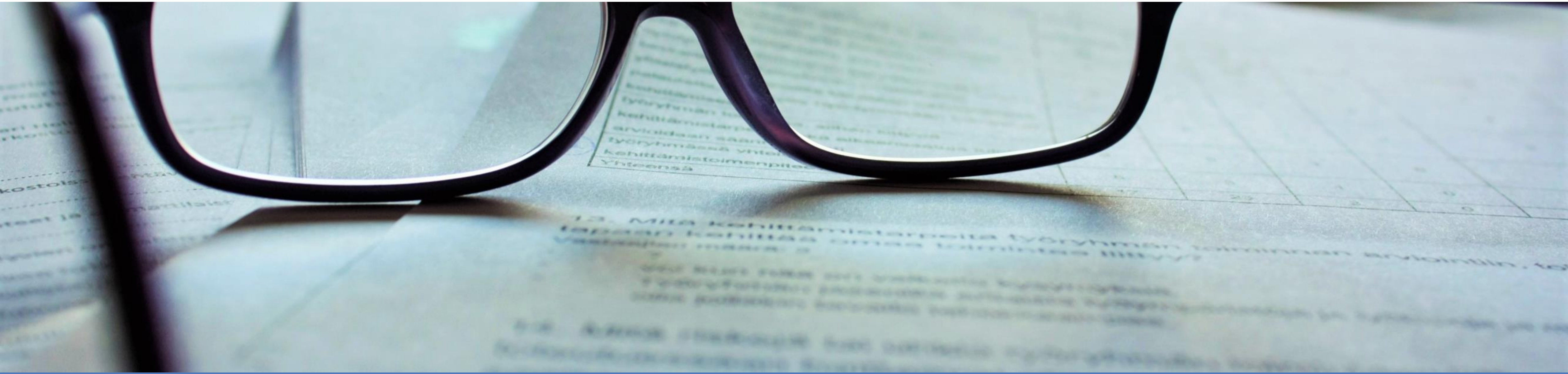


How to Read a Paper

Human-Computer Interaction Exercise

Preperation

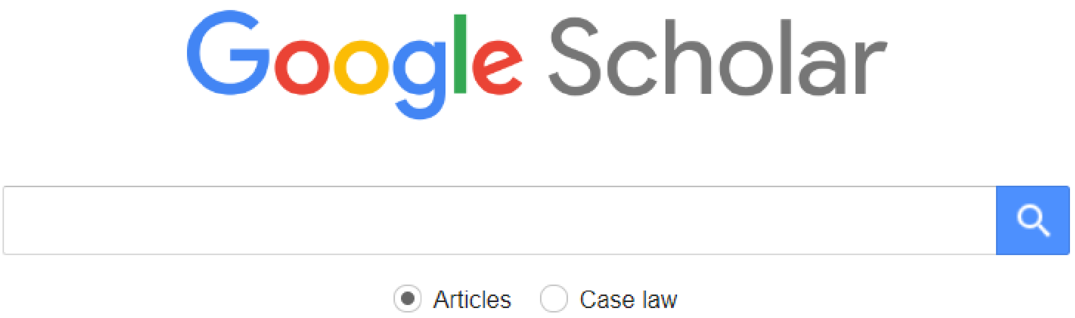
- **Be in the university's subnet**
  - If not: goto https://www.frankfurt-university.de/de/hochschule/bibliothek/fernzugriff/
  - Install VPN (Forticlient)
- Later you will need and use **a literature management system**
  - You can use Zitavi or Zotero: https://www.frankfurt-university.de/de/hochschule/bibliothek/citavi-zotero/
  - Both are free (for you)
- **A ChatGPT Account** is helpful
  - ChatGPT Plus is even more helpful

Find your Keywords

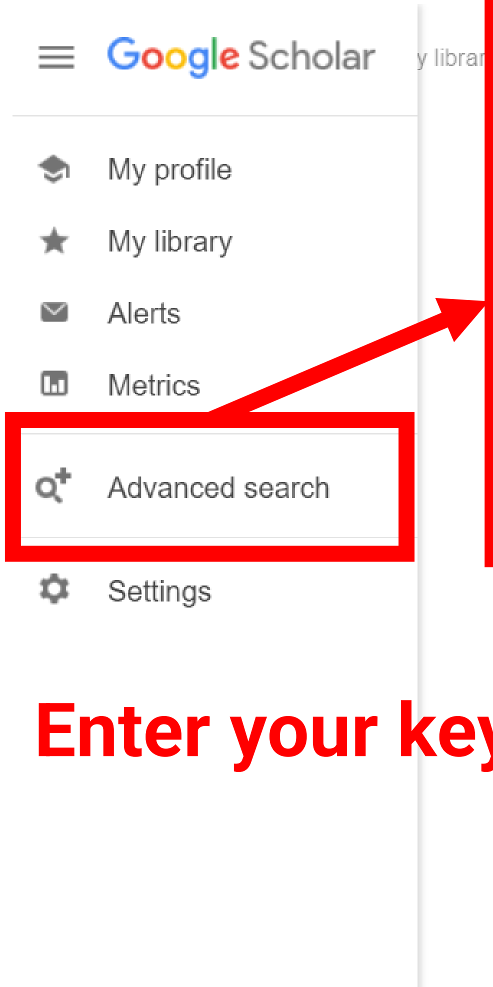
- **Use your keywords from your research question** to start searching for literature
- **Make a list** of other **keywords/annotations**
  - Include each of the key concepts or variables you’re interested
  - Find synonyms and related terms
- How to find keywords? Identify your **research fields**, **theoretical frameworks**, **device categories**, and **measures (or methods)**
  - **Research field(s):** “human-computer interaction“ (rarely required),…
  - **Theoretical frameworks:** “social acceptability“, „accessibility“, „ergonomics“, …
  - **Device categories:** “virtual reality“, „augmented reality“, „wearables“, „mobile devices“, …
  - **Measures/Tasks:** “target selection“, „Fitts‘ law“, “EMG“,“electromyography“, …
  - **Be more specific, if required:** “heart rate“, „privacy“, „face detection“, …

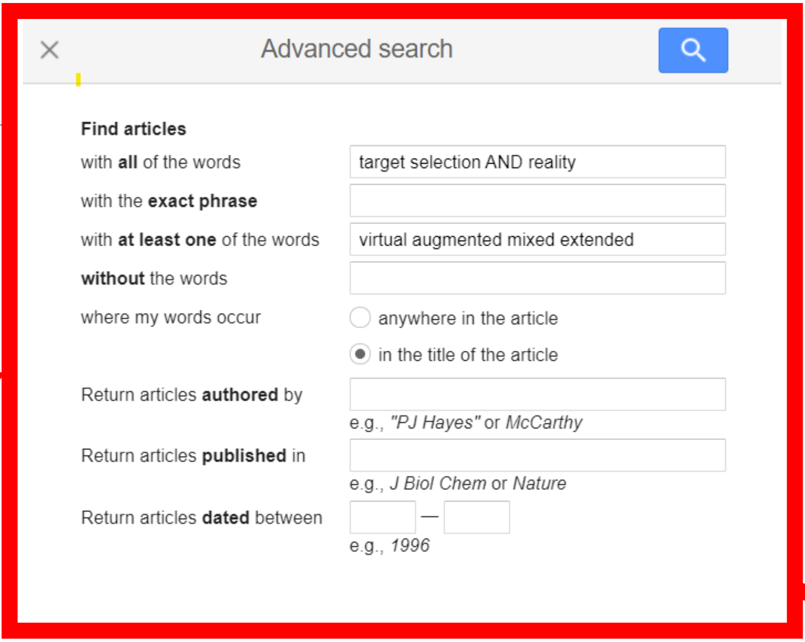
Databases

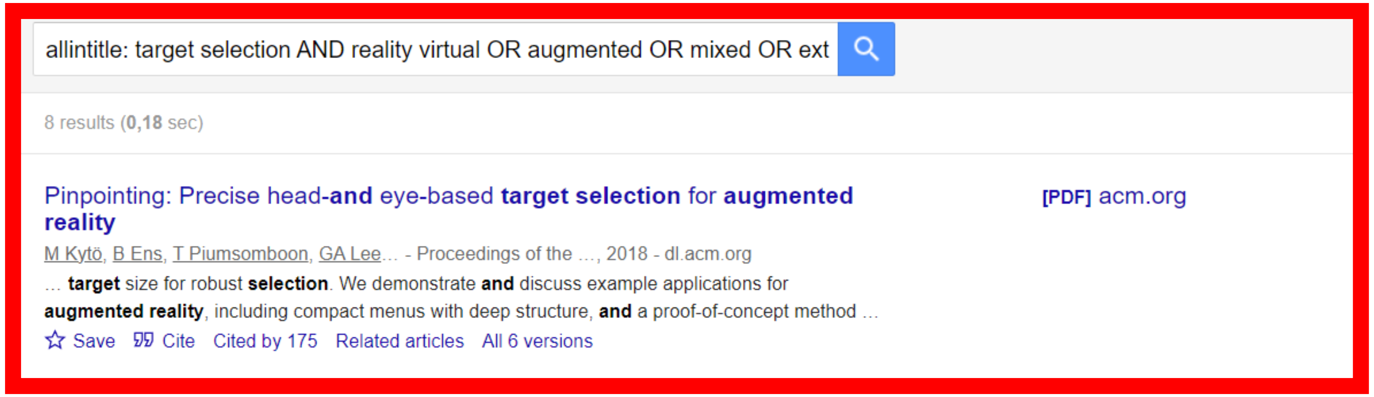
- Some useful databases to **search for journals and conferences articles**:
  - Google Scholar https://scholar.google.de/
  - ACM https://dl.acm.org/
  - IEEE https://ieeexplore.ieee.org/
  - Web of Science https://www.webofscience.com/
  - Scopus https://www.scopus.com/
  - The university's library https://idp.hebis.de/
  - JSTOR (history) https://www.jstor.org/
  - Project Muse (humanities and social sciences) https://muse.jhu.edu
  - PubMed (life sciences and biomedicine) https://pubmed.ncbi.nlm.nih.gov/


