

Programming for Moving Bodies

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ABSTRACT

Movement plays an increasingly important role in interactive systems design, from users' physical engagement, to how designed artefacts can move or be moved, and to the concert between users and artefacts. Designers, as well as programmers, have to engage more and more in physical activities when they want to create appealing experiences involving movement. There is a need for articulating emerging dialogues between designers, developers, and their materials. We will explore such dialogues in a 2-half-day workshop, focusing on data and its challenges, on tools and methods, on sensing and actuation when designing or detecting subtle body movements, and on catering for bodily changes over time.

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1 INTRODUCTION

Movement plays an increasingly important role in interactive systems design [6], from users' physical engagement, to how designed artefacts can move or be moved, and to the concert between users and artefacts, termed "intercorporeality" [3]. While facing the challenge of understanding and encoding movement, interaction designers may develop "choreographic thinking" and engage with

corresponding notations [2, 9], as well as with attunement, attention, and kinesthetic empathy [4]. Designers must consider the perspective of the mover, the machine and the observer [10]. In addition, designers and programmers increasingly need to engage in physical activities [7, 8] such as imitation and enactment [3] as part of their practice.

This shift sets the stage for a whole new set of programming challenges, which we wish to address in this workshop. For example, communicating choreographic vocabulary to developers will require new programming approaches and tools, possibly inspired by embodied programming [11] or material programming [12]. Additionally, because "*embodied knowledge involved in movement interaction is very different from the representational knowledge involved in a traditional interface*" ([5], p.5:1), designing machines that are able to interpret human movement requires novel techniques such as "interactive machine learning" [5]. Finally, it is challenging to bring the felt bodily experience (cf. soma [1]) as an aim for the expression of movement, specially as designing movement-based interactions becomes increasingly important in a number of diverse domains with growing importance in HCI, such as dance, sports, gaming and health [6]. There is a need for a new kind of dialogue between designers and developers, which will necessarily affect both sides.

2 GOALS AND OUTCOMES OF THE WORKSHOP

The goal of this workshop is to collaboratively map out, discuss and reflect on existing approaches to programming with and for moving bodies, and in tandem with computational composite materials. This design space can include, but is not limited to, programming interactions with autonomous agents (e.g., drones), wearable interactions, dance performances, or programming somaesthetic [1] interactive experiences, requiring an intimate coupling between bodies and computational materials. By bringing together researchers working

in these or in similar domains, we aim to outline the possibilities and limitations offered by existing programming paradigms for domains where moving bodies (human and non-human) are central. Based on this mapping, we seek to cover the following themes, articulated here as questions, which highlight core challenges and opportunities in this context:

- "*What new tools and methods would be needed for programming with and for movements?*": This theme speaks to the challenges stemming from representational programming paradigms when designing with bodily movements, and when including human and more-than-human assemblies.
- "*How to map implicit or subtle bodily movements (sensing) to responses on computational composite materials (actuation)?*": This theme encompasses challenges brought by, for example, mapping bodily movements that can be subtle, such as micro-movements, to behaviours on shape-changing materials, and it offers a lens to discuss opportunities emerging in this space.
- "*How to work with bodily data as a design material when programming with and for bodies?*": moving beyond data visualized on a screen and instead turning bodily data into a material in order to be explored close to the body, similar to any other design material. This theme also suggests opportunities for bridging the gap between bodies and data as two disparate entities, bringing them closer instead.
- "*How can programming with and for moving bodies cater for different bodies and for changing bodies?*": taking into account a plurality of bodies, including both the designer's/programmer's and the end-users' bodies. This theme also suggests opportunities for going beyond the understanding of bodies as "static", taking into account that the bodies for which we program interactions change over time throughout short- and long-term cycles and processes, as they age and go through meaningful life transitions.

After the workshop we plan to invite participants to submit to a special journal issue. We aim for ACM Transactions in Computer-Human Interaction.

