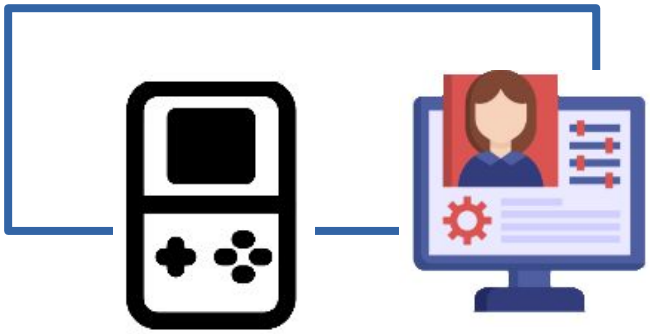
Education

CodeToon:

Story Ideation, Auto Comic Generation, and Structure Mapping for Code-Driven Storytelling



Overview



What is a *Coding Strip*?

- It is a form of comic strip accompanied by its corresponding code.
- It presents programming concepts in both concrete and abstract contexts/representations to support the teaching and learning of programming concepts, languages, and procedures.

Discussion

- Have you ever used or experienced coding strips? How was your experience?
- Have you heard of others using it and their experiences?
- If none of these apply, what are your thoughts on coding strips, in general? Do you they are and will be helpful for coding education?

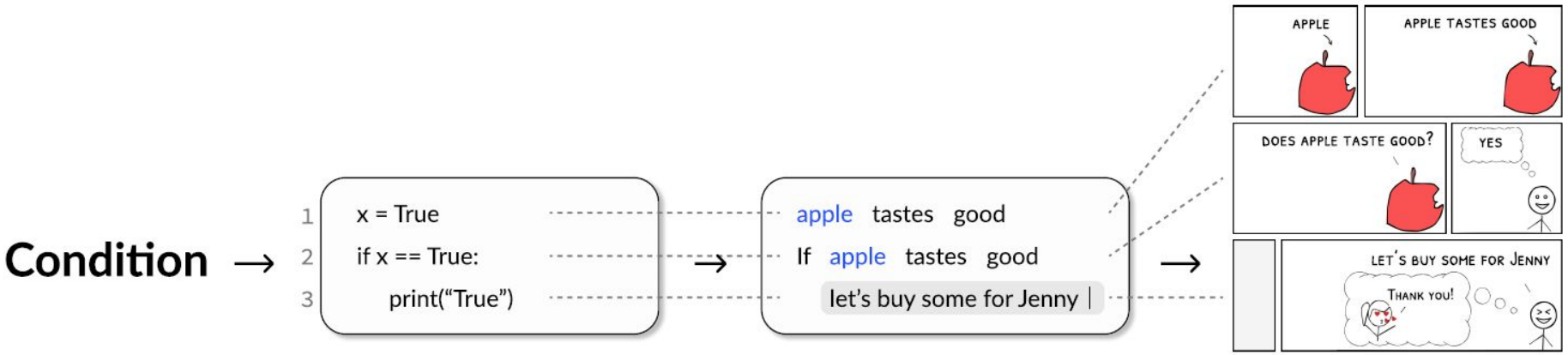
Very High Level Overview

Code-driven storytelling tool *for:*

(1) story ideation from code using metaphor and

(2) automatic comic generation from the story.