Google Scholar
Articles
Case law

Refine your Query

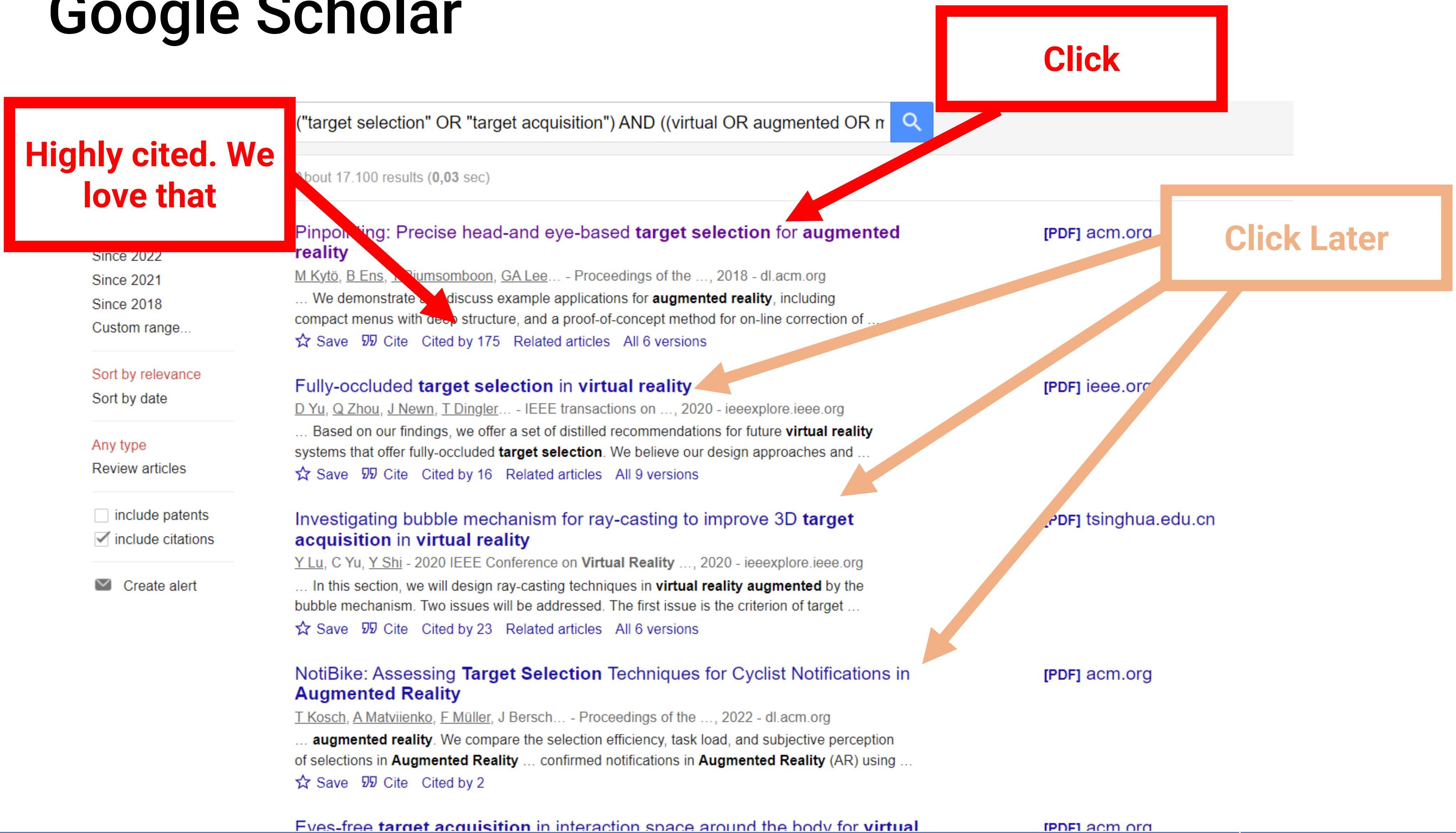


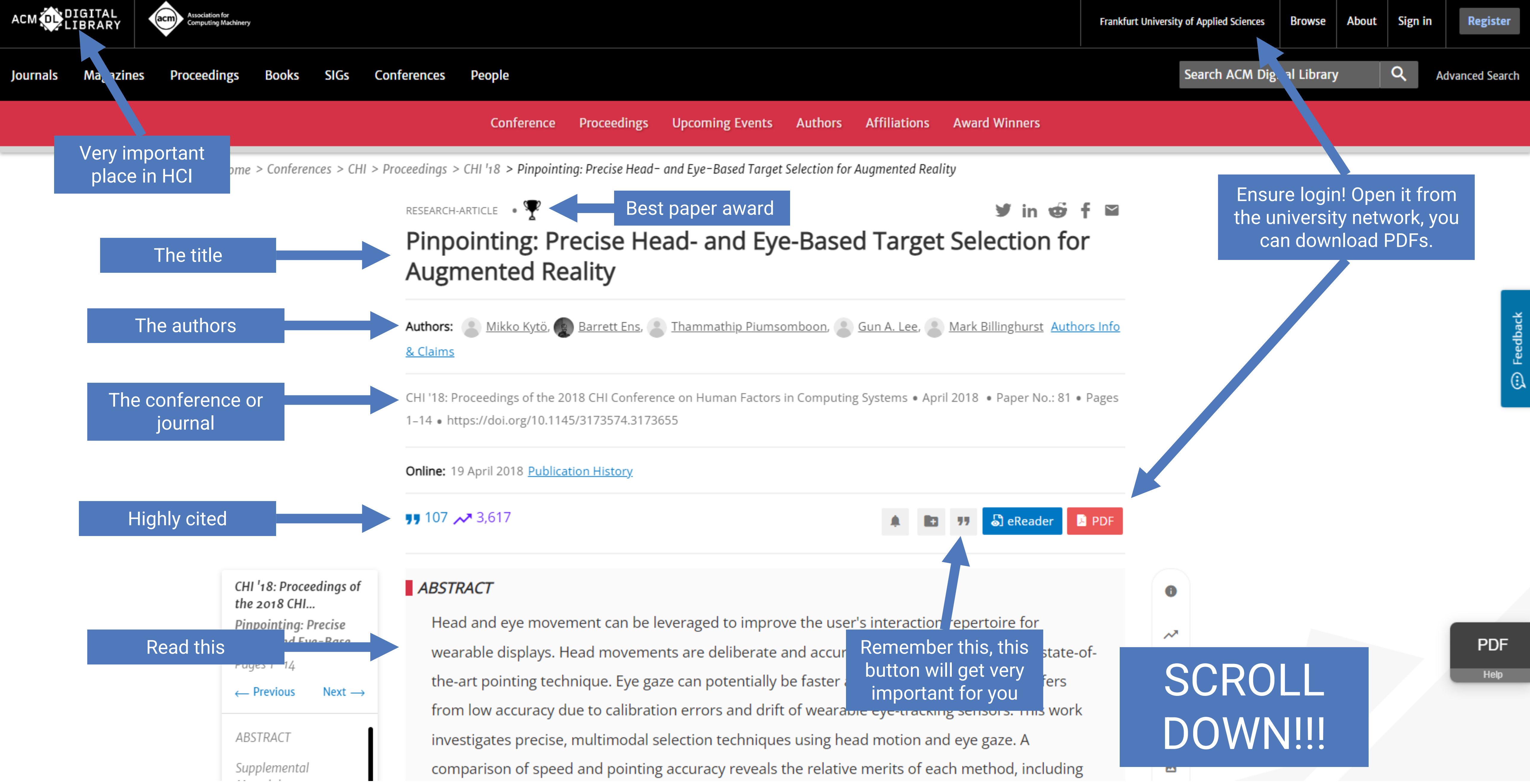




Enter your keywords

Google Scholar




ACM DIGITAL LIBRARY
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Frankfurt University of Applied Sciences
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About
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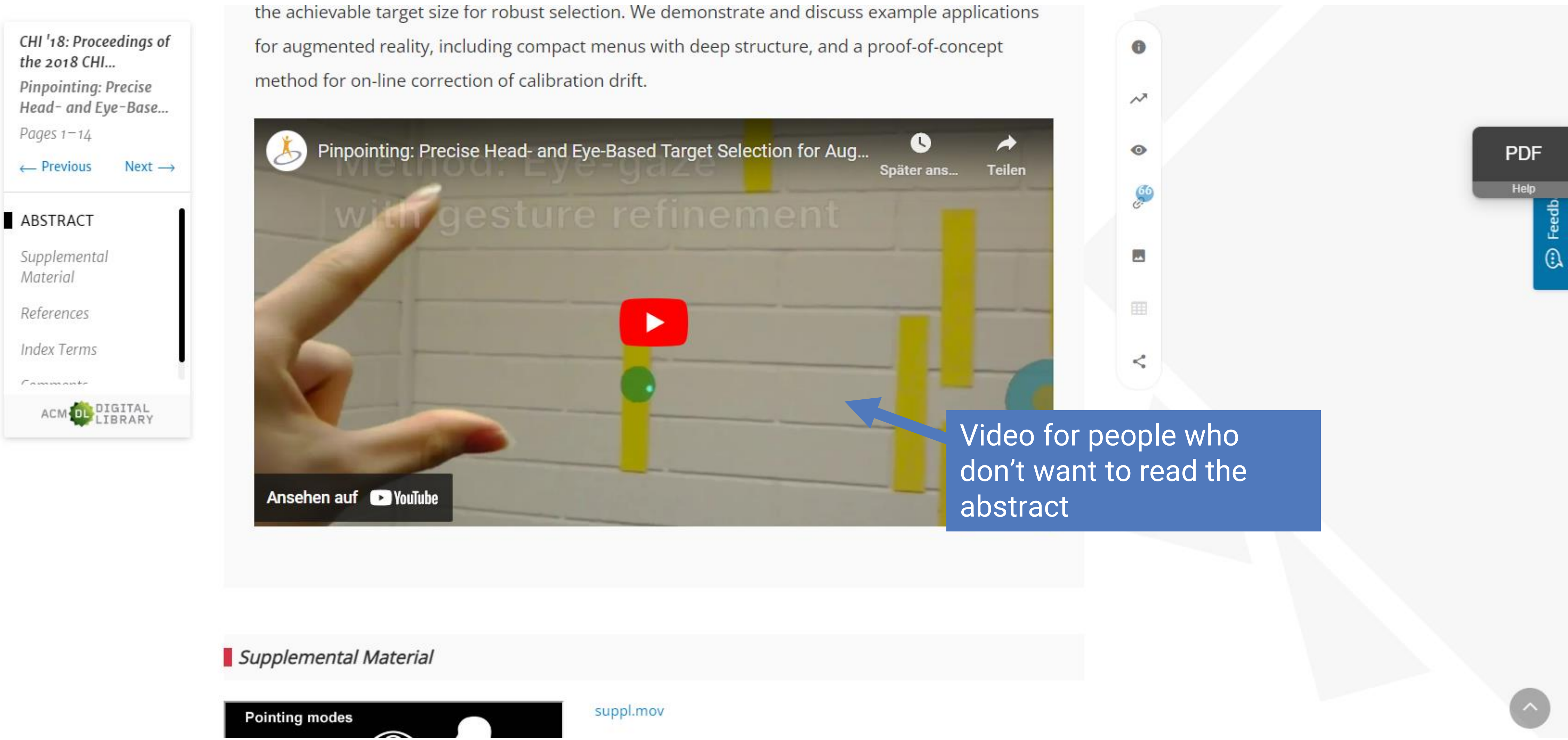
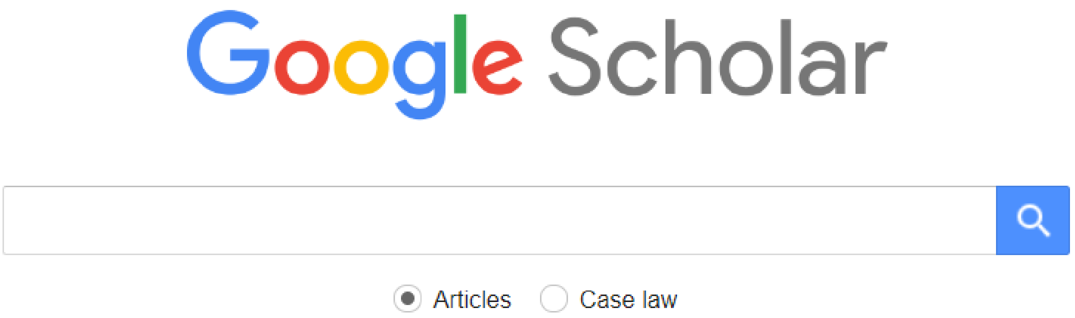
Register
Journals
Magazines
Proceedings
Books
SIGs
Conferences
People
Search ACM Digital Library
Advanced Search
Conference
Proceedings
Upcoming Events
Authors
Affiliations
Award Winners
Very important place in HCI
Home > Conferences > CHI > Proceedings > CHI '18 > Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality
RESEARCH-ARTICLE
Best paper award
Ensure login! Open it from the university network, you can download PDFs.
The title
Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality
The authors
Authors: Mikko Kytö, Barrett Ens, Thammathip Piumsomboon, Gun A. Lee, Mark Billinghurst Authors Info & Claims
The conference or journal
CHI '18: Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems • April 2018 • Paper No.: 81 • Pages 1–14 • https://doi.org/10.1145/3173574.3173655
Online: 19 April 2018 Publication History
Highly cited
107
3,617
eReader
PDF
Feedback
CHI '18: Proceedings of the 2018 CHI...
Pinpointing: Precise Head- and Eye-Base
Pages 1–14
Previous
Next
ABSTRACT
Supplemental
Read this
ABSTRACT
Head and eye movement can be leveraged to improve the user's interaction repertoire for wearable displays. Head movements are deliberate and accur... state-of-the-art pointing technique. Eye gaze can potentially be faster ... fers from low accuracy due to calibration errors and drift of wearable eye-tracking sensors. This work investigates precise, multimodal selection techniques using head motion and eye gaze. A comparison of speed and pointing accuracy reveals the relative merits of each method, including
Remember this, this button will get very important for you
SCROLL DOWN!!!
PDF
Help

