

# Collaborative mechanics in the multi-sensory VR experience Klima-ACT!

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## ABSTRACT

In this submission paper for the MuC – Mensch und Computer Conference 2022 we discuss multi-user and collaborative design methods and mechanics for our work in progress multi-sensory VR prototype. Users experience a collaborative social and gamified VR environment, which could evoke positive in-game actions and user discussion against climate change to be transformed into real life actions. We discuss how collaborative mechanics in such an environment could contribute the overall project goals listing risks and opportunities.

**Keywords:** Multi-user mechanics, Collaborative software, VR environment, multi-sensory experience, Gamification

## 1 INTRODUCTION

In the research project “Klima-ACT! - Promoting Climate Action through Immersive User Experience” we investigate the potential of gamified immersive and multi-user-capable multi-platform technologies with regards to behavioural change. More specifically, to support climate friendly behaviour. In a playful VR environment, paired with a haptic device, climate change becomes tangible through a multisensory system, a combination of sound and visuals conveyed through a VR device and haptics embedded in an e-textile wearable. In this virtual environment (the Game Hub) users (VR and non-VR) have to cooperatively

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cope climate change-evoked challenges in the form of various extreme weather scenarios. It is expected that the confrontation with these virtual climate change scenarios will affect the motivation of participants to act in a more climate-friendly way.

In support of the gaming experience a parent multi-user platform (the Klima-ACT!-Hub), is planned, in which the participants can further intensify their learnings from the game, access surrounding information, attend speeches or workshops and generally interact with each other.

## 2 BACKGROUND

Virtual multi-user technologies offer a promising format for a knowledge transfer [Frick, 2022], but also for an emotional and collective experience [Barbot, Kaufmann, 2020]. Generally, VR approaches already proved to be useful tools to motivate climate action [Markowitz, et al.]. In this context, immersive experiences have been shown to lead to higher motivation for environmentally conscious and climate-protecting behavior compared to the non-immersive transmission of information [Ahn et al., 2014].

Soft technology, in particular e-textiles, offer novel ways of interaction with an interactive system, like wrapping, rolling, stuffing and more. This intensifies the ability to use textiles in novel interactive systems using the intuitive knowledge of users how to interact with textiles [Gowrishankar et al. 2017].

In contexts of learning, examples of how e-textile learning toys can be applied as alternative interactive toys for children are topics of design research, to either invite for play with electronics to foster emotional relation [Veske & Scholz, 2019] or to mediate between the physical and the virtual world [Honauer et al., 2020].

In any case, the integration of playful elements in a non-game context, especially via multi-user applications, can facilitate the understanding of complex phenomena such as global climate change [Sailer, Hence, Mayr et al. 2017; Deliyannis & Kaimara, 2019]. Multi-user interactions provide a motivating factor, not only in a moderated virtual learning environment [Vrellis et al., 2012] but especially with regards to the integration of multi-user mechanics it has been shown that users deepen their involvement in gamified experiences resulting in a better translation of in-game actions to the real world [Whittle et al., 2022].

## 3 KLIMA-ACT!: A GAMIFIED INTERACTION AND LEARNING ENVIRONMENT

Referred to the workshop “Virtuelle und augmentierte Realität für Partizipation und Teilhabe” this work in progress paper tries to contribute answers to the following questions:

### 3.1 How can VR/AR be utilized to enable social, economic and political participation?

The main hypothesis of the research project "Klima-ACT!" is that one's own concern is the greatest motivation to change one's own behaviour. In the view of climate change, this association leads to the assumption that the actual virtual confrontation with climate change consequences could make an impact and motivate people to act more climate friendly. With specific weather scenarios for the city of Hamburg, based on scientific forecasts, users are confronted with possible future problems and ways to deal with these challenges. Those challenges are surely not only coped with on an individual level but involves political and/or economic solutions on a societal level.

It is our vision, that with the application developed, users can not only immersively experience future climate change scenarios in Hamburg but should also have the possibility to influence political decisions which in return affects the severity of the climate change consequences. Moreover, in our Klima-ACT!-Hub, which appears like an online platform, we plan to integrate an element to collect comments/ statements from users after having experienced the game. After demonstrating the application, these comments are to be sent to communal politicians. Overall, the application enables German-speaking people from different backgrounds to playfully get to know facts and coherences about climate change at a low threshold level. Moreover, it supports users in participating politically a little bit as well.

### 3.2 How can the special possibilities offered by VR/AR, which go beyond the depiction of reality, be used creatively to enable new forms of participation and involvement?

The tangible weather simulation created by "Klima-ACT!" is a gamified experience in which users must overcome the challenges of climate change together. In this context the virtual reality approach allows to either depict scenarios which show a possible future, which are not yet and thus cannot be experienced in real-life or put the users in an extreme situation (e.g., the flooding of one's home). Our VR application therewith contains the potential of increased involvement of the general population in plausible (evidence-based) future scenarios of climate change in Hamburg, which are usually only accessible to climate change researchers.

Depending on the collaborative mechanics of the game, "Klima-ACT!" may be able to evoke empathy and trust, two key factors for a positive learning experience e.g., by handing over the control of the weather, and thus the multi-sensory experience, to collaborating players.

In cooperation with the research project partner Exit Games GmbH, it is possible to utilize VR-specific communication and collaboration tools: e.g., chat bubbles offer a seamless switching into a space for private conversations in an otherwise crowded hub environment. The use of avatars and specific features such as eye movement, hand gestures etc. intend to heighten co-presence [Pidel & Ackermann, 2020]

### 3.3 What opportunities and risks arise from the use of VR/AR in the context of participation and involvement?

#### 3.3.1 Opportunities

The utilization of an immersive VR multiplayer gamified experience holds the potential to intensify the experience and thus the learning effect either in a collaborative or a competitive scenario [Whittle et al., 2022; Ahn et al., 2014]. An immersive multiplayer experience additionally raises awareness of the power of collaboration e.g., by collaboratively solve tasks together rather than alone.

The plausible depiction of future scenarios in VR and its political and economical tasks, as well as approaches to solve these tasks collaboratively holds great learning potential and can create awareness and sense for participation.

#### 3.3.2 Risks

As Whittle et al. state competitive gaming mechanics can motivate users to translate positive in-game actions to reality. However, to achieve that, the competitive mechanics must have a meaning beyond competition in itself [Whittle et al.]. Researchers and designers have to put great thought into the interconnection of mechanics, meaning (story and setting) and goal.

Trust and empathy as well as a sense for collaboration and participation could be evoked by interaction. In contrast, open multi-user VR environments can also have the opposite effect. Collaborating with strangers can be an obstacle, especially when certain social cues (e.g., body language or eye contact) are missing or tend to fall into the so-called uncanny valley due to technical limitations.

Also, the danger of strangers transgressing personal space in VR needs to be considered if there are no artificial mechanisms preventing such behaviour.

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