Shape Changing Interfaces

Agenda

Overview of shape change

Presentation of projects

- Exploring SCI as Means of Interaction through the Design Case of Vacuum Cleaning
- Exploring the Use of Shape Change in Home Appliances

Our story of TEI '16

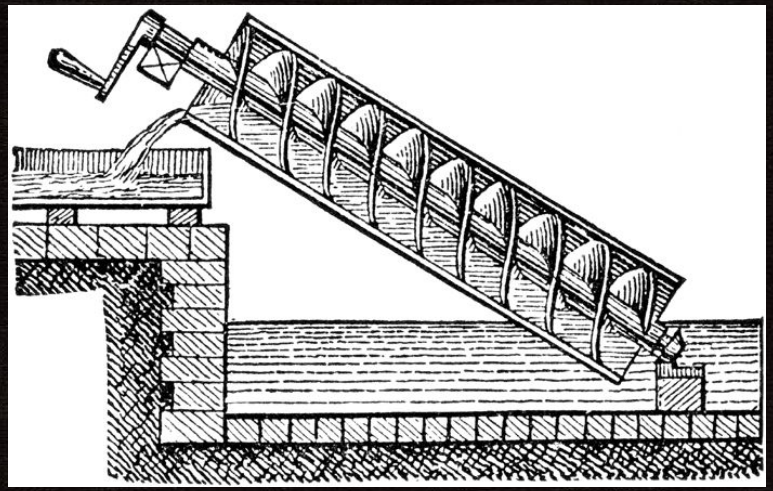
Demo

The Mechanisms of Shape Change (SC)

Mechanical systems have been around for some time…

…However they are perceived as rigid and static.

+



Invention of Archimedes
(Hydro mechanism for moving water)

The Mechanisms of SC

Dynamic, flexible systems and the ability to change shape can be found in nature!

The Indonesian Mimic Octopus

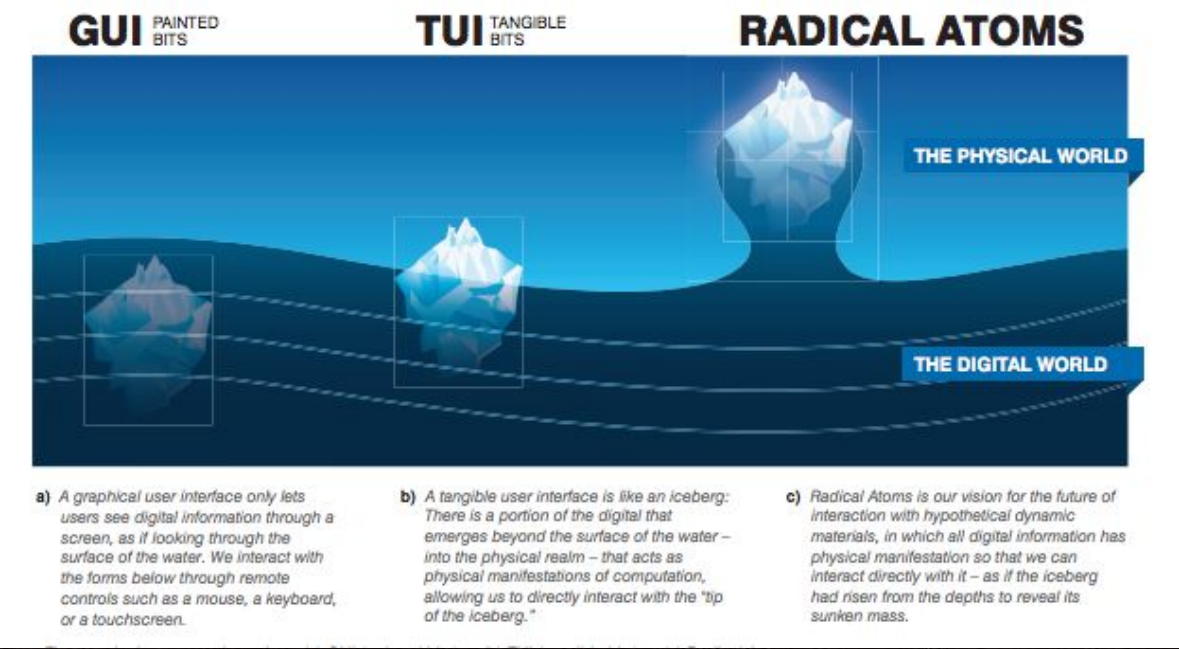
How can we mimic nature by constructing mechanical systems?