Digital Libraries



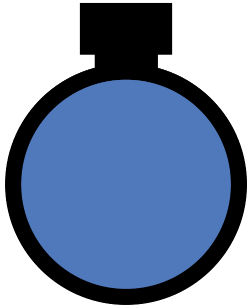
Video for people who don't want to read the abstract



Exercise: Find and describe a paper that measuring user experience in video games

1. Go to https://scholar.google.com …
2. Enter the related keywords
3. Click on results that seems to be relevant…
4. Find and open a paper (if not possible open the next one)…
5. Find and describe what they measured…

You have 5 minutes…



Issues in Understanding Scientific Reports in HCI

- What could you find?
- How did you select the paper?
- How did you ensure that you found a good paper?
- Do you understand it?
- What was your problem?
- Why was is difficult to understand?

Research Paper in HCI

- **Empirical Papers**: Describes material and data used for an empirical user study, the methodologies applied to answer the research questions and the results obtained.
- **Case Study Papers**: Used to describe the study of a certain person, group, location, event, or situation.
- **Methodology Papers**: Describe a novel method which may be intended for use in research or practical settings (or both).
- **System/Data Papers**: Describes material and design process of set. They contain no empirical user study.

Original Research / Primary Research

- **Literature Reviews/Survey Papers**: Provide insights and an overview about the field and have their own contribution

Secondary Research

- **Theory/Position/White/Ontology Papers**: Describe definitions, principles, concepts or models on which work in the field (empirical, experience, meth

Popular science

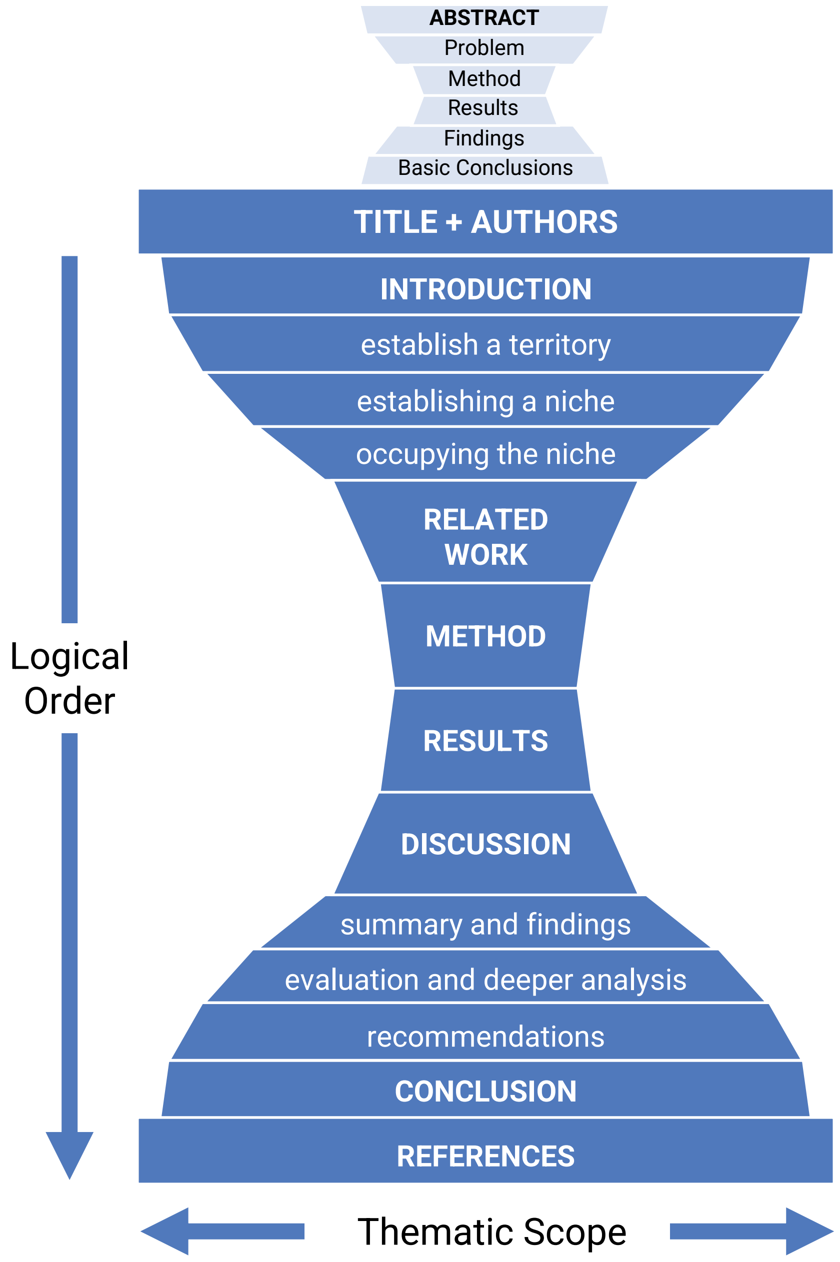
The IMRAD Structure

- **IMRAD**: **I**ntroduction, **M**ethods, **R**esults, **a**nd **D**iscussion
- All research articles (and yours) are typically structured in this order
  - **Introduction** – Why was the study undertaken? What was the research question, the tested hypothesis or the purpose of the research?
  - **Related Work** – What are findings of previous work before the study was undertaken?
  - **Methods** – When, where, and how was the study done? What materials were used or who was included in the study groups (patients, etc.)?
  - **Results** – What answer was found to the research question; what did the study find? Was the tested hypothesis true?
  - **Discussion** – What might the answer imply and why does it matter? How does it fit in with what other researchers have found? What are the perspectives for future research?

[1] https://en.wikipedia.org/wiki/IMRAD

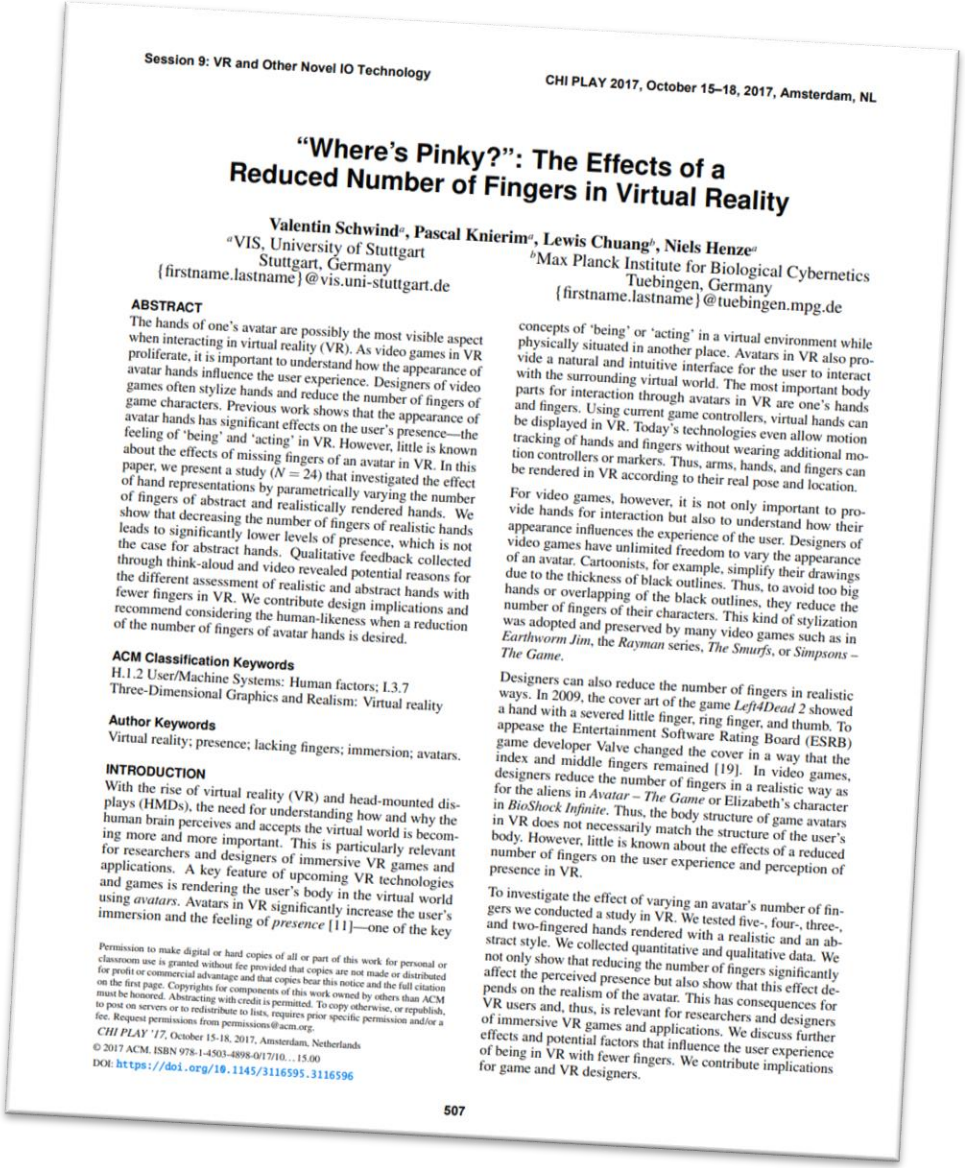
The Paper as an Hourglass

- **ABSTRACT**
- **INTRODUCTION**
  - Motivation & Problem Statement
  - Theoretical Background
  - Research Question
  - Hypothesis
- **RELATED WORK**
- **METHOD**
  - Study Design
  - Independent Variables
  - Dependent Variables
  - Apparatus
  - Tasks
  - Procedure
  - Participants
- **RESULTS**
  - Descriptive statistics
  - Inferential statistics (No interpretation!)
- **DISCUSSION**
  - Brief summary of findings
  - Discussion/Interpretation of findings
  - Relation to previous/related work
  - Limitation of the study
- **CONCLUSION**
- (CONTRIBUTION)
- (ACKNOWLEDGEMENTS)



