

Exploring Tangible Non-Screen Games with Physical Interface Props Inspired by Soft Robotics

Shape changing, malleable and deformable tangible user interfaces have become a recent focus of interaction design and research. They provide a novel design space for tangible user interfaces and can enable entirely new user experiences and use qualities. How can they be leveraged for physical/tangible interactive games?

Your Task:

Develop and implement a *multiplayer interactive game* that uses *physical, dynamically inflatable objects/props* as input/output devices and that does not rely on screen based interactions (LEDs embedded in the object and sound can be used).

The goal of this thesis work is to *design, implement* and test *prototypes of novel tangible game concepts* that explore the design space and the user experience of *tangible game concepts* with *soft and malleable, handheld interface props*. The game should create engaging interactive experiences for the players without the use of a screen and support physical exertion. The game concept can be based on a (modified) existing game/sport, a new game concept or an augmented sport (see: <http://superhuman-sports.org/games/> or similar).

The focus of the thesis work can either be on the game design aspects and the implementation in software *and/or* the material/hardware development of the project (focus will be adjusted by individual arrangement with the student). A working, programmable control-platform (Arduino/Teensy, pneumatic control board with sensors) is available in the lab and can be used for software development and testing. Custom inflatable interface objects can be provided or manufactured (from Nylon or TPU) on a CNC-controlled heat welding machine (from pdf, ai, svg, eps or similar file formats) at the Bauhaus Apparate Labor. Lab access and hands-on support will be provided to the student during the thesis work.

Contact & Questions:

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Keywords:

- Tangible (exertion) games / networked interactive objects
- Input modalities: bending, impact, motion/orientation, touch
- Output modalities: shape change (pneumatic/hydraulic), haptic actuators, sound, LEDs as the main modalities
- The digitally augmented game should work without additional displays or VR/AR-goggles
- Soft Robotics, Wearables, Tangible Interaction Design, Non-Screen Games, Exertion Games

Background & Inspiration:

Joshua Tanenbaum, Karen Tanenbaum. 2015. Envisioning the Future of Wearable Play: Conceptual Models for Props and Costumes as Game Controllers. In *Proceedings of the 10th International Conference on the Foundations of Digital Games (FDG 2015)*, June 22-25, 2015, Pacific Grove, CA, USA. DOI: <https://pdfs.semanticscholar.org/9fd4/7248449651cb9cb747eeca93caa988c40f2.pdf>

The Transformative Play Lab. <https://transformativeplay.ics.uci.edu/research/>

The Superhuman Sports Society. <http://superhuman-sports.org/games/>

Exertion Games Lab. <http://exertiongameslab.org/>

Touché for Arduino. <http://www.instructables.com/id/Touche-for-Arduino-Advanced-touch-sensing/>

MGC Capacitive Gesture Sensor: <http://www.microchip.com/wwwproducts/en/MGC3130>

Rinat Mustafin, Jan Wehner, Wolfgang Sattler, and Kristian Gohlke. 2012. T.F.O.: Tangible Flying Objects. In *Proceedings of the Sixth International Conference on Tangible, Embedded and Embodied Interaction (TEI '12)*, Stephen N. Spencer (Ed.). ACM, New York, NY, USA, 193-196.

<http://doi.acm.org/10.1145/2148131.2148173>

<https://vimeo.com/141598624>

Christopher Kopic and Kristian Gohlke. 2016. InflatiBits: A Modular Soft Robotic Construction Kit for Children. In *Proceedings of the TEI '16: Tenth International Conference on Tangible, Embedded, and Embodied Interaction (TEI '16)*. ACM, New York, NY, USA, 723-728. DOI:

<https://doi.org/10.1145/2839462.2872962>

<https://vimeo.com/144290379>

Kristian Gohlke. 2017. Exploring Bio-Inspired Soft Fluidic Actuators and Sensors for the Design of Shape Changing Tangible User Interfaces. In *Proceedings of the Eleventh International Conference on Tangible, Embedded, and Embodied Interaction (TEI '17)*. ACM, New York, NY, USA, 703-706. DOI:

<https://doi.org/10.1145/3024969.3025039>