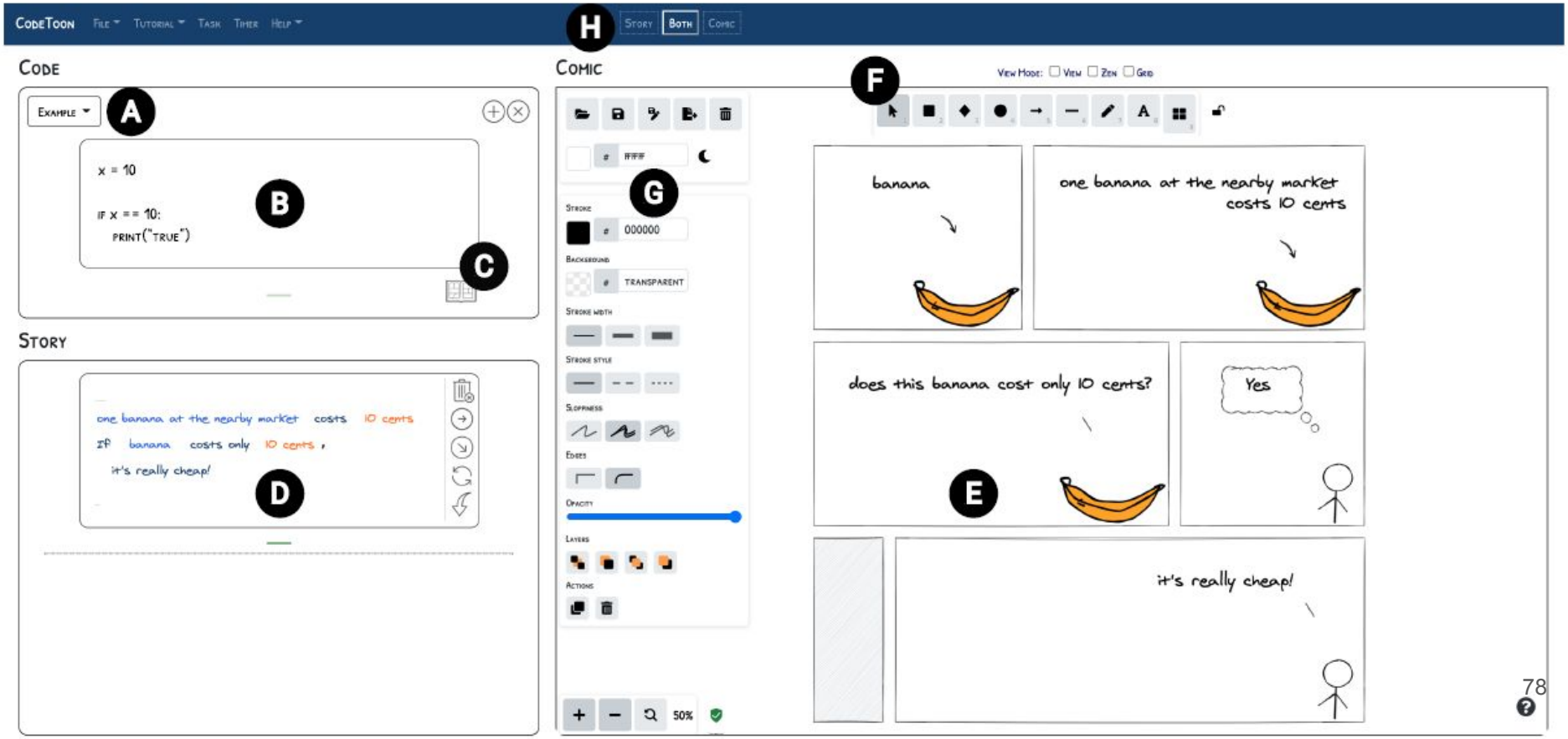
Evaluation: two-part user study



User Interface

Code → Story → Comic

(F) tool palette; (G) style palette; (H) buttons for changing the interface layout



Code → Story

code	*hybrid* (code & story)	story
`x = 5`	*time = 5* *wallet = 5* *student = 5*	time is 5 o'clock wallet has 5 parking coins student received 5 dollars
`x = True`	*switch = on* *my_schedule = busy* *this = True*	switch is on my schedule is busy this is expensive
`x = ''hello''`	*message = "hello"*	message reads, "hello"
`print(''Even'')`	*print("it's even")*	say, "It's even!"

Evaluation

Q1) Does CodeToon **support the authoring of coding strip**, in terms of story ideation and comic creation?

Q2) Does CodeToon make the process of **authoring coding strip more efficient**?

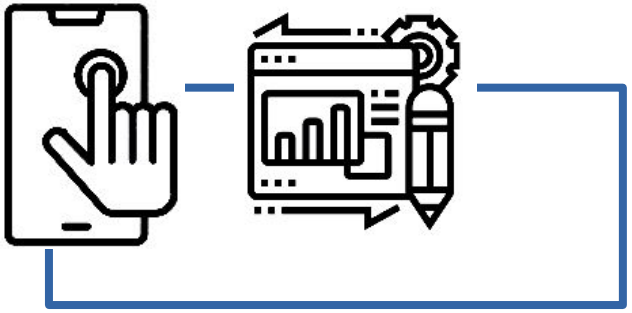
Q3) What are the **perceived utility and use cases** of CodeToon for teaching and learning programming?

