Out of Your Mind!? Embodied Interaction in Sports

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People engage in sportive activities for reasons beyond improving their athletic performance. They also seek experiences like fun, adventure, a feeling of oneness, clear their heads, and flow. Since sport is a highly bodily experience, we argue that taking an embodied interaction perspective to inspire interaction design of sports systems is a promising direction in HCI research and practice. This workshop will address the challenges of designing interactive systems in the realm of sports from an embodied interaction perspective focusing on athletes' experience rather than performance. We will explore how interactive systems enhance sports experience without distracting from the actual goal of the athlete, such as freeing the mind. We will focus on several topics of interest such as sensory augmentation, augmented experience, multi-modal interaction, and motor learning in sports.

CCS Concepts: • **Human-centered computing** → *Human computer interaction (HCI)*; Interaction paradigms;

Additional Key Words and Phrases: HCI, sports, Embodied Interaction, Muscle Memory, Motor Memory, EMS, Human-Computer Integration

1 INTRODUCTION

People who are doing sports often seek experiences *beyond* their pure athletic performance (e.g. [20] such as fun, adventure, escape from routines, awe[38], and flow. Mueller [16] also highlighted this need to go beyond performance by proposing *10 lenses to sports HCI*.

Interactive systems in within HCI research address multiple facets of physical activity; from supporting performance to enhancing playful experiences. For example, through sonification or sound feedback [26, 30, 31], (vibro)tactile feedback [29, 32], visual training equipment like [9, 14], EMS-based interfaces [7, 12, 39, 40], wearable displays [41] or augmenting sports [1, 33]. HCI has discussed the concept of embodied interaction [8, 34] for two decades. Needless to say, sport in itself

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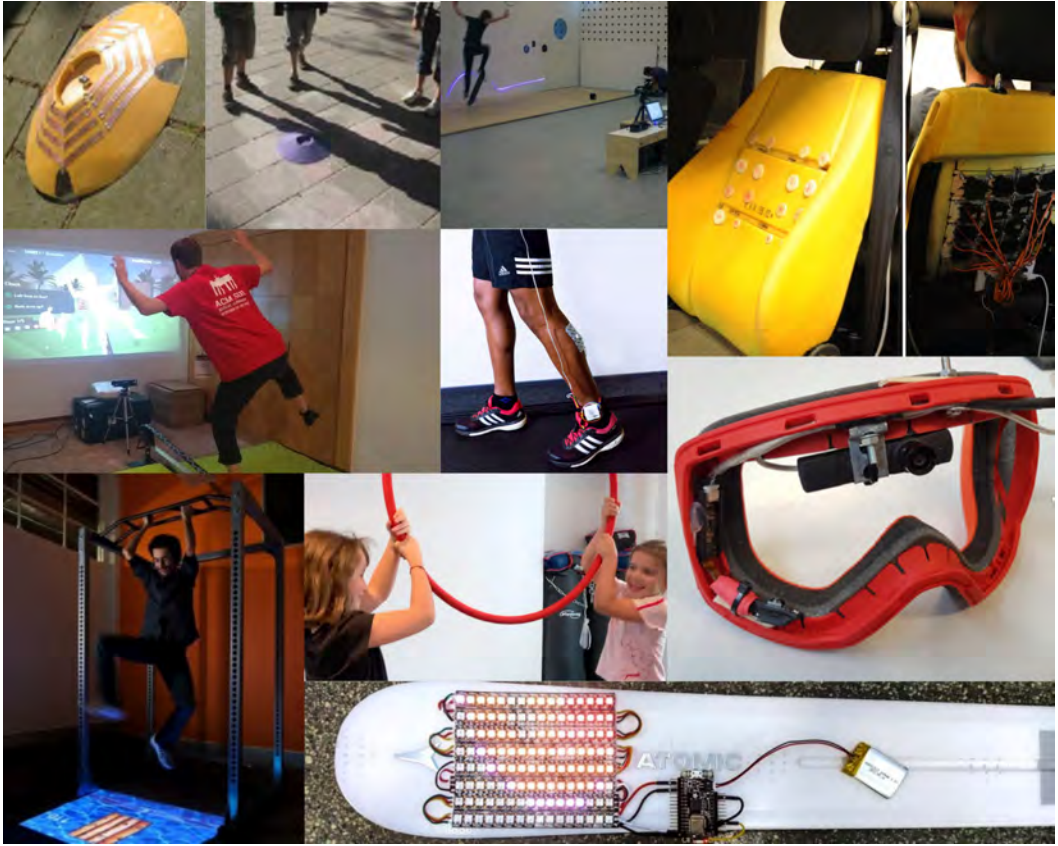*Both authors contributed equally to this research.