Example:

- Valentin Schwind, Pascal Knierim, Lewis Chuang, and Niels Henze. 2017. "Where's Pinky?": The Effects of a Reduced Number of Fingers in Virtual Reality. In Proceedings of the Annual Symposium on Computer-Human Interaction in Play (CHI PLAY '17). Association for Computing Machinery, New York, NY, USA, 507–515. https://doi.org/10.1145/3116595.3116596



"Where's Pinky?": The Effects of a Reduced Number of Fingers in Virtual Reality

Valentin Schwind[a], Pascal Knierim[a], Lewis Chuang[b], Niels Henze[a]

[a]VIS, University of Stuttgart
Stuttgart, Germany
{firstname.lastname}@vis.uni-stuttgart.de

[b]Max Planck Institute for Biological Cybernetics
Tuebingen, Germany
{firstname.lastname}@tuebingen.mpg.de

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H.1.2 User/Machine Systems: Human factors; I.3.7 Three-Dimensional Graphics and Realism: Virtual reality

Author Keywords

Virtual reality; presence; lacking fingers; immersion; avatars.

INTRODUCTION

With the rise of virtual reality (VR) and head-mounted displays (HMDs), the need for understanding how and why the human brain perceives and accepts the virtual world is becoming more and more important. This is particularly relevant for researchers and designers of immersive VR games and applications. A key feature of upcoming VR technologies and games is rendering the user's body in the virtual world using *avatars*. Avatars in VR significantly increase the user's immersion and the feeling of *presence* [11]—one of the key concepts of 'being' or 'acting' in a virtual environment while physically situated in another place. Avatars in VR also provide a natural and intuitive interface for the user to interact with the surrounding virtual world. The most important body parts for interaction through avatars in VR are one's hands and fingers. Using current game controllers, virtual hands can be displayed in VR. Today's technologies even allow motion tracking of hands and fingers without wearing additional motion controllers or markers. Thus, arms, hands, and fingers can be rendered in VR according to their real pose and location.

For video games, however, it is not only important to provide hands for interaction but also to understand how their appearance influences the experience of the user. Designers of video games have unlimited freedom to vary the appearance of an avatar. Cartoonists, for example, simplify their drawings due to the thickness of black outlines. Thus, to avoid too big hands or overlapping of the black outlines, they reduce the number of fingers of their characters. This kind of stylization was adopted and preserved by many video games such as in *Earthworm Jim*, the *Rayman* series, *The Smurfs*, or *Simpsons – The Game*.

Designers can also reduce the number of fingers in realistic ways. In 2009, the cover art of the game *Left4Dead 2* showed a hand with a severed little finger, ring finger, and thumb. To appease the Entertainment Software Rating Board (ESRB) game developer Valve changed the cover in a way that the index and middle fingers remained [19]. In video games, designers reduce the number of fingers in a realistic way as for the aliens in *Avatar – The Game* or Elizabeth's character in *BioShock Infinite*. Thus, the body structure of game avatars in VR does not necessarily match the structure of the user's body. However, little is known about the effects of a reduced number of fingers on the user experience and perception of presence in VR.

To investigate the effect of varying an avatar's number of fingers we conducted a study in VR. We tested five-, four-, three-, and two-fingered hands rendered with a realistic and an abstract style. We collected quantitative and qualitative data. We not only show that reducing the number of fingers significantly affect the perceived presence but also show that this effect depends on the realism of the avatar. This has consequences for VR users and, thus, is relevant for researchers and designers of immersive VR games and applications. We discuss further effects and potential factors that influence the user experience of being in VR with fewer fingers. We contribute implications for game and VR designers.

CHI PLAY '17, October 15-18, 2017, Amsterdam, Netherlands

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DOI: https://doi.org/10.1145/3116595.3116596

Example: Title and Authors

Sometimes papers have catchy titles or acronyms..

It‘s a conference paper and obviously from 2017

Obviously it‘s about missing fingers in VR

Authors

Session 9: VR and Other Novel IO Technology   CHI PLAY 2017, October 15–18, 2017, Amsterdam, NL

"Where's Pinky?": The Effects of a Reduced Number of Fingers in Virtual Reality

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[a]VIS, University of Stuttgart
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{firstname.lastname}@vis.uni-stuttgart.de

[b]Max Planck Institute for Biological Cyberne[tics]
Tuebingen, Germany
{firstname.lastname}@tuebingen.mpg.de

ABSTRACT

The hands of one's avatar are possibly the most visible aspect when interacting in virtual reality (VR). As video games in VR

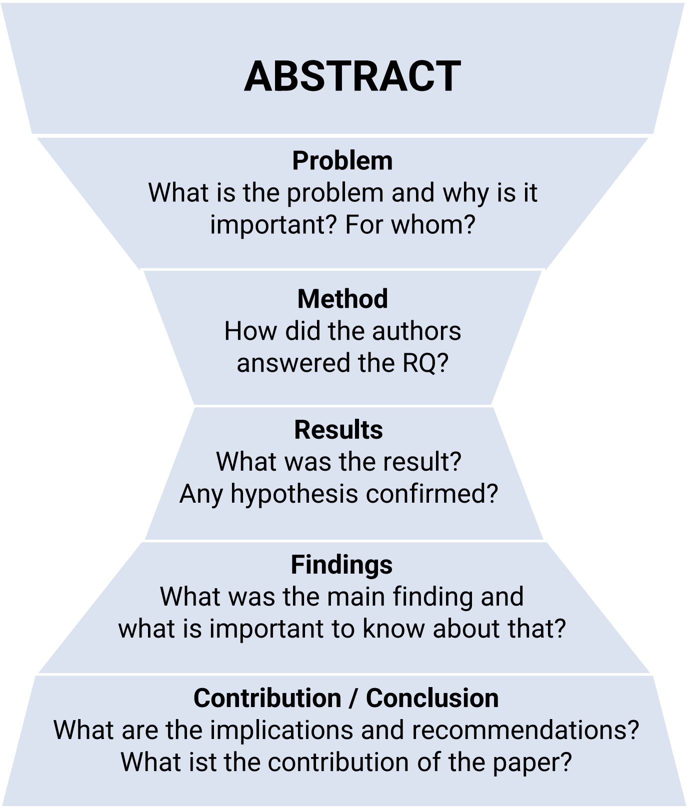
concept of 'being' or 'acting' in a virtual environment while physically situated in another place. Avatars in VR also pro-vide a natural and intuitive interface for the user to interact

I still have a redirection on that mail

The affiliations

Abstract

- Typically, 150 - 250 words
- **Briefly introduces the reader** to
  - motivation, problem, and relevance
  - the aims of the study and which methods were used
  - results and findings
  - conclusion & contribution
- Ideally, each sentence deals about one section in your paper
- The abstract **always answers** these four questions:
  - Why did you do this?
  - What did you do?
  - What did you find?
  - What do your findings mean?



Abstract: Tips for reading

- **Reflect the structure** of the paper
  - Bear in mind that there is a match between abstract and paper
  - Ideally, each section of your paper belongs to one sentence in the paper
- **Search for what they did and why**
  - What did they developed?
  - How many participants were tested?
  - What happened during the study?
- **Find the contribution**
  - What is the key benefit for readers?
  - For whom it is interesting?
  - How is the contribution articulated? (Which words are used, are there any ‘modulators’, e.g. ‘Perhaps … suggests … might … could …?)

The Abstract

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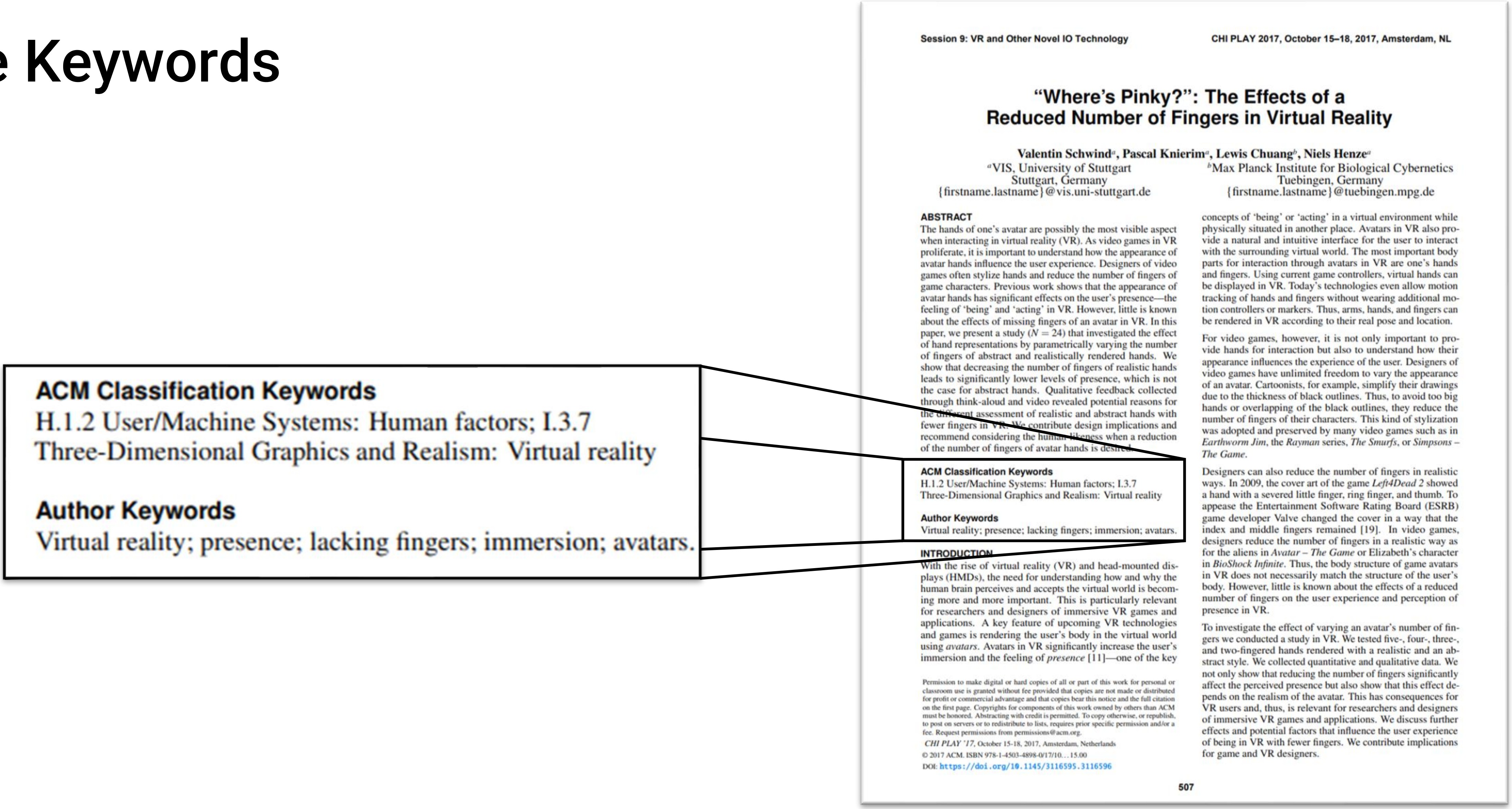