Q4) Does CodeToon **help generate high quality comics**, and how consistent is the quality?

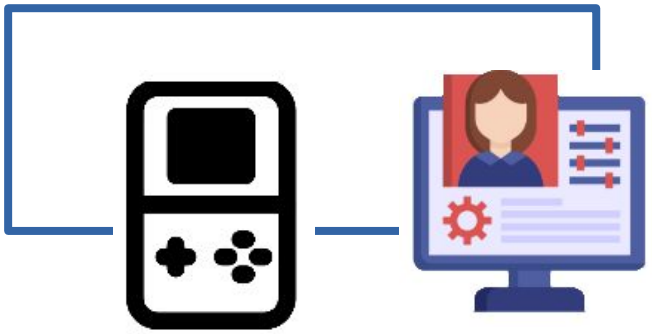
User Study + Comic Evaluation Study (Interview, Surveys, Creativity Support Index (CSI))

Discussion

Any initial thoughts / impressions on the paper (before we dive into the specifics of its contributions etc.) ?

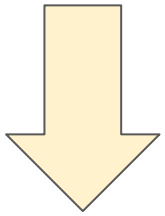


Why is this worthy of studying?



Why is it important

- **Learning programming is difficult** due to its abstract nature: it requires learning concepts and programming languages that have been derived through a series of **abstractions**.

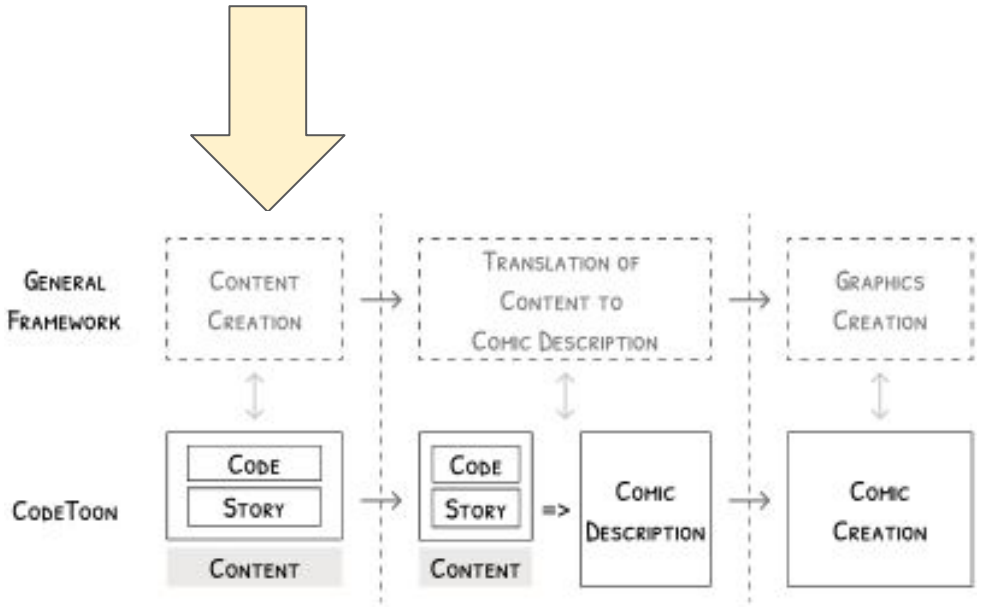


- **Coding Strips**: a form of comic strips with code, inspired by the use **familiar abstractions** such as real-life objects, situations, and visual representations to **make computer programming more concrete and accessible**

Why is it important

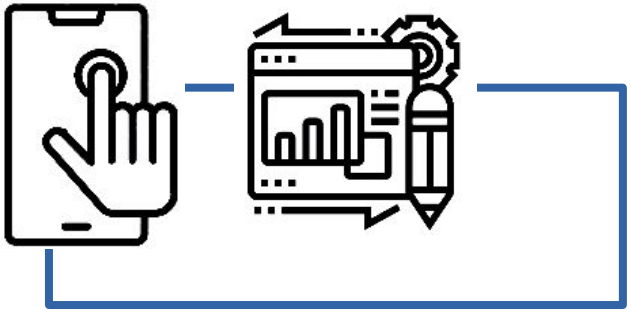
- **Time-Consuming Process:** creating coding strips remains a creative, laborious, and time-consuming process: First, it requires creators to ideate (brainstorm) and select stories that align with code. Second, creators need to invest significant effort and time (and sometimes confidence in drawing) to sketch stories in the form of comics

- **CodeToon**!