Fig. 1. A collage of images from authors' previous related work.

is a highly bodily experience. As such we argue that taking an embodied interaction perspective is a promising direction to inspire the interaction design of sports systems. In this workshop we want to create a focused dedication of embodied interaction to sports in HCI. It leads to our main focus of this workshop:

- How can interactive systems enhance sports experiences beyond performance highlighting an embodied interaction perspective?

The topic of sports has received quite some attention in the last decade (e.g., [22]). There have been several workshops on both the paradigms of embodied interaction and sports in HCI at CHI so far. For example, Mueller organizes the well-known *Jogging at CHI workshops* (e.g.[18, 19]) to discuss Sports-HCI in an alternative format and *Sports and HCI* [21] particularly focused on improving interfaces for enhancing performance. The paradigms of embodied interaction has been covered in a workshop at CHI'11 ([3]) and CHI' 20 [23].

Our focus goes beyond these workshops by putting emphasis on embodied interaction, sports in HCI and the sportsperson's user experience.

2   GOALS OF THE WORKSHOP

The workshop goals are as follows:

- Provide an interdisciplinary forum for researchers, practitioners and designers to discuss embodied interaction and sports
- Discuss state-of-the-art research on embodied interaction and sports in HCI, and how to enhance sportsperson's experience beyond the focus of performance
- Collect best practices for designing interfaces while being on the move
- Explore new interaction paradigms that support UX while doing sports such as skiing or outdoor running
- Develop tangible concepts that enhance sports experiences beyond performance-focus
- Publish a contribution to a special issue (e.g. in Interactions)
- Provide the foundation to establish a SIG for HCI in sports.

3   TOPICS OF INTEREST

The topics of interest for the workshop include theories, technologies, and applications related to embodied interaction in sports. Relevant topics include, but are not limited to:

- Sensory Augmentation
- Motor Memory
- Sonification
- EMS
- Augmented Experiences
- Wearables
- Multimodal Interaction
- Adapted Physical Activity (APA)[25]

4   ORGANIZERS

Vincent van Rheden is a research fellow at the Center for Human-Computer Interaction, University of Salzburg, Austria. His research focuses on embodied interaction [36], combining the physical and digital realm [15, 27, 28, 37]. His PhD focuses on enhancing sports experiences through interactive systems, e.g. sonification [35].

    Thomas Grah is a research fellow and PhD candidate at the Center for Human-Computer Interaction. His main focus lies on design-driven research around sensory augmentation[10] and tangible interaction[28]. In his PhD, Thomas explores the potentials of embodied sensory augmentation for data interaction during demanding main tasks (i.e., driving a car[11], skiing).

    Alexander Meschtscherjakov is an associate professor at the Center for HCI of Salzburg University. His research focus on new forms of user interface design, user experience with autonomous systems, and persuasion to foster new forms of behaviour. He co-organized conferences such as AutomotiveUI'11 or Persuasive'15 and was co-organizer of more than 25 workshops (e.g., AutomotiveUI'13-16, CHI'15-'20).