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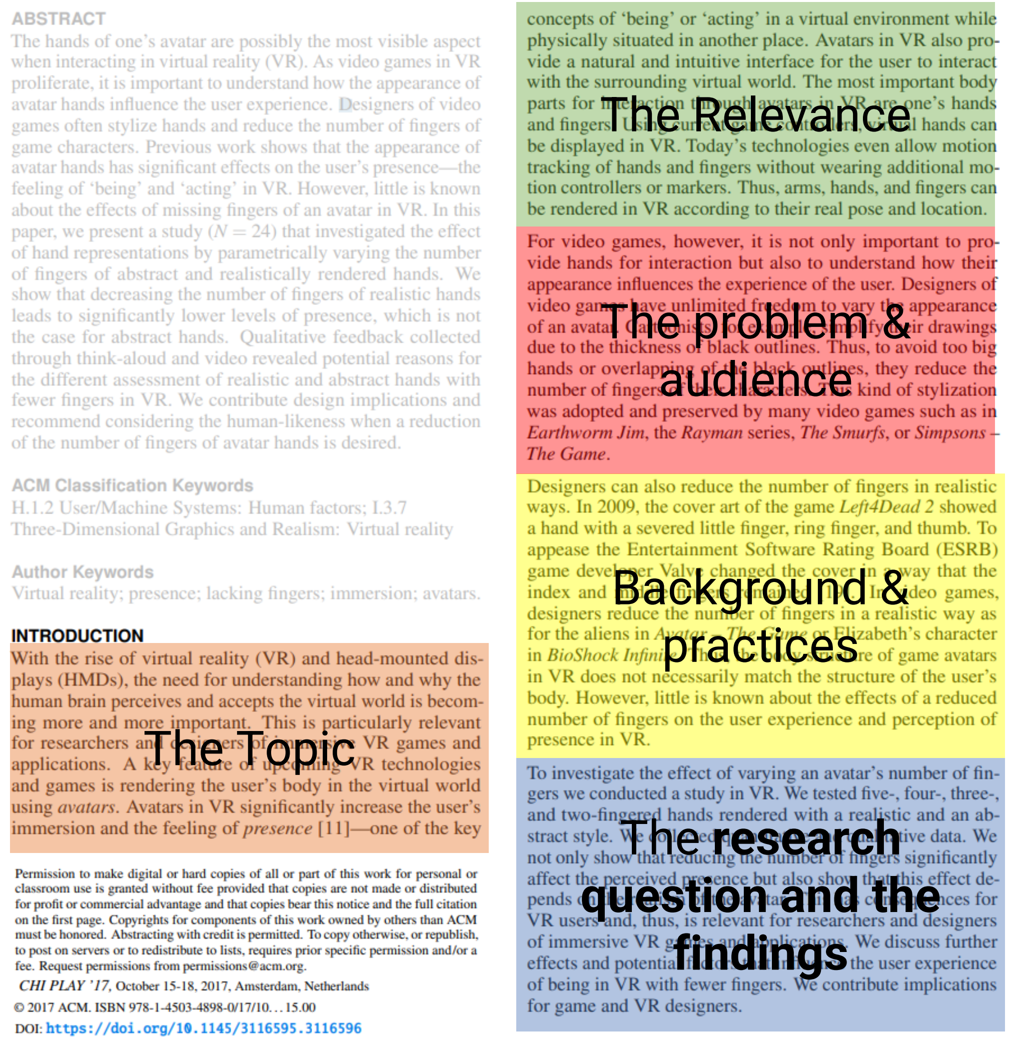
Dissecting the Abstract

- **RELEVANCE**: The hands of one's avatar are possibly the most visible aspect when interacting in virtual reality (VR). As video games in VR proliferate, it is important to understand how the appearance of avatar hands influence the user experience. Designers of video games often stylize hands and reduce the number of fingers of game characters.
- **PREVIOUS WORK**: Previous work shows that the appearance of avatar hands has significant effects on the user's presence—the feeling of 'being' and 'acting' in VR.
- **THE PROBLEM**: However, little is known about the effects of missing fingers of an avatar in VR
- **THE STUDY**: In this paper, we present a study (N = 24) that investigated the effect of hand representations by parametrically varying the number of fingers of abstract and realistically rendered hands.
- **RESULTS + FINDINGS**: We show that decreasing the number of fingers of realistic hands leads to significantly lower levels of presence, which is not the case for abstract hands. Qualitative feedback collected through think-aloud and video revealed potential reasons for the different assessment of realistic and abstract hands with fewer fingers in VR.
- **INTEPRETATION, CONCLUSION, CONTRIBUTION**: We contribute design implications and recommend considering the human-likeness when a reduction of the number of fingers of avatar hands is desired.

Introduction



ABSTRACT

The hands of one's avatar are possibly the most visible aspect when interacting in virtual reality (VR). As video games in VR proliferate, it is important to understand how the appearance of avatar hands influence the user experience. Designers of video games often stylize hands and reduce the number of fingers of game characters. Previous work shows that the appearance of avatar hands has significant effects on the user's presence—the feeling of 'being' and 'acting' in VR. However, little is known about the effects of missing fingers of an avatar in VR. In this paper, we present a study ($N = 24$) that investigated the effect of hand representations by parametrically varying the number of fingers of abstract and realistically rendered hands. We show that decreasing the number of fingers of realistic hands leads to significantly lower levels of presence, which is not the case for abstract hands. Qualitative feedback collected through think-aloud and video revealed potential reasons for the different assessment of realistic and abstract hands with fewer fingers in VR. We contribute design implications and recommend considering the human-likeness when a reduction of the number of fingers of avatar hands is desired.

ACM Classification Keywords

H.1.2 User/Machine Systems: Human factors; I.3.7 Three-Dimensional Graphics and Realism: Virtual reality

Author Keywords

Virtual reality; presence; lacking fingers; immersion; avatars.

INTRODUCTION

With the rise of virtual reality (VR) and head-mounted displays (HMDs), the need for understanding how and why the human brain perceives and accepts the virtual world is becoming more and more important. This is particularly relevant for researchers and designers of immersive VR games and applications. A key feature of upcoming VR technologies and games is rendering the user's body in the virtual world using *avatars*. Avatars in VR significantly increase the user's immersion and the feeling of *presence* [11]—one of the key concepts of 'being' or 'acting' in a virtual environment while physically situated in another place. Avatars in VR also provide a natural and intuitive interface for the user to interact with the surrounding virtual world. The most important body parts for interaction through avatars in VR are one's hands and fingers. Using current game controllers, virtual hands can be displayed in VR. Today's technologies even allow motion tracking of hands and fingers without wearing additional motion controllers or markers. Thus, arms, hands, and fingers can be rendered in VR according to their real pose and location.

For video games, however, it is not only important to provide hands for interaction but also to understand how their appearance influences the experience of the user. Designers of video games have unlimited freedom to vary the appearance of an avatar. Cartoonists, for example, simplify their drawings due to the thickness of black outlines. Thus, to avoid too big hands or overlapping of the black outlines, they reduce the number of fingers of their characters. This kind of stylization was adopted and preserved by many video games such as in *Earthworm Jim*, the *Rayman* series, *The Smurfs*, or *Simpsons – The Game*.

Designers can also reduce the number of fingers in realistic ways. In 2009, the cover art of the game *Left4Dead 2* showed a hand with a severed little finger, ring finger, and thumb. To appease the Entertainment Software Rating Board (ESRB) game developer Valve changed the cover in a way that the index and middle fingers remained [19]. In video games, designers reduce the number of fingers in a realistic way as for the aliens in *Avatar – The Game* or Elizabeth's character in *BioShock Infinite*. Thus, the body structure of game avatars in VR does not necessarily match the structure of the user's body. However, little is known about the effects of a reduced number of fingers on the user experience and perception of presence in VR.

To investigate the effect of varying an avatar's number of fingers we conducted a study in VR. We tested five-, four-, three-, and two-fingered hands rendered with a realistic and an abstract style. We collected quantitative and qualitative data. We not only show that reducing the number of fingers significantly affect the perceived presence but also show that this effect depends on the realism of the avatar. This has consequences for VR users and, thus, is relevant for researchers and designers of immersive VR games and applications. We discuss further effects and potential factors that influence the user experience of being in VR with fewer fingers. We contribute implications for game and VR designers.