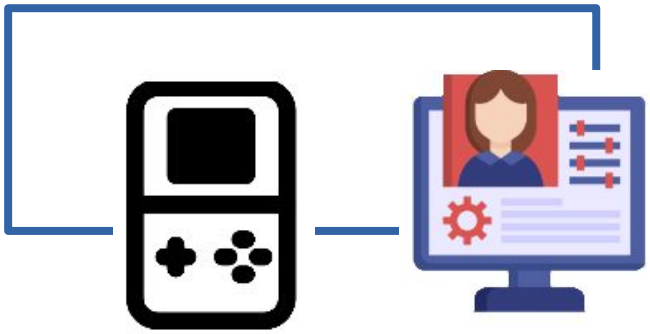


Why is it important

Do you think CodeToon would be serve as a good solution to the problem talked in this paper? Why or why not?



Typical Contributions



What of the typical HCI research contributions is this paper making? And why?

What of the typical HCI research contributions is this paper making?

Empirical Research

Artifact

Methodological Research

Theoretical Research

Dataset

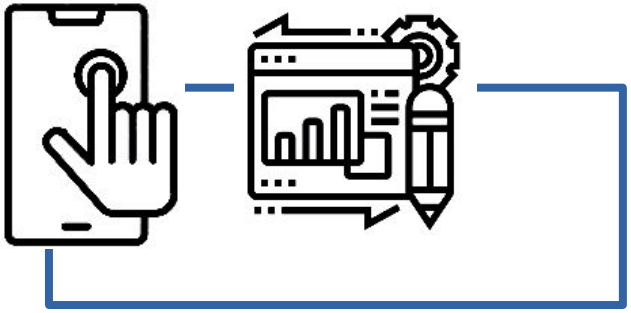
Survey

Opinion

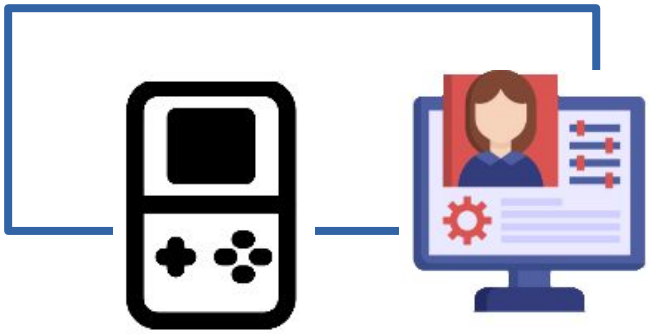
What of the typical HCI research contributions is this paper making?

Empirical Research | Artifact | Methodological Research | Theoretical Research | Dataset | Survey | Opinion

- The study conducted a two-part **user study** and a comic evaluation **survey**
- They created the **CodeToon**, a comic authoring tool for facilitating the creation of coding strips by supporting story ideation and enabling **auto generation of comics from code**