    Rakesh Patibanda is a PhD candidate at the Exertion Games Lab, Monash University. His research mainly focuses at the intersection of body, technology and play [2, 17, 24, 42]. His PhD focuses on how we can use muscle memory as a design resource to create memory support systems.

    Wanyu Liu is a CNRS (The French National Centre for Scientific Research) research scientist at IRCAM in Paris. Her main interests include computational interaction, interactive music systems and movement sonification.

Florian Daiber is a post-doctoral researcher at the German Research Center for Artificial Intelligence (DFKI). His work involves 3D user interfaces and ubiquitous sports technologies particularly in the context of running and rock climbing. He co-organized the ISIS3D Workshop and Tutorial [4], the EPO4VR workshop [5] the UbiMount workshops [6] and the HCI Outdoors Workshop [13].

Elise van den Hoven is a Professor at University of Technology Sydney, Eindhoven University of Technology, and Honorary Professor at University of Dundee. Elise's research interests span different disciplines, including interaction design, human-computer interaction and cognitive psychology, which all come together in the research program she leads, called Materialising Memories. She has co-organised three CHI-workshops before and was general co-chair of TEI'20, the International conference on Tangible, Embedded and Embodied Interaction.

Florian 'Floyd' Mueller is a professor at Monash University, where he directs the Exertion Games Lab. His will bring to the workshop experience in designing sports HCI systems since 2003. He has co-organized nine workshops at CHI previously and was general co-chair of CHI'20.

5 WEBSITE

The workshop website will include the workshop description and goals, call for participation and suggested topics, link to the submission system, detailed workshop schedule, ways to get involved during the workshop, organizational information for the workshops procedure (i.e., virtual meeting rooms), and information about the organizers. The accepted position papers will be uploaded on the website before the conference to start a discussion already prior the workshop. https://sports-hci.com

6 PRE-WORKSHOP PLANS

Prior to the workshop, to recruit participants, we will distribute the call for participation through HCI related mailing lists (e.g. CHI Announcements), as well as our own lists of potential participants from our previous workshops at CHI (e.g. Jogging at CHI) (complying with EU GDPR). Prior to the workshop, prospective participants and research groups will be actively approached and scoped for interest via mail. Next to that, the call for participation and the workshop website will be shared through relevant social media channels.

7 WORKSHOP STRUCTURE

The workshop will span six hours and contains two sessions. The first session runs for 2.5 hours followed by a 30 minutes break and the second session for 3 hours. Activities are planned to comprise workshop presentations by participants (short and fun), content creation and future thinking activity sessions, out-of-the-classroom group exercises, and discussions. Prospective participants will apply to join the workshop by responding to an online form available via the website. This information will provide the required input for the workshop using an online form provided on the website in section participate (https://sports-hci.com/#participate):

- **Position paper/s** - based on three good and three bad examples of embodied interaction in Sports - arguing the choice of the examples (which could be research prototypes, products on the market, etc. (max 1 good example created by the author him/herself). Each example should be accompanied with a representative image, if possible. Additionally participants need to deliver a short description of one-to-two core qualities that make it either a good or bad example of embodied interaction in Sports.

- **Sports background** - describing the prospective participant's personal experience with sports i.e., which sports the prospective participant performs or had extensive experience with in the past. This will be used to create groups and select relevant video footage to be used in Activity 2 described below.

In general, this information will help us to understand the thinking, prior research, future plans, insights, and/or interests of potential participants as it pertains to embodied interaction in Sports. Responses will be reviewed by the workshop organizers, and selected for inclusion based on quality, novelty, and potential to engender discussion, while aiming for a balance of different perspectives.

7.1 Timeline

We detail the timeline for the full-day workshop and the activities under the two sessions.