Application possibilities

Try to imagine future scenarios involving shape changing technology

Talk to your neighbor for 2 minutes

The Vision



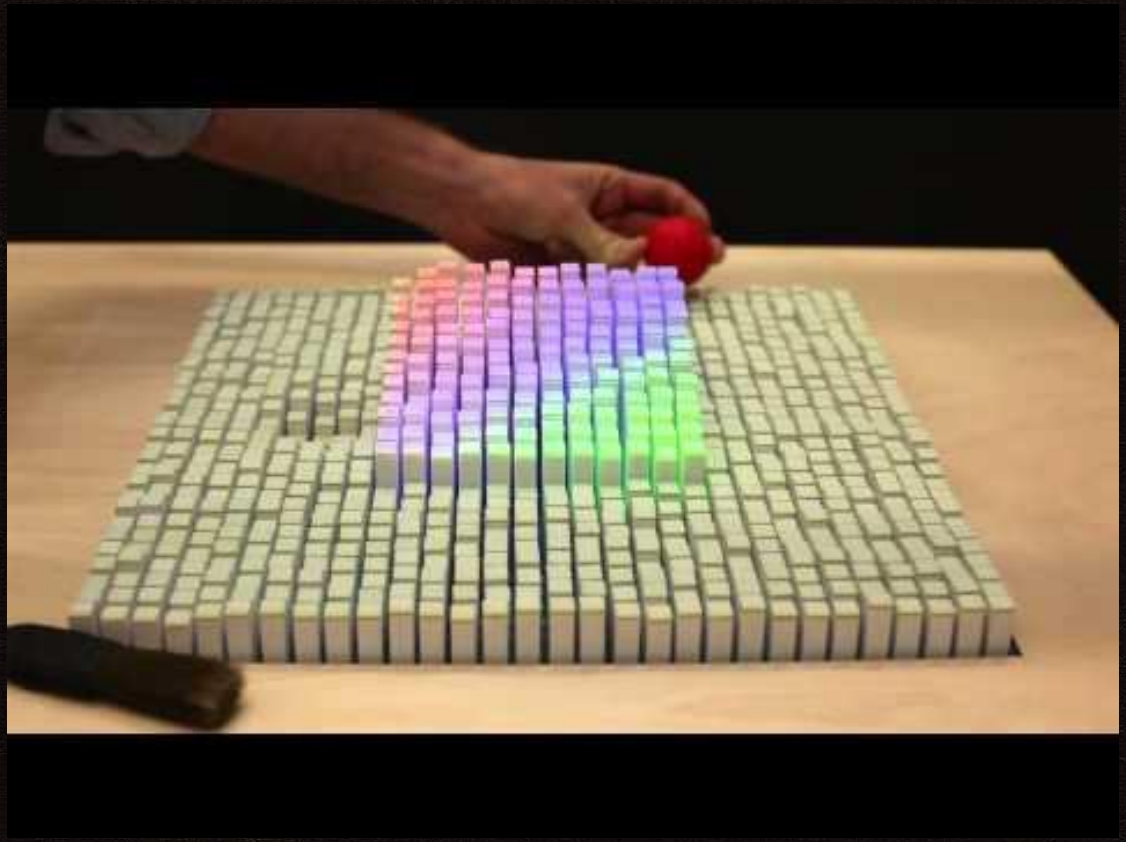
a) *A graphical user interface only lets users see digital information through a screen, as if looking through the surface of the water. We interact with the forms below through remote controls such as a mouse, a keyboard, or a touchscreen.*

b) *A tangible user interface is like an iceberg: There is a portion of the digital that emerges beyond the surface of the water – into the physical realm – that acts as physical manifestations of computation, allowing us to directly interact with the "tip of the iceberg."*

c) *Radical Atoms is our vision for the future of interaction with hypothetical dynamic materials, in which all digital information has physical manifestation so that we can interact directly with it – as if the iceberg had risen from the depths to reveal its sunken mass.*

Perfect Red (2013)

inFORM (2014)



What is a Shape Changing Interface?

1. A SCI uses physical change of shape as input and/or output
2. A SCI is self-actuated
3. The self-actuation must be controllable (return to the initial state)

Rasmussen et al. (2012)

TEI'16
TENTH ANNIVERSARY CONFERENCE ON TANGIBLE
EMBEDDED AND EMBODIED INTERACTION

Work-in-progress

GENERAL INFO

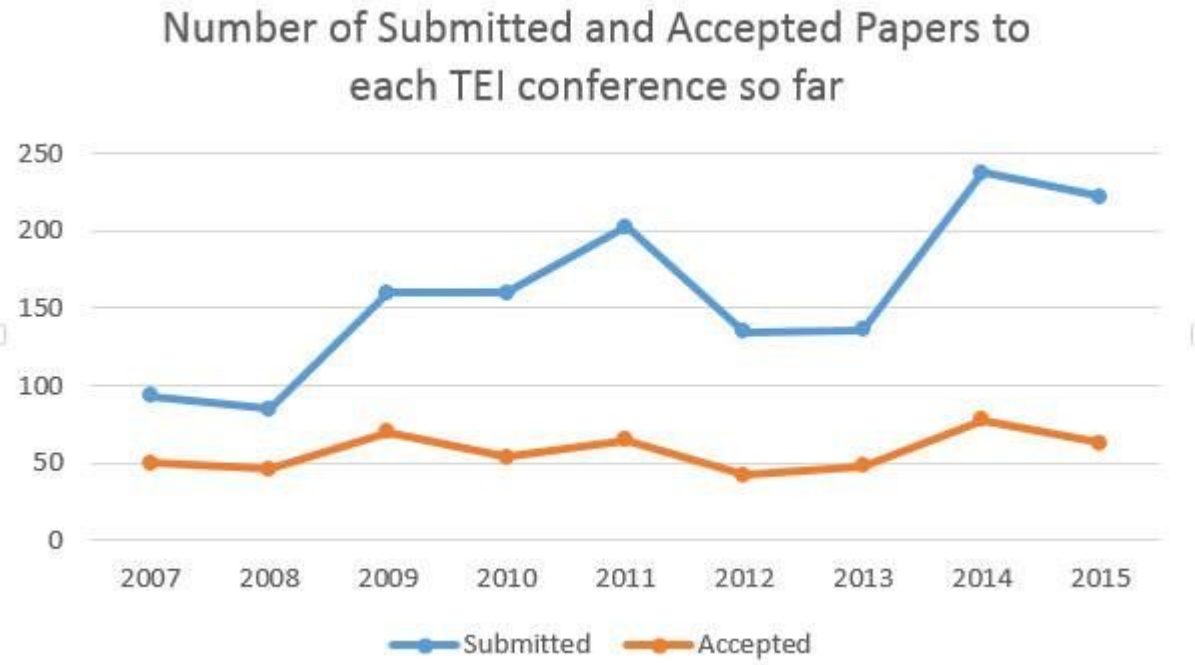
The Work-in-Progress track in TEI'16 is the premiere venue for presenting your cutting-edge, straight-from-the-lab and hot-from-the-laser-cutter work that is truly in progress. We ask for intermediate reports on high-potential, original, imaginative research projects that, although not yet finished today, promise to become a hotly debated break-through of tomorrow. We welcome promising results, early prototypes, inspiring problems and ideas, puzzling research data, outstanding problems, future directions, horizons, and conceptual analyses that are all grounded in solid - yet unfinished - research and design work.