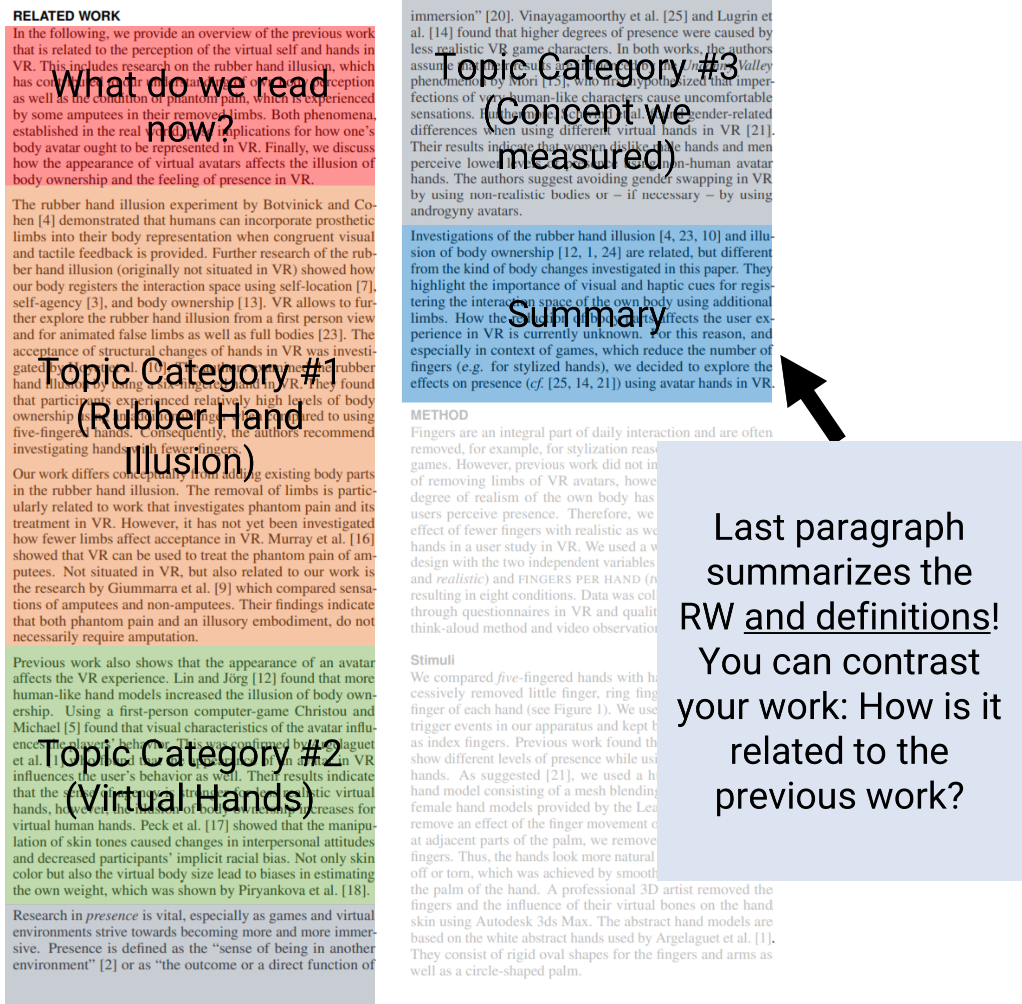
CHI PLAY '17, October 15-18, 2017, Amsterdam, Netherlands

© 2017 ACM. ISBN 978-1-4503-4898-0/17/10...15.00

DOI: https://doi.org/10.1145/3116595.3116596

- The big picture
- The statement problem
- The audience
- Brief background or relevant theory
- Practices for the topic
- Overall purpose, motivation
- The research question and hypotheses
- Overview about the rest of the paper
- Findings and contribution

Related Work



Last paragraph summarizes the RW <u>and definitions</u>! You can contrast your work: How is it related to the previous work?

- **Summarizes and presents the state of knowledge** using a simple narrative
- Mostly structured by related fields
- Conclusions that have been reached until today
  - Do all writers agree with each other?
  - Are the experiments comparable?
  - What is the quality of the studies?
  - Main issue and controversies around the problem
- Summary at the end of the section

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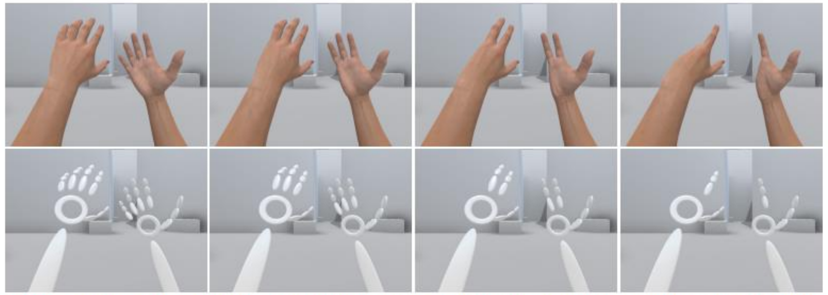

Figure 1. Screenshots of the avatar hand models of the four realistic (1st row) and four abstract (2nd row) hands with five, four, three, and two fingers.

What the participants saw

METHOD

Research question and study design

Fingers are an integral part of daily interaction and are often removed, for example, for stylization reasons in today's video games. However, [illegible] work did not investigate the effects of removing [illegible], shows that the degree of realism of the own body has an impact on how users perceive presence. Therefore, we decided to test the effect of [illegible] avatar hands in [illegible] study design with the two independent variables REALISM (*abstract* and *realistic*) and FINGERS PER HAND (*two*, *three*, *four*, *five*) resulting in [illegible] quantitatively through questionnaires in VR and qualitatively through the think-aloud method and video observations.

Stimuli

Stimuli creation

We compared *five*-fingered hands with hands where we successively removed little finger, ring finger, and the middle finger of each hand (see Figure 1). We used a pinch gesture to trigger events in our apparatus and kept both thumbs as well as index fingers. Previous work found that men and women show different levels of presence while using male and female hands. As suggested [21], we used a human androgynous hand model consisting of a mesh blending between male and female hand models provided by the Leap Motion SDK. To remove [illegible] skin at adjacent parts of the palm, we removed the stumps of the fingers. Thus, the hands look more natural and not as being cut off or torn, which was achieved by smooth transitions towards the palm of the hand. A professional 3D artist removed the fingers and the influence of their virtual bones on the hand skin using Autodesk 3ds Max. The abstract hand models are based on the white abstract hands used by Argelaguet et al. [1]. They consist of rigid oval shapes for the fingers and arms as well as a circle-shaped palm.

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What has been developed?

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Tasks

The tasks

Three immersive tasks were used to ensure that the virtual hands are in the field of view of each user. Furthermore, they enabled a versatile and immersive VR experience. We used the tasks purposed and provided by the software by Schwind et al. [21][1]. In the *typing task*, participants operated with a virtual keyboa[illegible] a text display. The *draw task* [illegible] hand painting in the surrounding virtual space using the pinch gesture. The *pyramid task* is a physical simulation where participants were advised to staple at least six blocks on a table to build a small pyramid. Black fading was used for transitions between all tasks as well as between the tasks and the final questionnaire.

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Experimental procedure

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Figure 2. Images of the participants situated and observed in our VR laboratory.

What the experimenter saw

Method: Study Description

- „How the authors answered the research question“
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Three immersive tasks were used to ensure that the virtual hands are in the field of view of each user. Furthermore, they enabled a versatile and immersive VR experience. We used the tasks purposed and provided by the software by Schwind et al. [21][1]. In the *typing task*, participants operated with a virtual keyboard to enter "I love VR" into a text display. The *draw task* enabled users to perform free hand painting in the surrounding virtual space using the pinch gesture. The *pyramid task* is a physical simulation where participants were advised to staple at least six blocks on a table to build a small pyramid. Black fading was used for transitions between all tasks as well as between the tasks and the final questionnaire.

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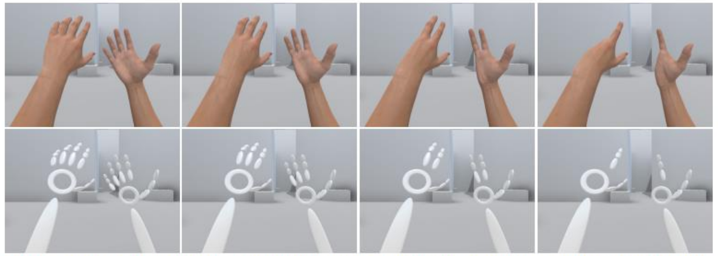

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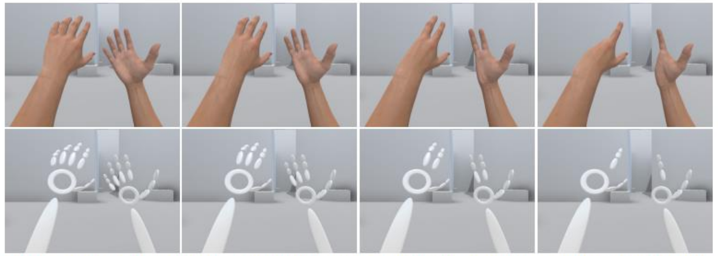

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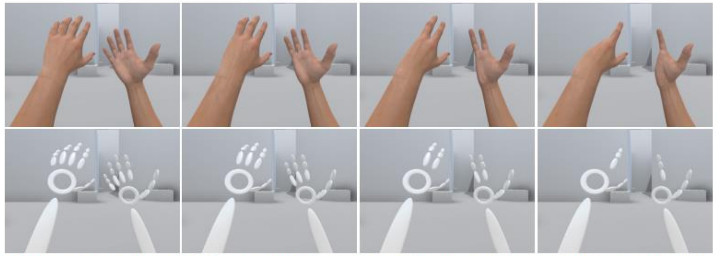

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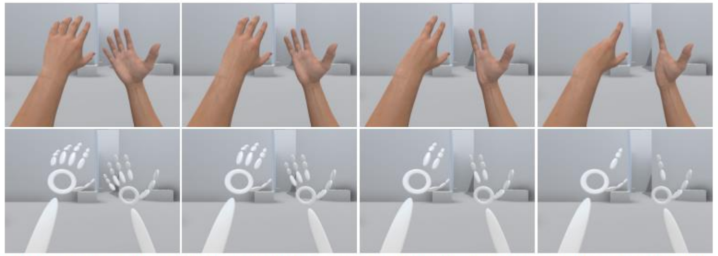

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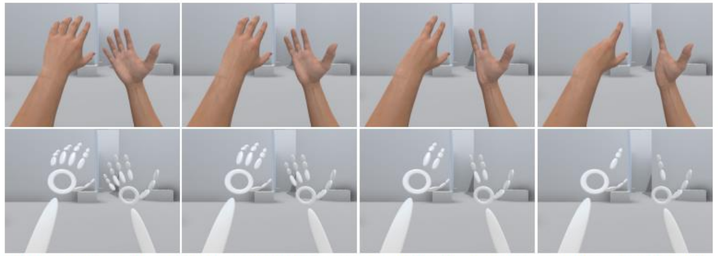

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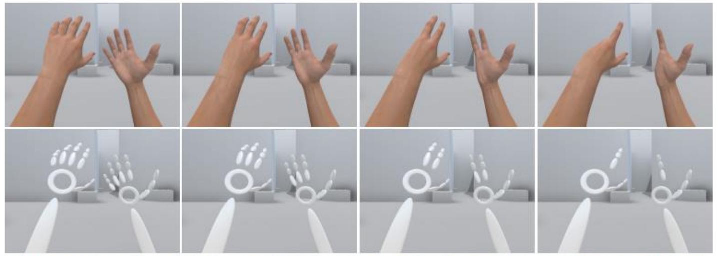

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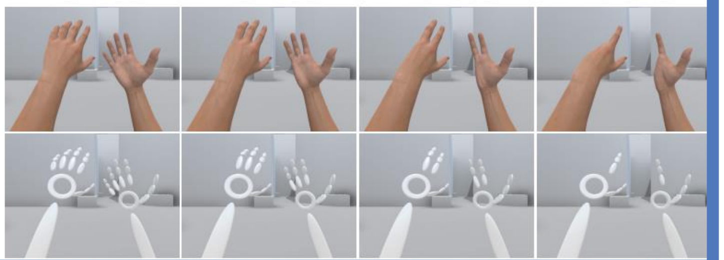

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We used questionnaires in VR to facilitate a continuously user experience (*cf.* integrated questionnaires in gaming environments by Frommel et al. [8]) as suggested by Schwind et al. [21]. Thus, every participant filled in the questionnaire using the virtual hands whose effect we actually measured. We decided to use the presence questionnaire (PQ) by Witmer and Singer [26]. The questionnaire has been used in a large number of studies, includes items that address related factors such as naturalness or involvement, and all questions can be meaningfully answered in VR. As suggested by previous work [21, 22], we additionally asked for likability, human-likeness, attractiveness, and eeriness on 7-point Likert scales. Participants' feedback and their actions were recorded through think-aloud protocols and video cameras.

