Validating Usability Heuristics for Augmented Reality Applications for Elderly Users

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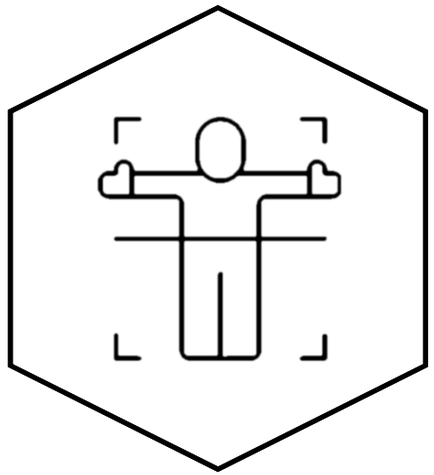
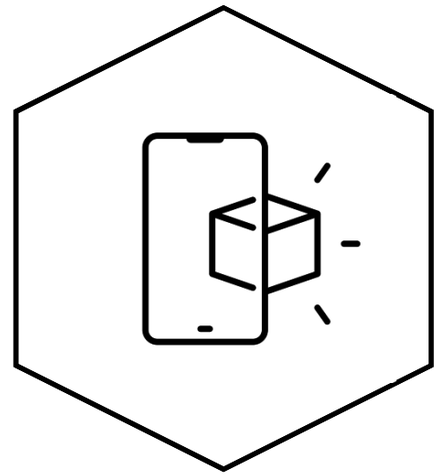
Background