“Our Body is our Manual”

THEME: OUR BODY IS OUR MANUAL

At TEI’16 we celebrate the conference’s 10th anniversary. We see this anniversary as a perfect opportunity for recalling some of our founding values and complementing these with contemporary values, for re-emphasizing the relationship between interactive products and systems and the body, and for learning from each other’s approaches and rationales. At TEI’16 we wish to celebrate our trans-disciplinarity and create a setting where all of us can learn not only from our similarities, but perhaps even more from our differences. Through a wide palette of work ranging from highly technical to highly artistic, and from highly applied to highly conceptual or theoretical, we wish to trigger discussion and reflection, with the aim of emphasizing what binds us.

TEI'16 TENTH ANNIVERSARY CONFERENCE ON TANGIBLE EMBEDDED AND EMBODIED INTERACTION



Exploring SCI as Means of Interaction through the Design Case of Vacuum Cleaning

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TEI '16, February 14-17, 2016, Eindhoven, Netherlands.

http://dx.doi.org/10.1145/2839462.2856540

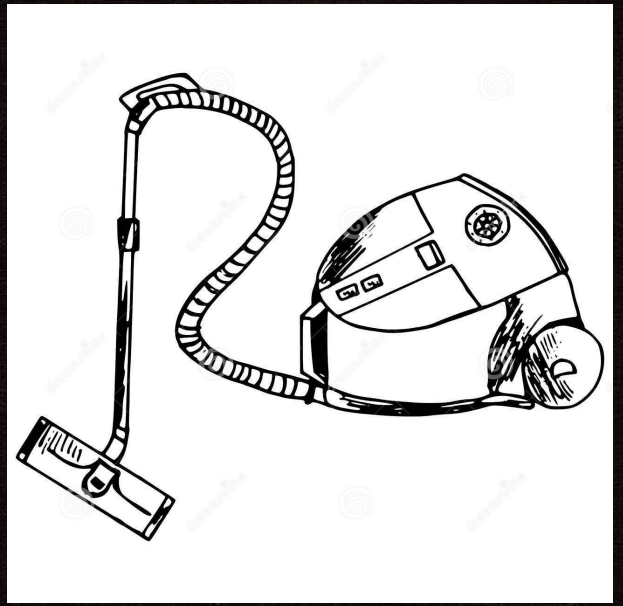
Abstract
This paper explores the opportunities for incorporating shape changing properties into everyday home appliances. Throughout a design research approach the vacuum cleaner is used as a design case with the overall aim of enhancing the user experience by transforming the appliance into a sensing object. Three fully functional prototypes were developed in order to illustrate how shape change can fit into the context of our homes. The shape changing functionalities are: 1) a digital power button that supports dynamic affordances, 2) an analog handle that mediates the amount of dust particles through haptic feedback and 3) a body that behaves in a lifelike manner dependent on the user treatment. We report the development and implementation of the functional prototypes as well as technical limitations and initial user reactions on the prototypes.

Author Keywords
Shape Changing Interfaces; Home Appliances; Design Research; Prototyping

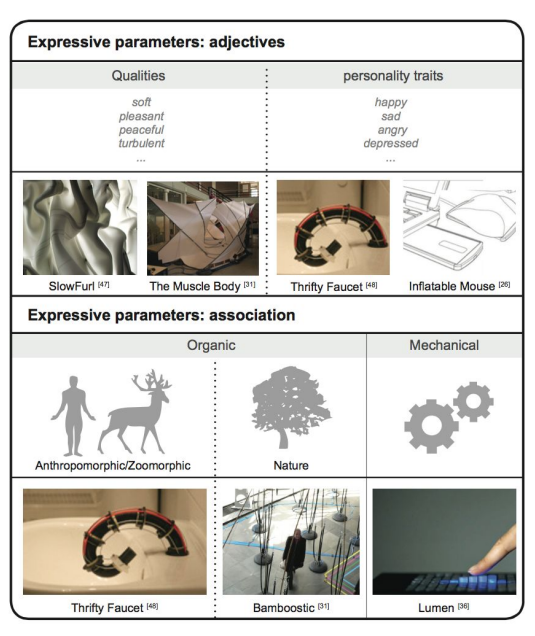
ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