[1] https://github.com/valentin-schwind/selfpresence

Procedure

After signing the consent form, every participant was asked to take a seat in the middle of our VR laboratory. We explained the experimental procedure and introduced the functionality of the HMD as well as the hand tracking sensor. Furthermore, all participants were instructed to "think aloud", which means to verbally articulate all their concerns and thoughts especially considering their virtual embodiments. We pointed out that participants could pause or abort the experiment at any time. The order of the eight virtual hands was given by a balanced Latin square design. The order of tasks was randomized by software. Every task could either be finished by pressing a button or showing a thumbs-up gesture. After completing all tasks a panel with the questionnaire appeared in front of the participant's view. Since all questions could not be displayed at once, panels containing four questions were presented. The participant navigated through these panels of the questionnaire by pressing two buttons labeled "back" and "next". After leaving the VR we handed out a questionnaire where we asked for feedback, general concerns, suggestions. Finally, we also asked for both the hand they prefer and definitely not prefer.

Figure 2. Images of the participants situated and observed in our VR laboratory.

Participants

We recruited 24 participants (11 males, 13 females) from our campus via mailing lists and social networks. All participants had light skin tones matching the visual appearance of the realistic virtual hand. None of the volunteers was excluded from participation in the study. The average age of the participants was 21.8 years ($SD = 6.41$). Only four participants mentioned having previous VR experience, 20 of our participants stated that they had no VR experience at all.

How to Read a Paper

Prof. Dr. Valentin Schwind

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Method: Images

- „How the authors answered the research question“
- Typical Sections:
  - What the authors do?
  - What did they compare?
  - How did the authors to answer the research question?
    - Where can I find it, if I want to repeat the study?
  - What did the participants do?
  - What did the authors measure?
  - What was the experimental procedure?
  - Who were the participants?
  - What did the participants see?
  - **What did the experimenters see?**

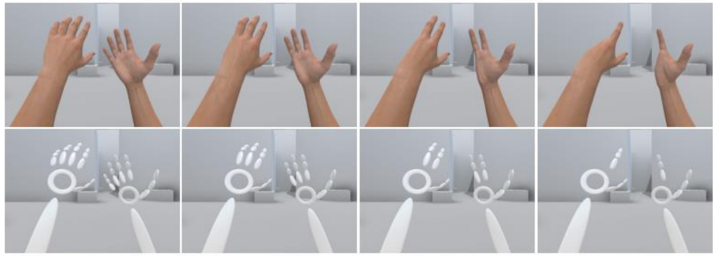

Figure 1. Screenshots of the avatar hand models of the four realistic (1st row) and four abstract (2nd row) hands with five, four, three, and two fingers.

METHOD

Fingers are an integral part of daily interaction and are often removed, for example, for stylization reasons in today's video games. However, previous work did not investigate the effects of removing limbs of VR avatars, however, shows that the degree of realism of the own body has an impact on how users perceive presence. Therefore, we decided to test the effect of fewer fingers with realistic as well as abstract avatar hands in a user study in VR. We used a within-subject study design with the two independent variables REALISM (*abstract* and *realistic*) and FINGERS PER HAND (*two*, *three*, *four*, *five*) resulting in eight conditions. Data was collected quantitatively through questionnaires in VR and qualitatively through the think-aloud method and video observations.

Stimuli

We compared *five*-fingered hands with hands where we successively removed little finger, ring finger, and the middle finger of each hand (see Figure 1). We used a pinch gesture to trigger events in our apparatus and kept both thumbs as well as index fingers. Previous work found that men and women show different levels of presence while using male and female hands. As suggested [21], we used a human androgynous hand model consisting of a mesh blending between male and female hand models provided by the Leap Motion SDK. To remove an effect of the finger movement on the animated skin at adjacent parts of the palm, we removed the stumps of the fingers. Thus, the hands look more natural and not as being cut off or torn, which was achieved by smooth transitions towards the palm of the hand. A professional 3D artist removed the fingers and the influence of their virtual bones on the hand skin using Autodesk 3ds Max. The abstract hand models are based on the white abstract hands used by Argelaguet et al. [1]. They consist of rigid oval shapes for the fingers and arms as well as a circle-shaped palm.

Apparatus

Our system consisted of an HTC Vive HMD and a Leap Motion sensor mounted onto the front of the display using a 3D printed frame. We used a PC with Windows 10, an Intel i7-6700, 16GB RAM, and a Nvidia GTX980 graphics card. Our Unity3D application used hand tracking provided by the Orion SDK of Leap Motion optimized for hand tracking on HMDs. The target frame rate of the application was 60 frames per second. To ensure that the frame rate and the tracking quality was the same for all hands, we used the same tracking system provided by Leap and the same configuration of bones. The surrounding scene was the same for all condition and designed with a neutral white style and a standard sun- and skylight. Real-time global illumination, anti-aliasing, and ambient occlusion were enabled for rendering.

Tasks

Three immersive tasks were used to ensure that the virtual hands are in the field of view of each user. Furthermore, they enabled a versatile and immersive VR experience. We used the tasks purposed and provided by the software by Schwind et al. [21][1]. In the *typing task*, participants operated with a virtual keyboard to enter "I love VR" into a text display. The *draw task* enabled users to perform free hand painting in the surrounding virtual space using the pinch gesture. The *pyramid task* is a physical simulation where participants were advised to staple at least six blocks on a table to build a small pyramid. Black fading was used for transitions between all tasks as well as between the tasks and the final questionnaire.

Measures

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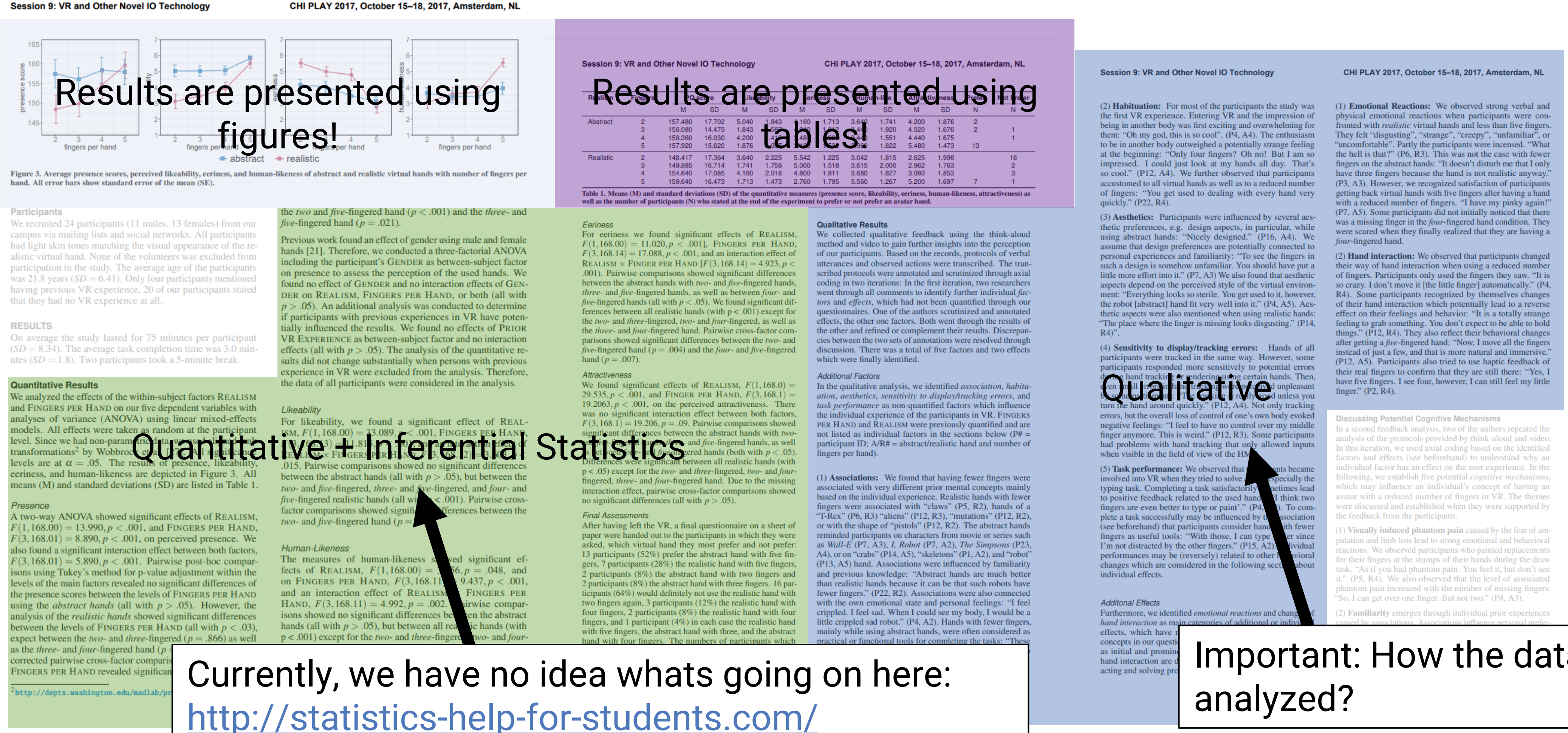
Study Design

- **What is the hypothesis** and **how do the authors want to answer it?**
  - "[…] previous work did not investigate the effects of removing limbs of VR avatars, however, shows that the degree of realism of the own body has an impact on how users perceive presence. Therefore, we decided to **test the effect of fewer fingers with realistic as well as abstract avatar hands in a user study in VR**."
- What is **the study design**? What are **the IVs**?
  - We used a **within-subject study design with the two independent variables REALISM (abstract and realistic) and FINGERS PER HAND (two, three, four, five)** resulting in eight conditions.
- Which **data** was **collected**? And **how**?
  - "Data was collected **quantitatively through questionnaires** in VR and **qualitatively through the think-aloud method and video observations.**"

Method

- **Apparatus**
  - There must be a picture → if not, search for the source code
  - What did they build ?
  - How did participants use it?
  - Often contain condensed: „To prevent motion sickness, we used an HMD with 90 FPS“
- **Tasks**
  - What did the participants do?
  - Why/How did they do the tasks? And why?
- **Procedure**
  - Describes what happened to every participant
    - e.g., How were stimuli ordered in the procedure („The order of the conditions was randomized for each participant.”)?