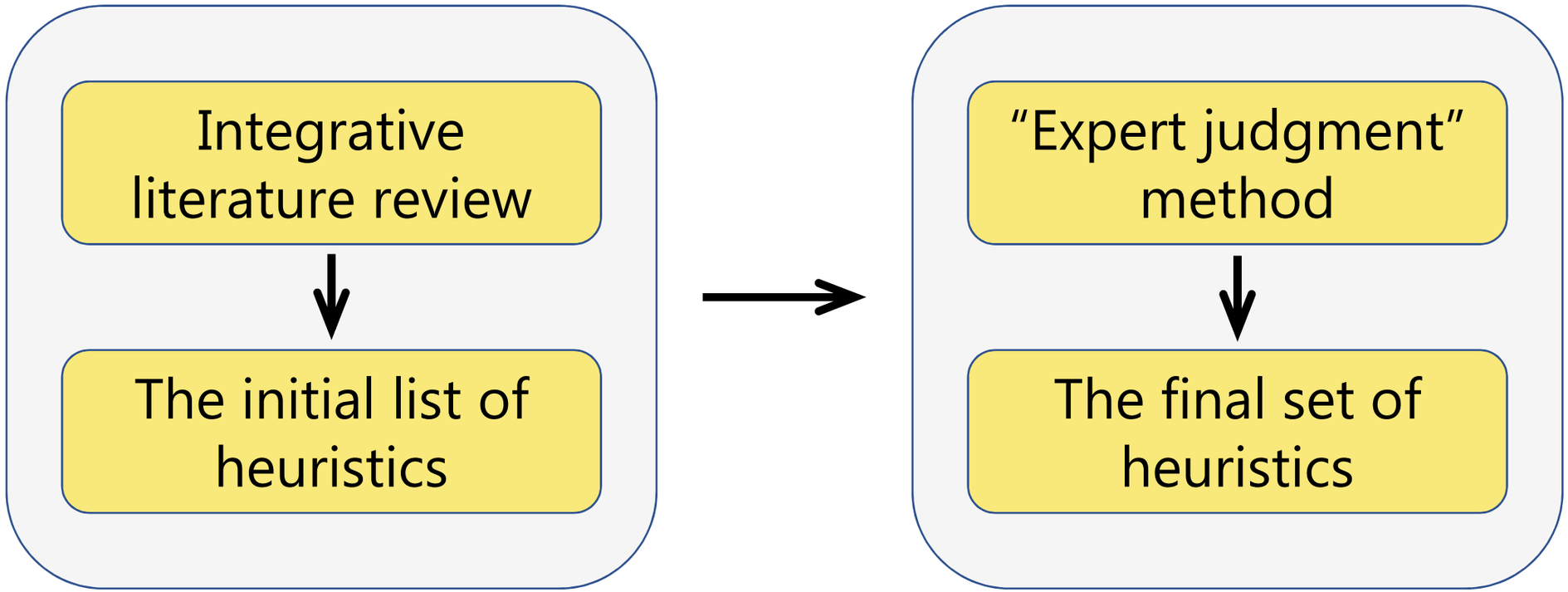
Augmented reality
and
Elderly people

Usability
and
Heuristic evaluation



Heuristics specific
for
AR and elderly
people

Our previous study



Our previous study

Heuristics for AR for Elderly Users

55 heuristics divided into 6 categories

- User involvement
- Usability and accessibility
- Hardware
- Cognitive and physical load
- Privacy
- Gamification

Aim of the study

To further validate the developed set of heuristics by using it to design an AR application interface and gathering feedback from the designers and front-end developers about the usefulness of the heuristics.

Partisipants

	P1	P2	P3
Type of work	Front-end developer and UX designer	Front-end developer, has experience with design tasks	UX designer specializing in user research
Years of experience	4.5	9.5	4
Experience with AR	Yes, as a user	Yes, as a developer	Yes, as a designer
Usability knowledge	Yes	Yes	Yes
Experience designing for and/or testing with elderly	No experience, but has knowledge of elderly users' needs	No experience, but has knowledge of elderly users' needs	Included elderly in user testing

Methods: Instructions

User group: elderly people.

Product: AR application for performing physical exercises (in a form of a game).

Exercise: Move hands over the head for 30 s.

Game scenario: Users need to imagine that they are flying over a canyon.

Hardware: Choose one of the following hardware:

> Smartphone, Microsoft Kinect and TV, or Head-mounted device.

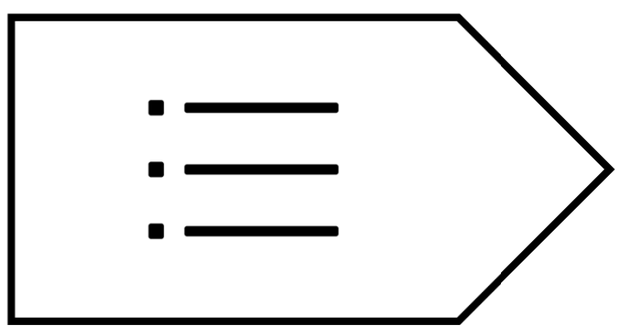
Task: To create a prototype of an AR application with 3-5 interface sketches using the set of heuristics.

Methods: Interviews

- Semi-structured
- Approximately one hour each
- Audio-recorded; notes taken
- The interviewer went through the participants' notes and asked clarifying questions
- The data was analyzed by creating inductive semantic codes and categories

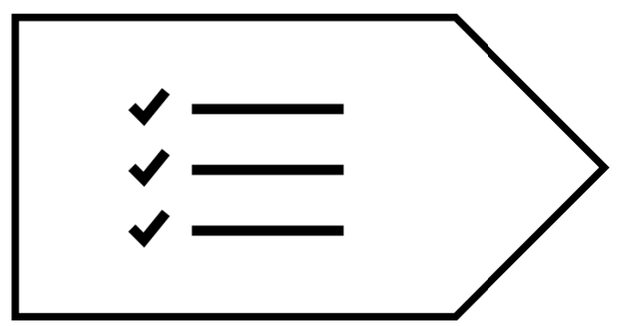
Results

All the participants independently chose the following way to proceed with the task:



Quickly looked through the list of heuristics

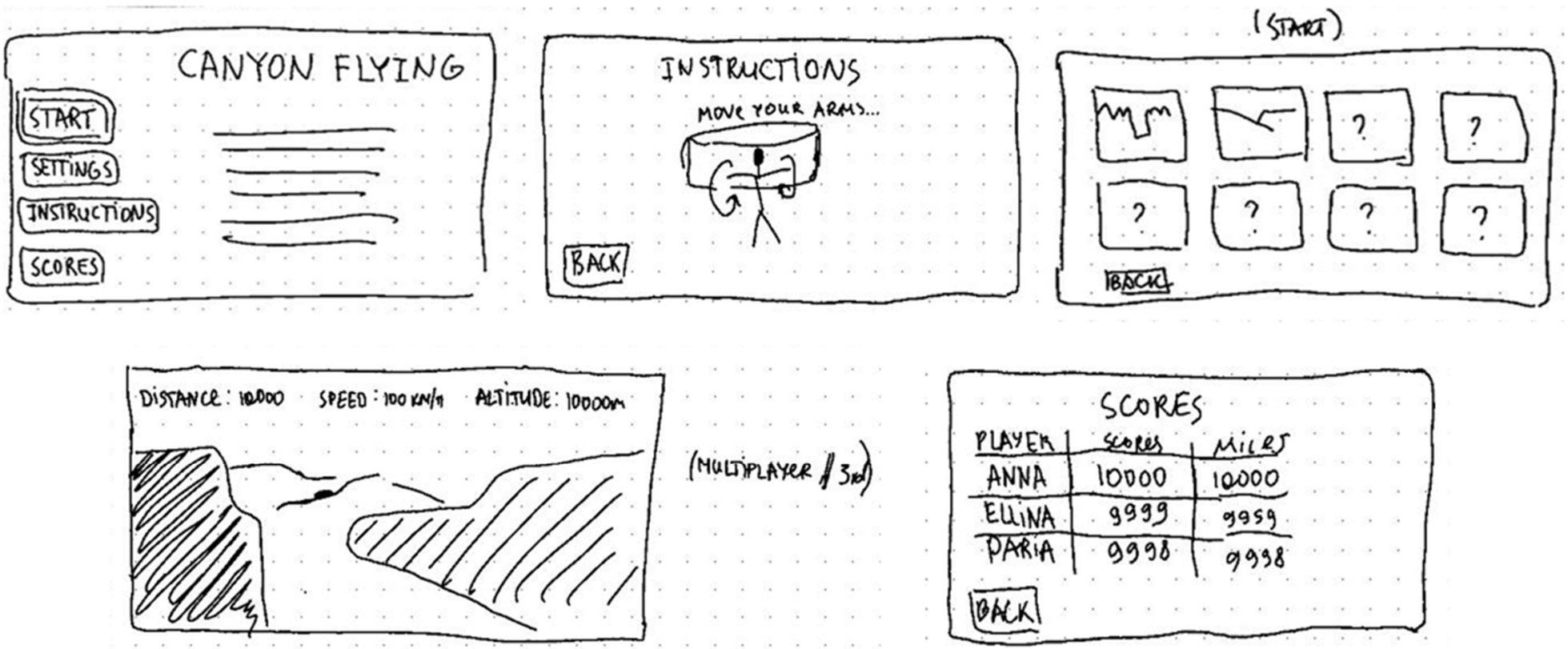
Made initial prototype



Checked if the prototype was compliant with the heuristics. Made changes

Design of the prototype

Participant 1

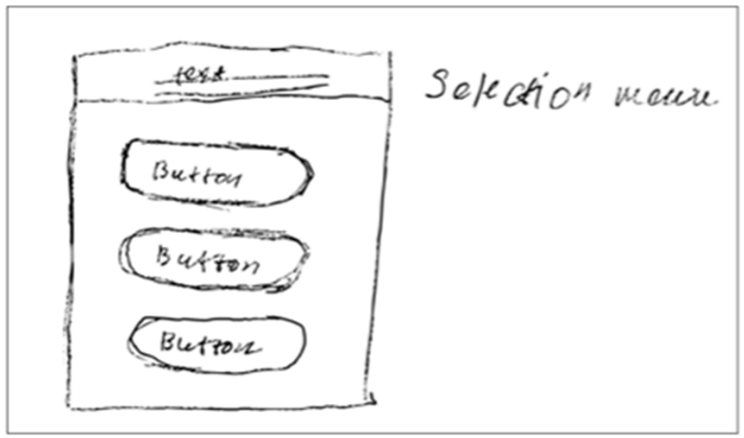


Participant 1

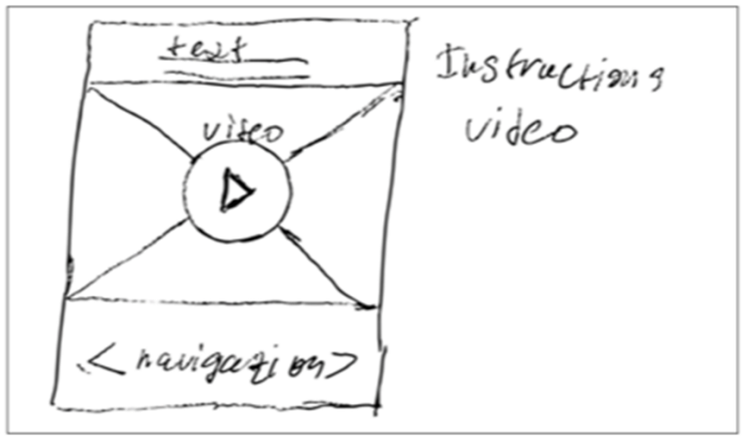
Heuristic	Change
31. Understandability, familiarity, and learnability: Use representative figures and icons that the user can distinguish and differentiate. **NOTE:** Elderly people may not be familiar with many standard Internet icons, so, when possible, to use short text, use it instead of an icon.	Added text to the button “Back” in the interface sketches to make the purpose of the button clearer for the users