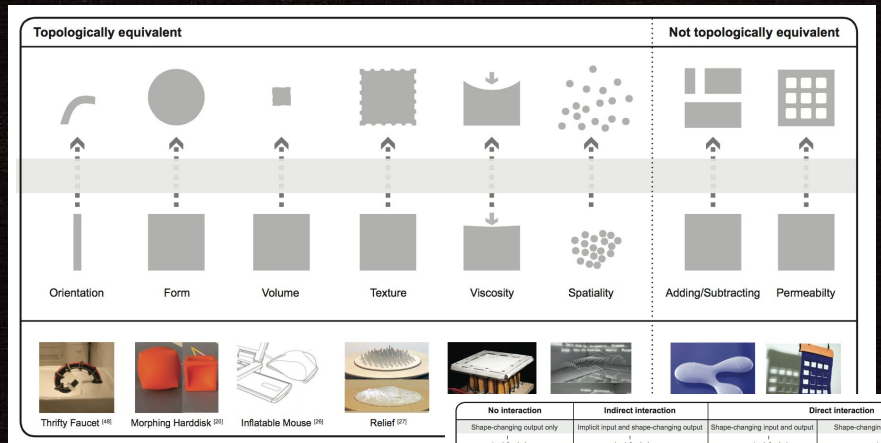
The Vacuum Cleaner as a Sensing Object

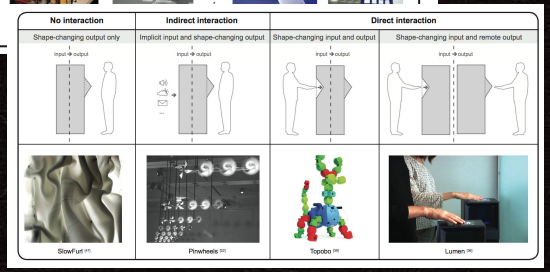
HOW CAN WE ENHANCE
THE EXPERIENCE
OF VACUUM CLEANING



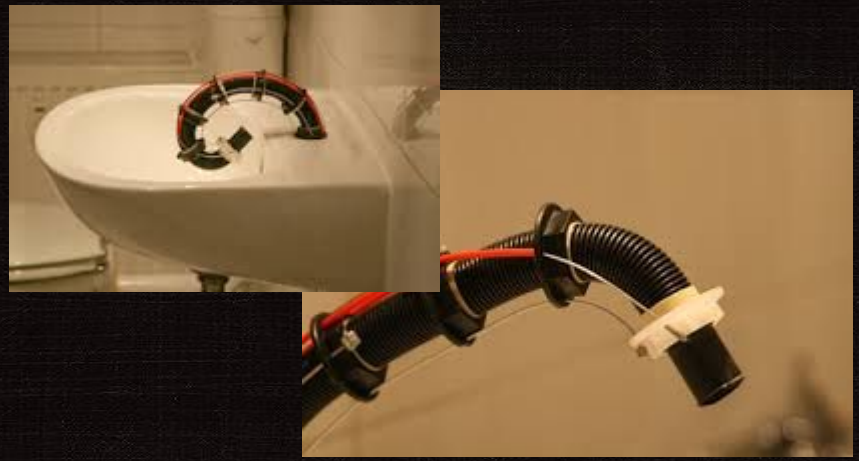
Related Work

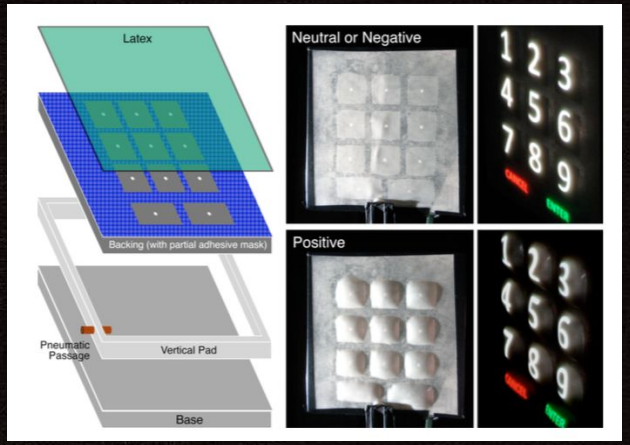






Related Work





Research Focus

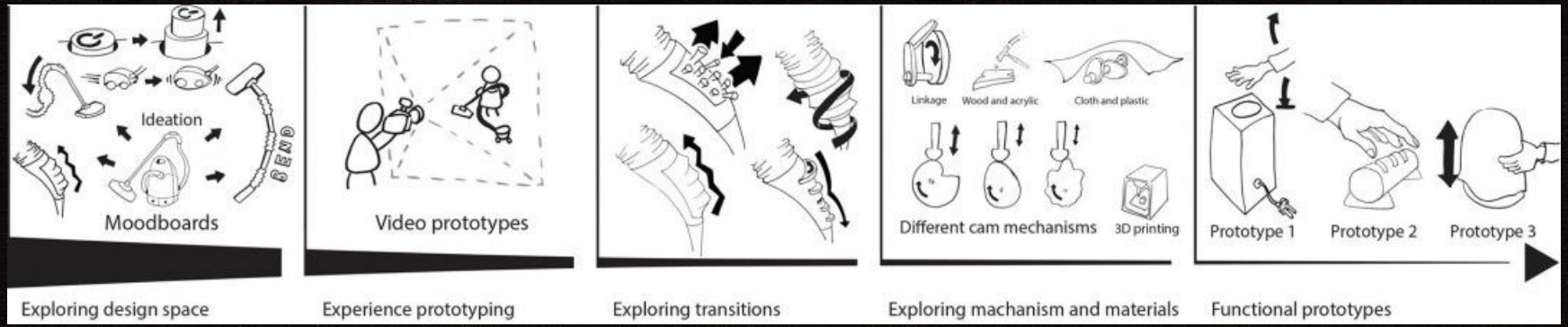
The vacuum cleaner as a sensing object

1) Provide information about the usage when needed