7.1.1 Session 1 (2 hr 30 min).

- *30 min* - Introduction with keynote by **Florian 'Floyd' Mueller**
- *55 min* - Activity 1: Affinity mapping of examples selected by participants
     10 min - small break
- *55 min* - Continue Activity 1: Affinity mapping of examples selected by participants

*** 30 min break ***

7.1.2 Session 2 (3 hr).

- *1 hr 40 min* - Activity 2: Ideation of novel interactive sports systems
     10min - small break
- *55min* - Present ideas
- *15 min* - Wrap up

The workshop will be kicked-off with a keynote and a short introduction to the day.

Activity 1: Affinity Mapping (AM) is the first activity in which participants present examples they have selected and shortly argue why they chose them (dependent on the number of participants, the number of examples per participant will be limited). These examples will be clustered and grouped to create an affinity map - providing an overview of the emerged themes, illustrated by exemplars and qualities of *embodied interaction in sports*. Following the AM activity we will take time to reflect on the emerged themes and identify niches and opportunities for future work. Activity 1 ends here followed by a 30 minutes break.

Activity 2: Ideation activity starts after the break in which participants will be divided in groups of two-to-four people. Groups will be based on the participant's personal sports experiences-allowing them to draw on these experiences and refer to them in this exercise. Each group will receive a video (provided by the organizers) showing the first and third person perspective of someone performing a sports activity. In addition, each group will be assigned with one of the identified themes from Activity 1.

Using the input, the groups will create initial interaction concepts that address the theme. Participants will develop ideas in the form of short presentations (using collaborative, visual tools they are comfortable with, like google slides, Miro (https://miro.com/), etc), including: short introduction on the sport and experiential focus, core concept on how to enhance the sport beyond performance, interaction design proposal to achieve this. Following this ideation session, the groups will present the interaction concepts to all participants, which will then be mapped on the affinity map created during Activity 1. The workshop is closed by identifying next steps to realize the generated interaction concepts and invite participants to commit to the dissemination activities.

Covid-19 note: *in order to address the current difficult times and to recognize that participants will be limited in their travels, the workshop is planned to be also a full virtual event. The organizers will facilitate the necessary video conferencing tool (e.g. Zoom-meeting with break-out rooms), visual mapping tool (e.g. Miro (https://miro.com/) as well as a data hub for sharing relevant files (i.e., the inspiration sports videos).*

8   POST-WORKSHOP PLANS

The workshop results will be communicated to a larger audience. We plan to produce a report for publication in ACM Interactions and prepare a special issue in a selected journal following the conference. Workshop results will be made available through the workshop website, which will be kept up-to-date also after the workshop in order to provide an interactive platform for research on HCI in sports.

9   CALL FOR PARTICIPATION

"Out of Your Mind!? Embodied Interaction in Sports" - One-day Workshop at CHI2021, Yokohama, Japan.

This workshop aims to explore how interactive systems can enhance sports experiences beyond performance - highlighting an embodied interaction perspective. Activities include hands-on discussion on state-of-the-art research on embodied interaction and sports in HCI, and developing tangible concepts that enhance sports experiences.

Topics of interest include:
- Sensory Augmentation
- Motor Memory
- Sonification
- EMS
- Augmented Experiences
- Wearables
- Multimodal Interaction
- Adapted physical activity (APA)

To apply to the workshop, submit your position using our form on our website. Position papers (max 4p, CHI EA format) should address 3 good and 3 bad examples of embodied interaction in Sports - arguing the choice of the examples (max 1 good example created by the author).

Responses will be reviewed by the workshop organizers, and selected for inclusion based on quality, novelty, and potential to engender discussion, while aiming for a balance of different perspectives. Accepted authors will be notified by February 28, 2021 and the list of participants will be posted on the website https://sports-hci.com. All participants must register for the workshop and for at least one day of the conference.

Important dates:
- Position paper deadline: February 21, 2021
- Acceptance notification: February 28, 2021
- Workshop at CHI2021: May 7th and/or 8th, 2021 (see final date on website)

More Information: https://sports-hci.com

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