Results



Currently, we have no idea whats going on here: http://statistics-help-for-students.com/

Important: How the data was analyzed?

The Results

- Objective findings of the research (not the interpretation!)
- Main results are always plotted

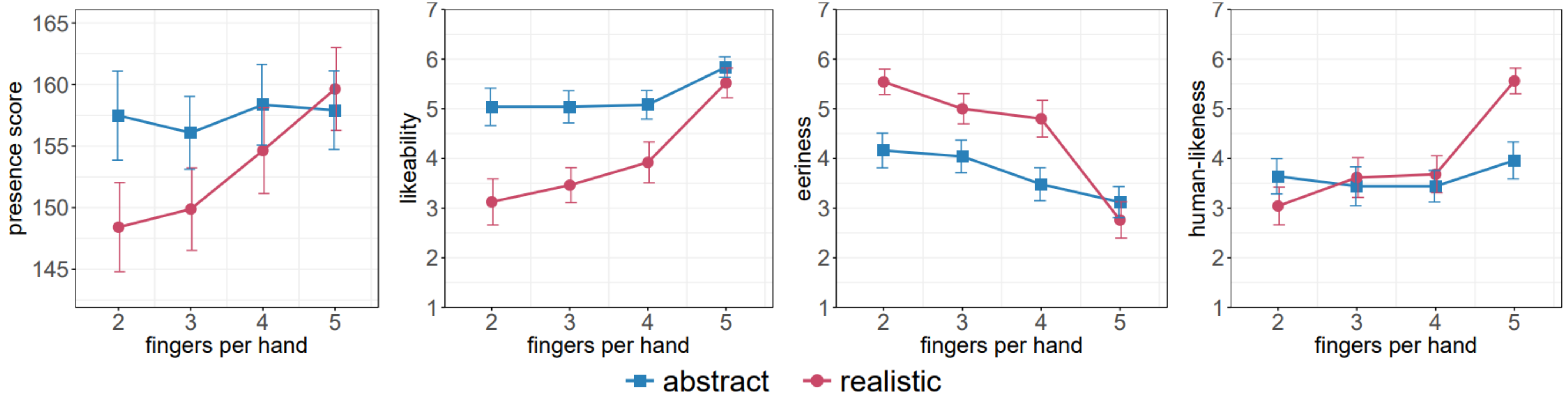
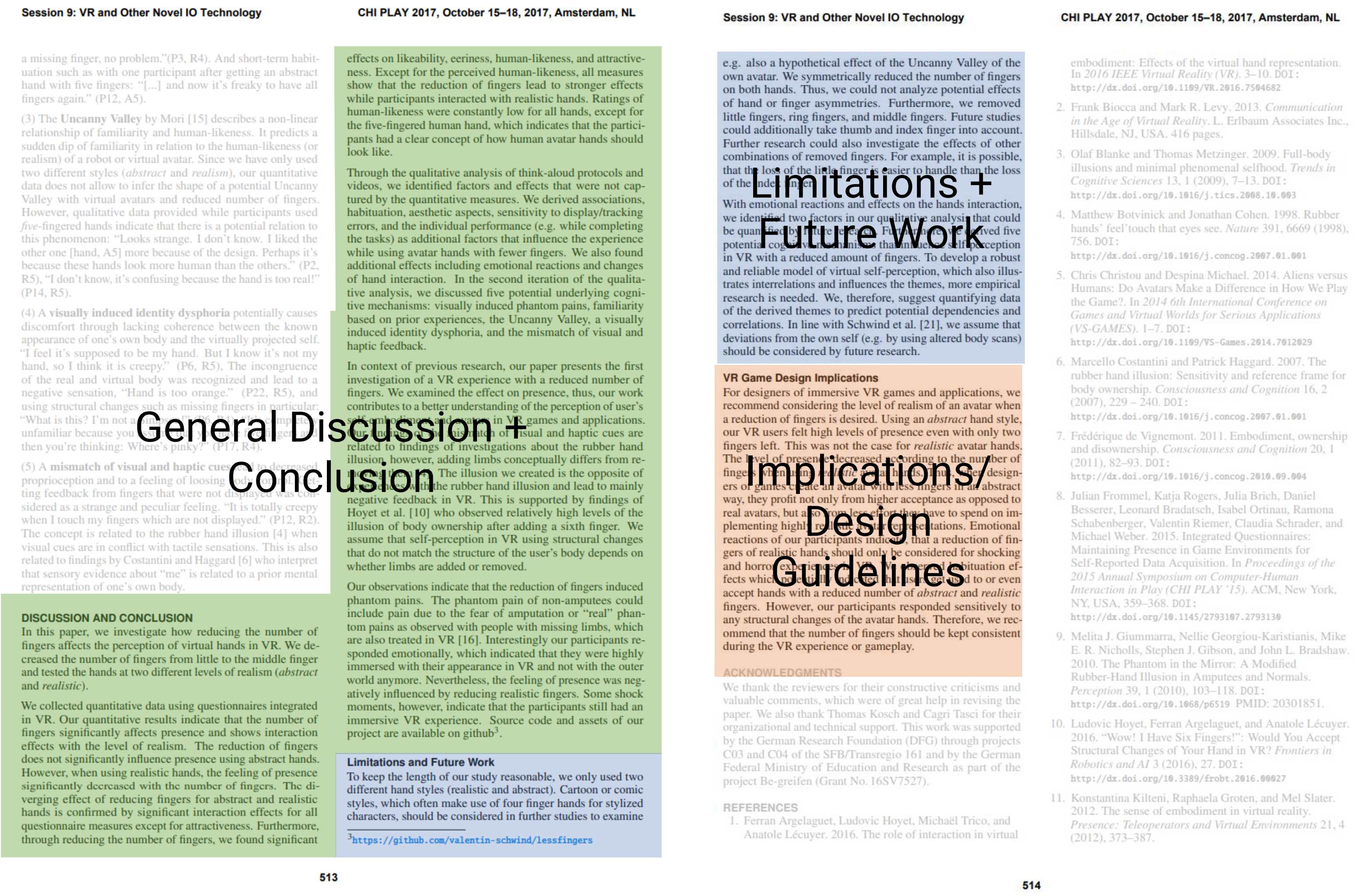


Figure 3. Average presence scores, perceived likeability, eeriness, and human-likeness of abstract and realistic virtual hands with number of fingers per hand. All error bars show standard error of the mean (SE).

Discussion



- The findings
- The reason for those findings
- The implications
- Illustrate the limitations
- Future Research
- Oftenr provides clear design guidelines

Discussion

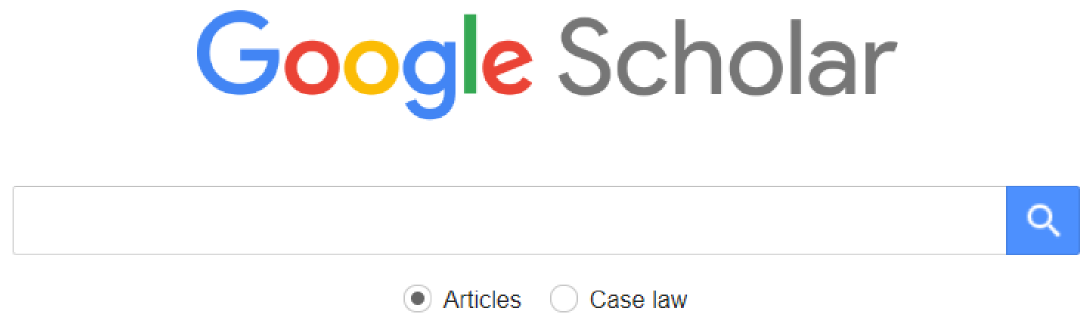
- A presentation of **background information** as well as recapitulation of the research aims of the study.
- A brief **summary of the results**, whereas the focus lies on discussing and not recapitulating the results.
- Explanation of the **results for normal humans**
- A **comparison of results with previously published studies**
- **Conclusions or hypotheses drawn from the results,** with summary of evidence for each conclusion
- **Proposed follow-up research questions** and outlook on further work
- **Weaknesses? Non-significant results? Unexpected data?**
- If you are a non-scientist, **where to find the interesting stuff**?

How I do read research papers…

Demonstration

Future Work

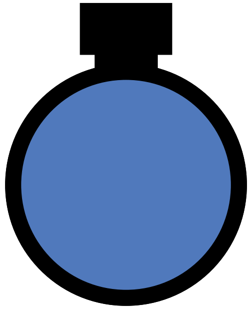
- **What are the recommendations now?**
  - Logical extension of the study: What comes next?
  - Replication of the study: Different setting?
  - Correction of limitations: Sample, apparatus, variable control, method
- **It is a great motiviation for you, when someone recommends to do your study**
  - Happens sometimes
  - That is a great template



Exercise: Find and describe
a paper that is related to your research question

1. Go to https://scholar.google.com …
2. Enter the related keywords
3. Click on a result that seems to be relevant…
4. Try to open the paper (if not possible open the next one)…
5. Find and describe the technique…

You have 5 minutes…



Questions

- What is the paper about?
- What did the authors do?
- Why did they do it?
- What are the independent variables?
- What are the dependent variables?
- What did they find out?
- What did you learn?

Using ChatGPT to summariz a paper…

Demonstration

Plugins: AI PDF

Summarize the paper, the findings, and method. Write one paragraph. Be concise. Do not hallucinate. Do not invent facts.

Using ChatGPT to summariz multiple papers…

Demonstration

Plugins: ScholarAI, Consensus Research, MixerBox Scholar

“**What is the effect of latency on games? I want to conduct a study with artificial latency to simulate the effect.** List and summarize in one paragraph about 3 related research papers that motivate the research around that topic. List and summarize in 3 papers that are related to that research question. List and summarize 3 research papers that use a similar method. Use all plugins. Ignore duplicates. Only use papers that have a DOI. Only summarize the main findings and method of the papers.”

Task Next Time

- **Each person** in your group **searches and reads at least 3 papers**
  - Person 1: papers **that motivate your research** (can be from other disciplines!)
  - Person 2: papers **closely related to your research question**
  - Person 3: papers **in your field** using a **similar method as you**

Research Motivation

Closely Related

Similar Method

No duplicates!