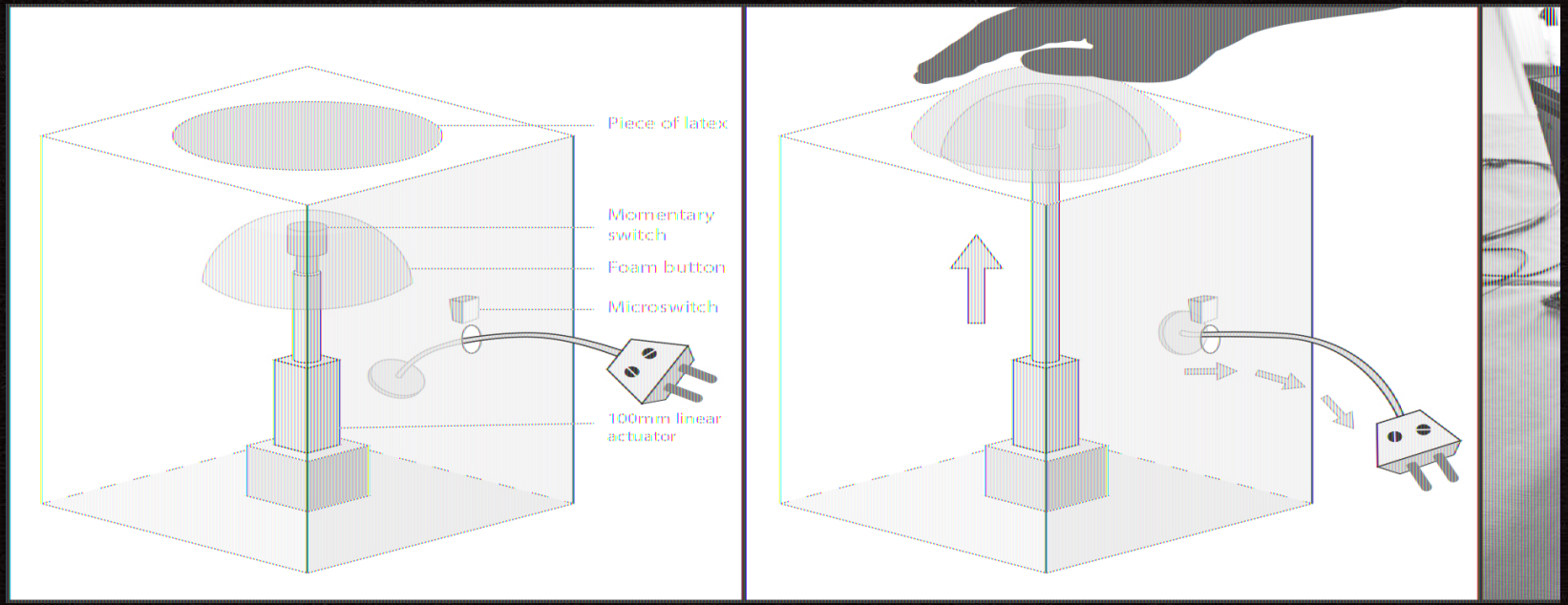
2) Improve the usability

3) Make the user reflect upon the usage situation

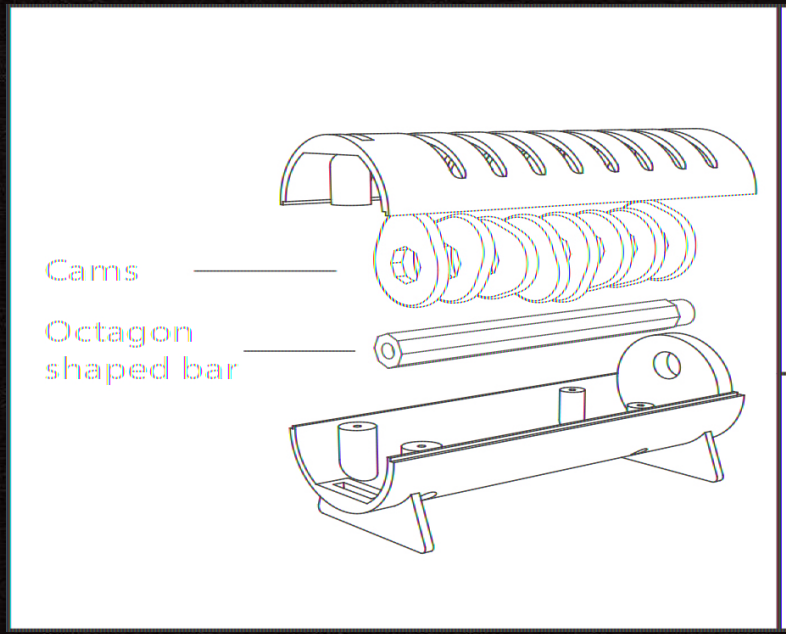
Process

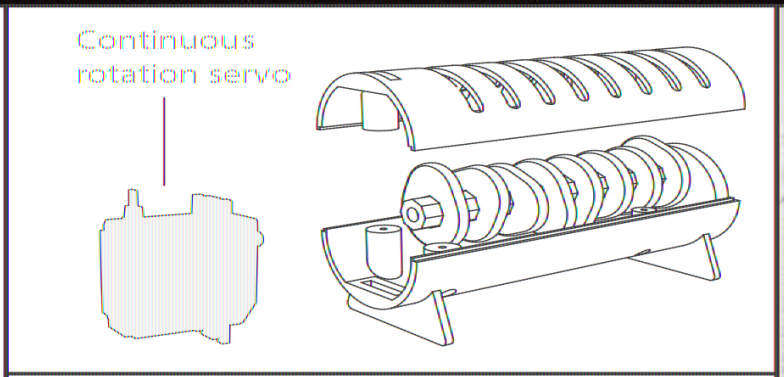

Ideation
Moodboards
Video prototypes
Linkage
Wood and acrylic
Cloth and plastic
Different cam mechanisms
3D printing
Prototype 1
Prototype 2
Prototype 3
Exploring design space
Experience prototyping
Exploring transitions
Exploring machanism and materials
Functional prototypes