Design of the prototype

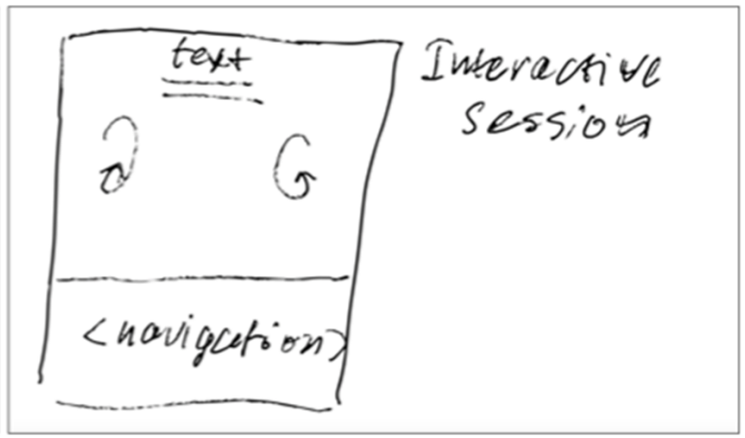
Participant 2



Selection menu



Instructions video



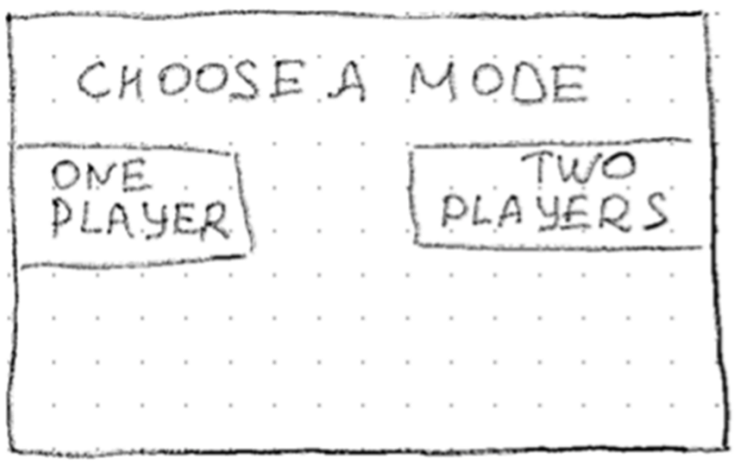
Interactive Sessions

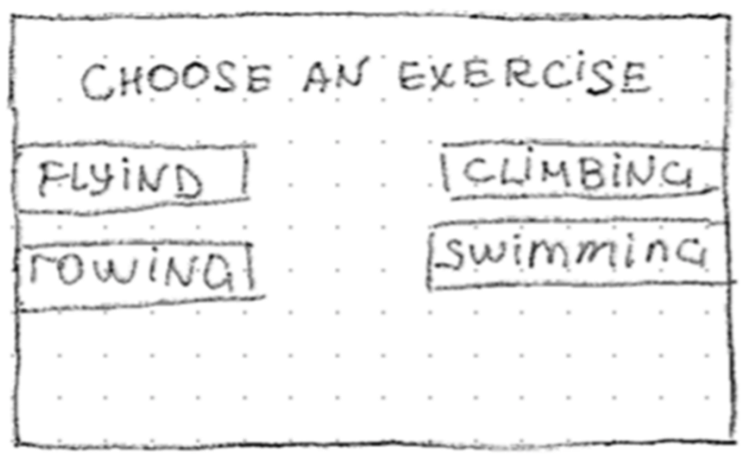
Participant 2

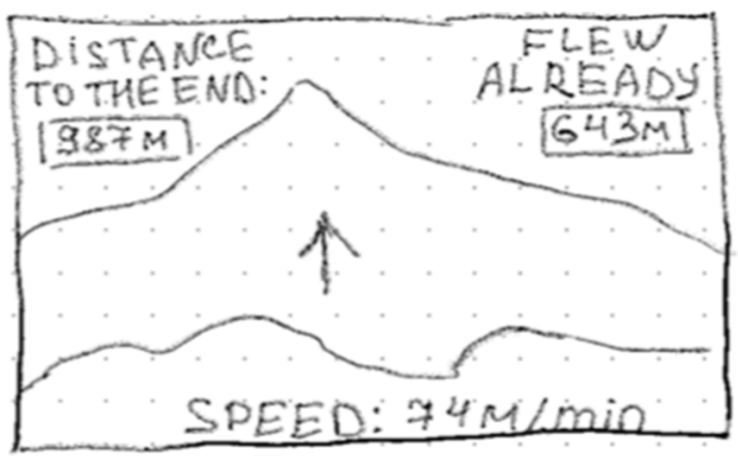
Heuristic	Change
9. Design the user interface design to enable the user to focus on the actual task and reduce the cognitive overhead needed to interact with the application**.**	Added a possibility to play the game without a login

Design of the prototype

Participant 3







Participant 3

Heuristic	Change
51. Consider adding an optional multi-player mode since playing together with family or friends can motivate elderly users to start and continue playing.	Added a two-players mode to support social aspect of the game and increase users' motivation to exercise

Applicability

- Some heuristics should be used before sketching the interface, and some should be used later in the development process.
- Heuristics cover tasks related to the work of different roles in the team, such as UX researcher, UX designer, front-end developer, hardware developer, and product manager.
- Good for the refinement stage and can be a good checklist
- A good start for the research and design process and usability testing at the end of the project

Understandability

- Overall, no issues understanding the heuristics.
- Most of the heuristics did not cause any confusion and were easy to use and apply.
- The notes for some of the heuristics were highly
- The only heuristic that raised some questions was heuristic number 7:

  "Involve and stimulate older adults' social networks."

- Some of the heuristics are overlapping