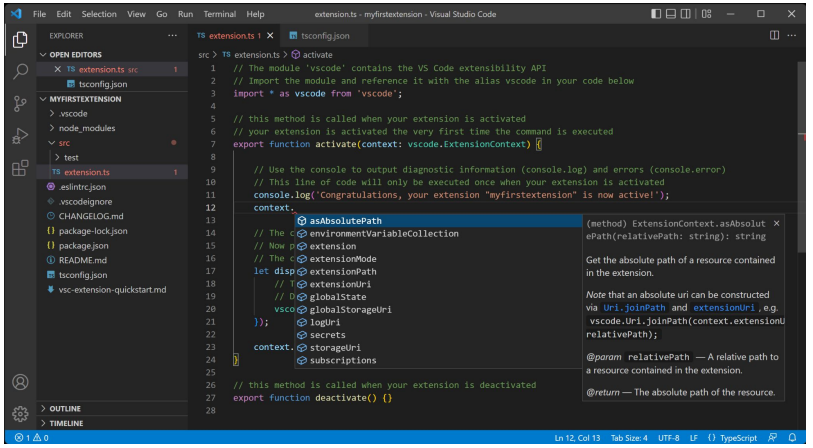


Areas the paper draw from

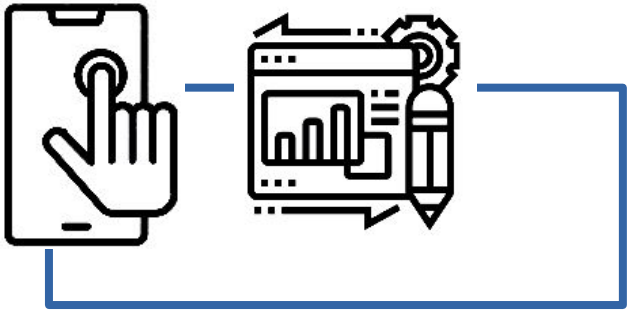


Areas the paper draws from

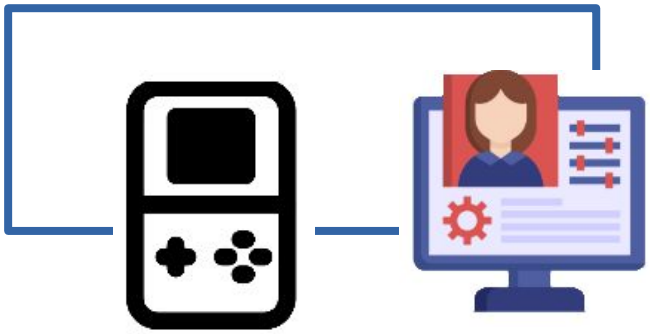
- **Artificial Intelligence** (Image/Object recommendation system)
- **Education** (Explainability/Grasping of course material)
- **Software Development** (Interfaces for project development/deployment)
- **Code Semantics** (Representations of world relations and their meaning)



What other areas do you think this paper draws from? Do you agree with the categories mentioned in the previous slide?



Takeaways for HCI community



Takeaways

WHAT Design goals & Implications & Opportunities

- Allow users to iterate on their code, story, and comic
- Augment creativity with story ideation & auto comic generation
- Make mapping clear across code, story, and comic
- Use simple, scalable visual vocabulary

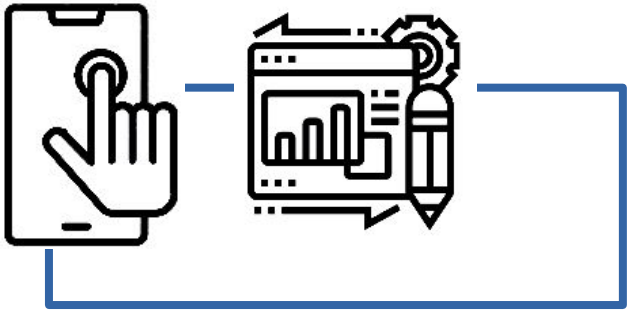
- Code-Driven Storytelling
- Storytelling with Text-based Programming
- Comics for Computational Languages
- Design implication: 1-to-1 mapping
- Visual Programming Environment for Artistic Activities

Takeaways

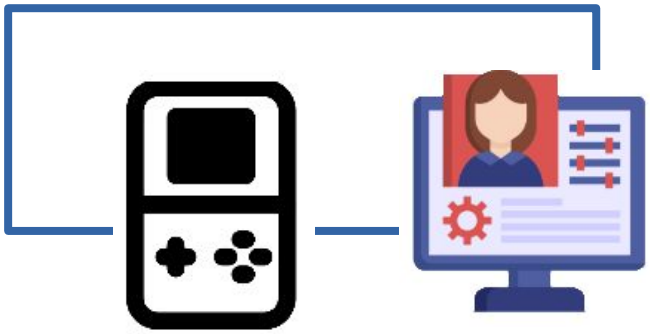
How can these takeaways help or be applied in HCI fields?
Anything helps your own HCI research?

Takeaways

WHAT	Design goals & Implications & Opportunities
WHO	HCI Researcher, Visualized Computing Designer
WHY	Coding strips Support text-based programming learning
WHERE	Text-based programming
WHEN	Education, Artistic Activities
HOW	Clear mapping between code, story and comics Take flexibility into account, apply on mathematics



Takeaways for non-HCI community



Discussion

What do you think are the takeaways and implications for other non-HCI related fields or communities?

Non-HCI Fields / Communities that maybe be impacted

Edu Tech

Software Engineering

(e.g. code review)

Evaluation Methods (e.g. Mixed)

Design

Generative AI

Thank You!