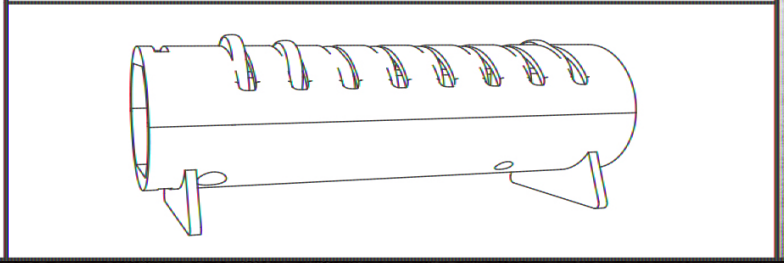
Prototype 1

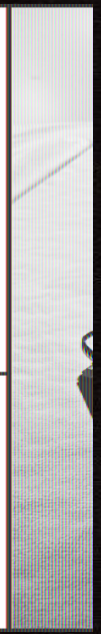

Piece of latex
Momentary switch
Foam button
Microswitch
100mm linear actuator

Prototype 2

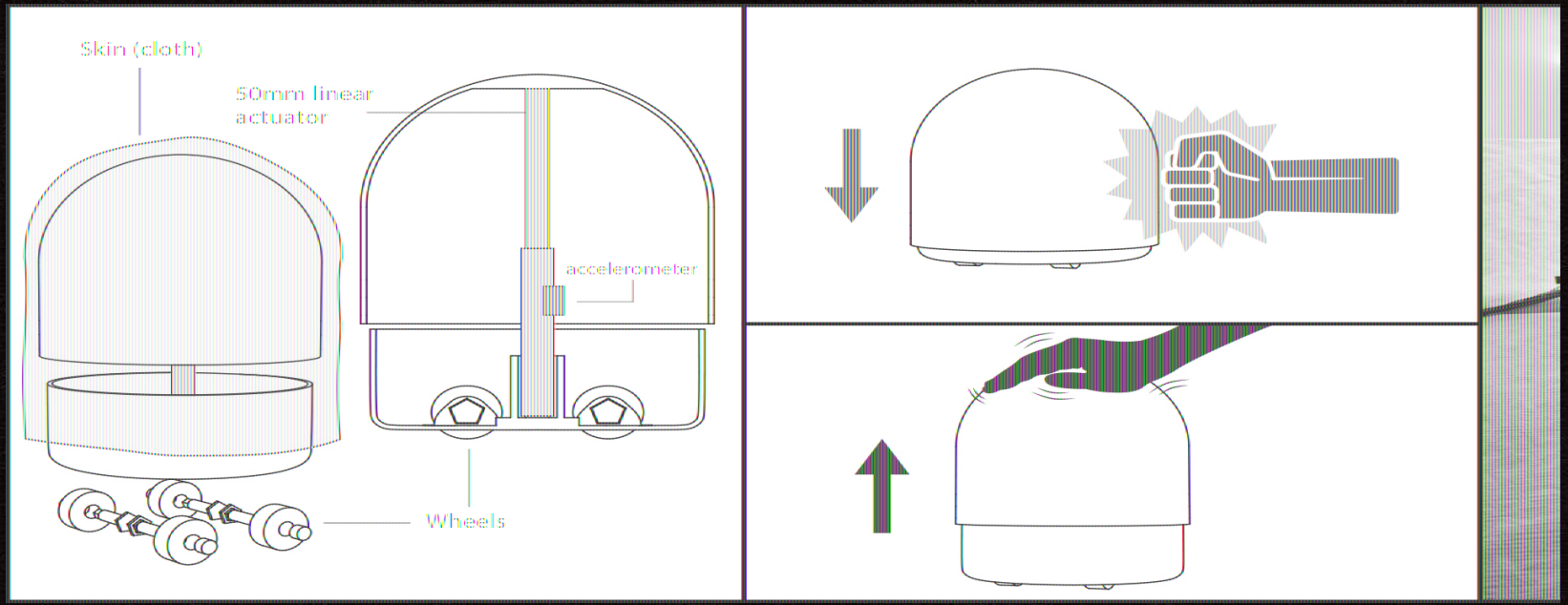


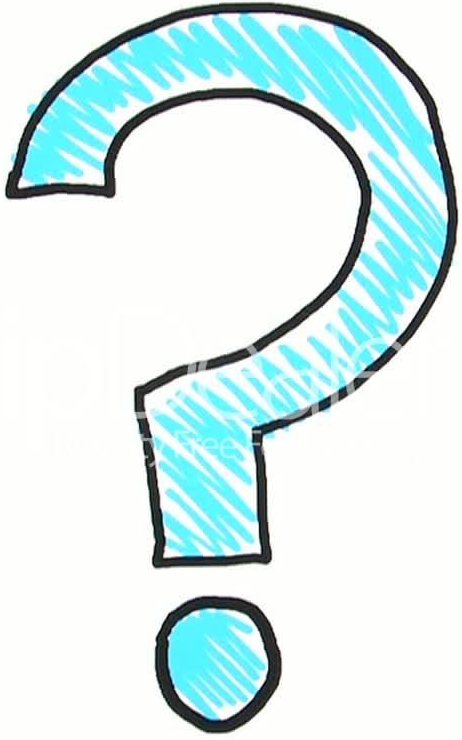






Prototype 3





Exploring the Use of Shape Change in Home Appliances

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Abstract
Vacuum cleaners are mundane, rigid, and at best manually reconfigurable. This paper investigates the potential of adding value to them by designing shape-changing interfaces. We present the conceptualization and design process of three prototypes that allow real-time reconfiguration of vacuum cleaners. Through discussion and reflection on design implications and experiences of the design process, we conclude that shape-change can contribute to designing engaging, functional, and aesthetic home appliances.