  "The heuristics are talking about the same issue, but they cover it from different angles."

Familiarity and novelty

- Some of the heuristics were common knowledge for an experienced UX designer, but they still need to be a part of a good checklist.

Familiarity and novelty

- The set highlights issues more specific for elderly people:

  Number 33: the higher importance of outdated technology consideration for the elderly.

  Number 5: the greater care needs of the elderly residents and the institutional infrastructure.

  Number 38: older adults' privacy needs and concerns.

  Number 3: need to consider specific conditions of older adults living environments.

  Number 25: need to support the user's procedural and semantic memory to enhance the learnability and usability of the interface.

Context and hardware

- It is not always possible to develop hardware in the project, or even sometimes choose it, so designers and developers do not always have an influence on the hardware.
- Heuristic number 13, “Consider that virtual elements hide real content.” was useful for mobile AR and head-mounted device, but not for Microsoft Kinect and TV.

Conclusion

Overall, the participants expressed a positive attitude towards the heuristics and stated its usefulness, ease of use, and understandability.

The set of heuristics was found to be a good checklist that can be used at different stages of the AR design and development process.

Future Work

- Validate the heuristics for the whole AR development process.
- Evaluated with a user study to investigate how designers/developers following the heuristics can influence the usability of an AR application.

Thank you
for your attention!