3 OVERVIEW OF PLANNED ACTIVITIES

The workshop is planned with the current pandemic in mind and we designed it to be held online, but it can be easily adapted to an in-person format, if needed. We aim for a two-part workshop spanning two half-days. The first day will consist of presentations of scenarios/artefacts/concept videos of previously submitted position papers by participants, aligned with the proposed themes. We will encourage participants to use alternative methods of presenting, such as enactment of movement programming scenarios, and showcasing of videos or artefacts. Thus the aim of the first day is to become familiar with each other's work in the domain, which will help in identifying common interests and themes among participants for the activities planned for the next day. On the second day, participants will work in smaller groups, which will later convene for group presentations and for combining the work of the different groups. The goal of the second day is to map out core existing approaches to programming with and for moving bodies, by using participants' projects and other inspirational works as material. The

group work will be done via a virtual shared workspace such as Miro.com. Both sessions will be accompanied by physical activities guided by the workshop organizers, encouraging participants to become attuned to their bodies. We also aim to provide participants with "inspirational bits" such as [13] to help facilitating discussions and spark creativity.

Time	Workshop Day 1 activities
13:00	Welcome and introduction
13:30	1st Presentation session with Q&A
14:00	<i>Coffee Break</i>
14:15	2nd Presentation session with Q&A
14:45	<i>Break with physical activity</i>
15:00	3rd Presentation session with Q&A
15:30	<i>Break with physical activity</i>
15:45	4th Presentation session with Q&A
16:15	<i>Break with physical activity</i>
16:30	Discuss, form themes, organise groups along position papers and next steps
17:15	Wrap-up Day 1

Time	Workshop Day 2 activities
13:00	Welcome to second session and start with a physical activity.
13:30	Participants work in smaller groups around emerging topics based on themes and presentations. Documentation choice is free.
16:00	Back together and presentation of group response
16:30	<i>Coffee Break</i>
16:45	Discussion, reflection and next steps
17:15	End of the workshop!

4 CALL FOR PARTICIPATION AND PROMOTIONAL STRATEGY

We invite researchers and practitioners who design with bodies and their movement to submit a statement of interest in the shape of a position paper (ACM single-column "Review Submission Format", up to 4 pages) and/or a video. The submission should reflect on an ongoing or finished project by the participant that relates to, or reinterprets one or more of the proposed themes. It may include a challenging programming-for-movement scenario, a created artefact, or a conceptual piece that could be showcased at the workshop.

The workshop will be held in two half-day sessions. We aim for an interactive experience, facilitated either online or in person, with space for discussion, self-expression, and physical and hands-on activities. We highly encourage participants to bring inspirational materials and artefacts to the workshop, related to the workshop themes. We will reach out to the intended audience using social

media channels (including Facebook groups, Twitter accounts, and the use of the NordiCHI hashtag), our institutions' mailing lists, and a dedicated website.

5 AUTHORS AND AFFILIATIONS

Cristian Bogdan is the founder of physical interaction design education at KTH Royal Institute of Technology in Stockholm. He does research on programming by novice users as well as novel forms of programming.

Vasiliki Tsaknaki is an Assistant Professor at the Digital Design department, at the IT University of Copenhagen. Her research combines materials experiences, computational crafts and some design methods in HCI.

Charles Windlin is a doctoral researcher at the Soma Design research group, at KTH Royal Institute of Technology in Stockholm. His research explores how to co-design interactive technologies within mental health with soma design methodology.

Marianela Ciolfi Felice is a postdoctoral researcher in Interaction Design at KTH. Her research explores the intersection between digital women's health and soma design. Previously, she worked on creativity support in choreography.

Ozgun Kilic Afsar is a doctoral researcher at Tangible Media Group at MIT Media Lab, and Soma Design research group at KTH. Her research explores co-adaptivity in interaction using on-body robotic swarms as dynamic assistants and co-performing agents.

Ylva Fernaeus is a researcher in interaction design at KTH, Stockholm. Research background in tangible and embodied programming, both for screen based dynamic media, robotic devices and full body interactive experiences.

Sara Eriksson is a doctoral researcher in the Stockholm Technology and Interaction Research group at Stockholm University. Her research explores bodily and material experiences in design and interaction with drones.

Pedro Sanches is a Postdoctoral researcher at KTH Royal Institute of Technology in Stockholm. He bridges the fields of interaction design and critical data studies, considering data as a design material in interactive applications.

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