Author Keywords
Shape-changing interfaces; vacuum cleaners; material computing

ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous

Introduction
Shape change provides new opportunities when designing and developing products, allowing products to communicate essential functions, elements, and other characteristics, resulting in a more engaging interaction. Many household appliances are manually reconfigurable at best, indicating that there is a unexplored design space.
In this paper we explore how shape change can add value

Related Work

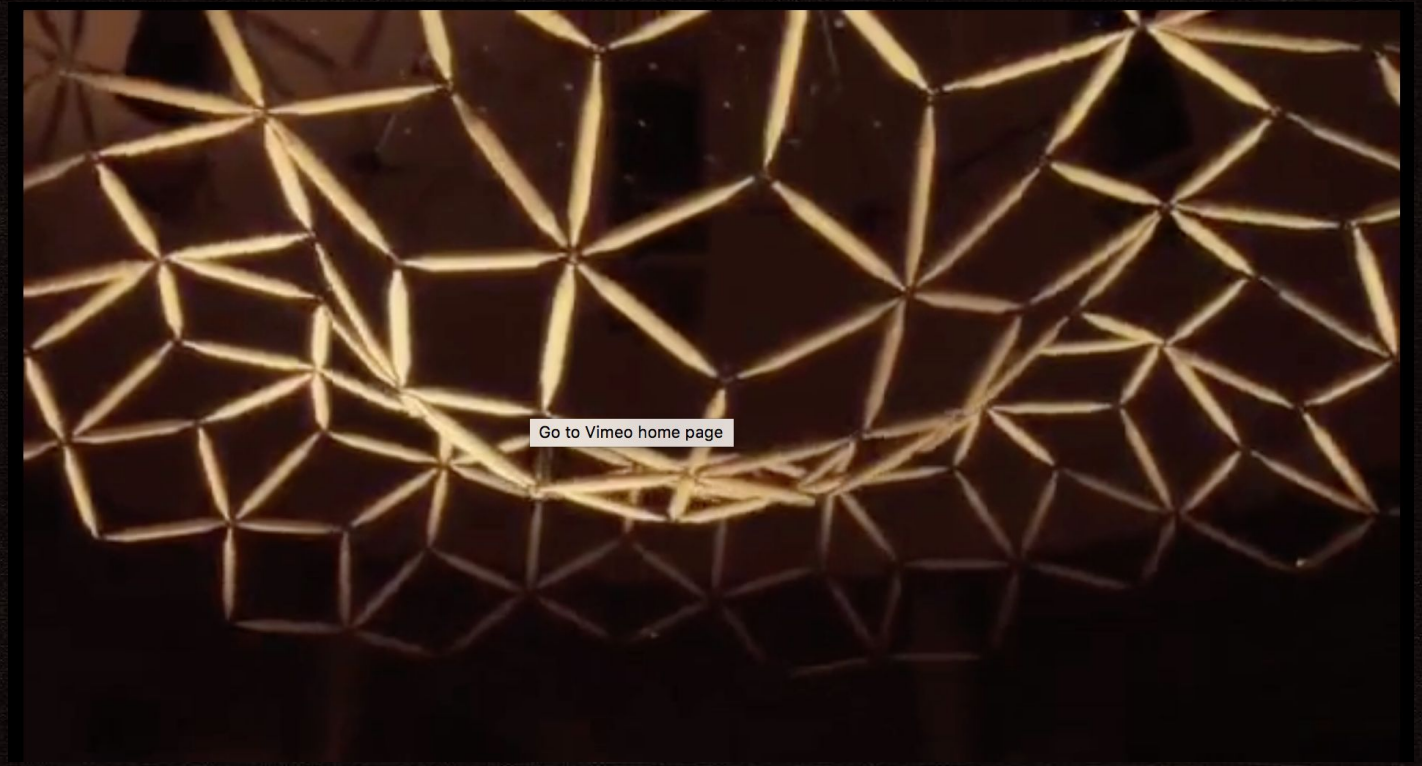
Dynamic Physical Affordances for Shape-Changing and Deformable User Interfaces

by

Sean Weston Follmer

Allow users to shape the affordances they need

Related Work



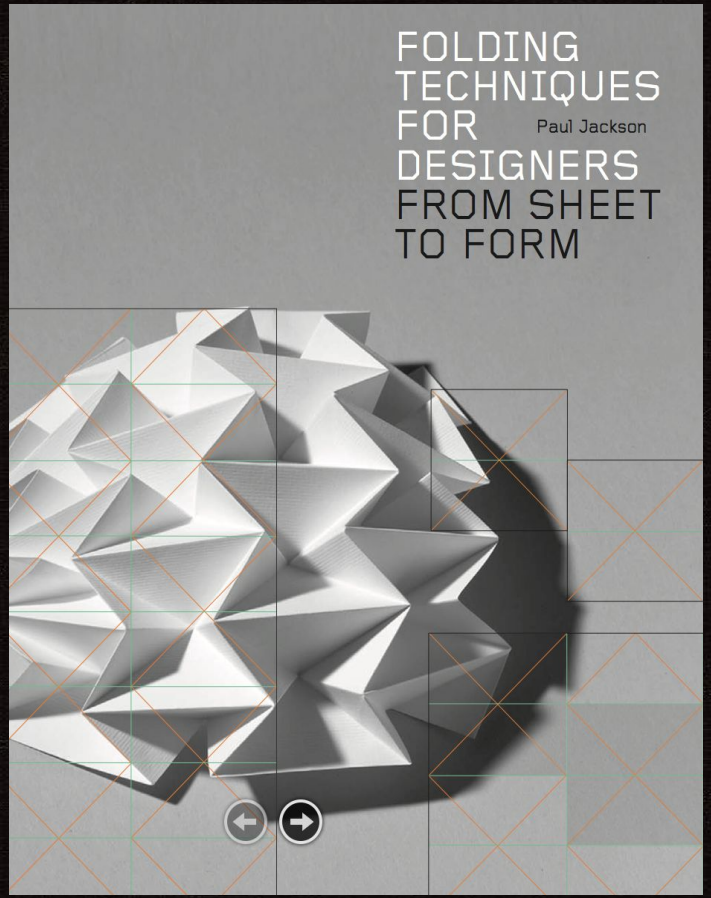
Research Focus

Add value to home appliances through SCI.
Real-time reconfiguration of appliances.

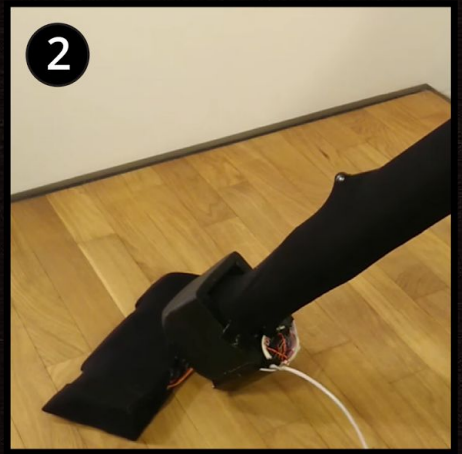
1. Fit into narrow spaces
2. Vacuum larger objects
3. Provide feedback to new interaction


Exploring the Use of Shape-Changing Interfaces
in Home Appliances

Inspiration

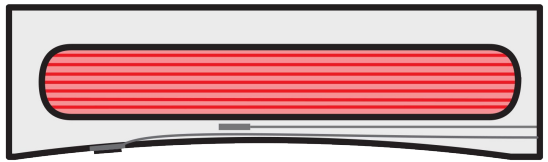


Submitted prototypes



How do they work?

①



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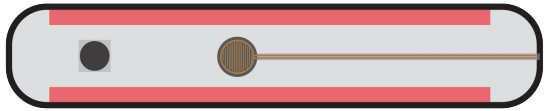

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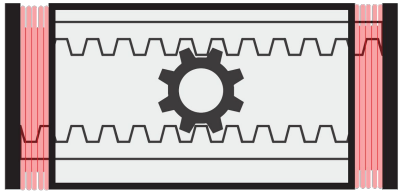

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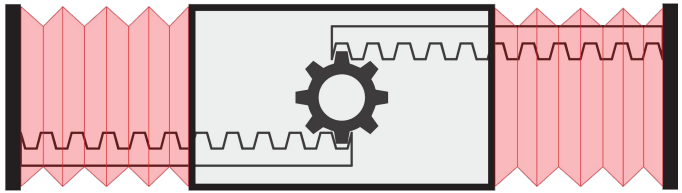
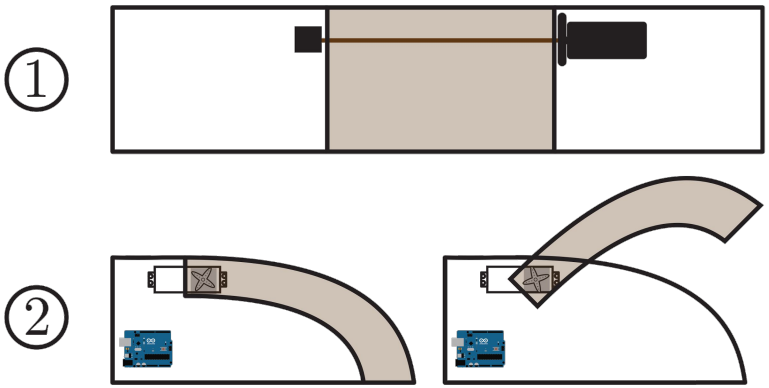
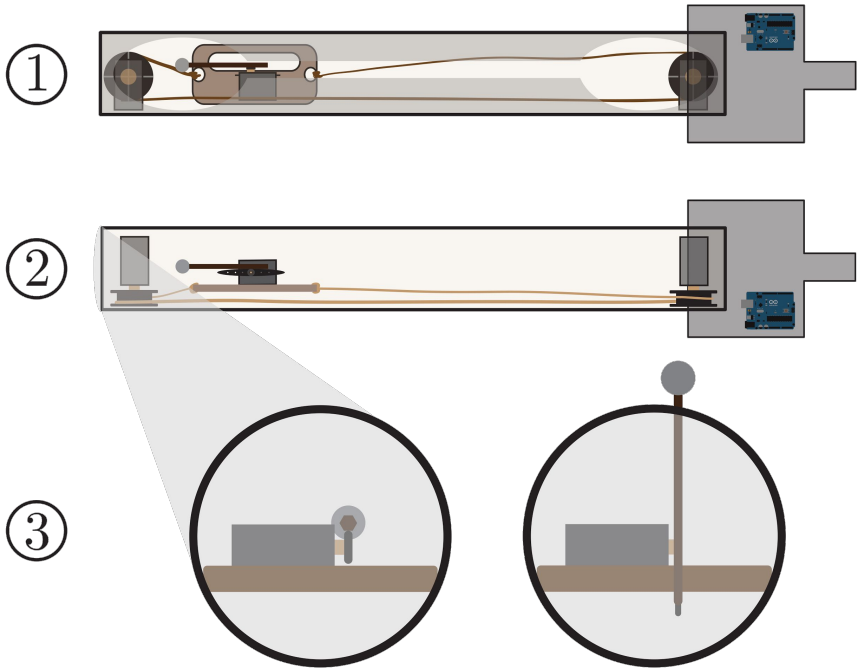
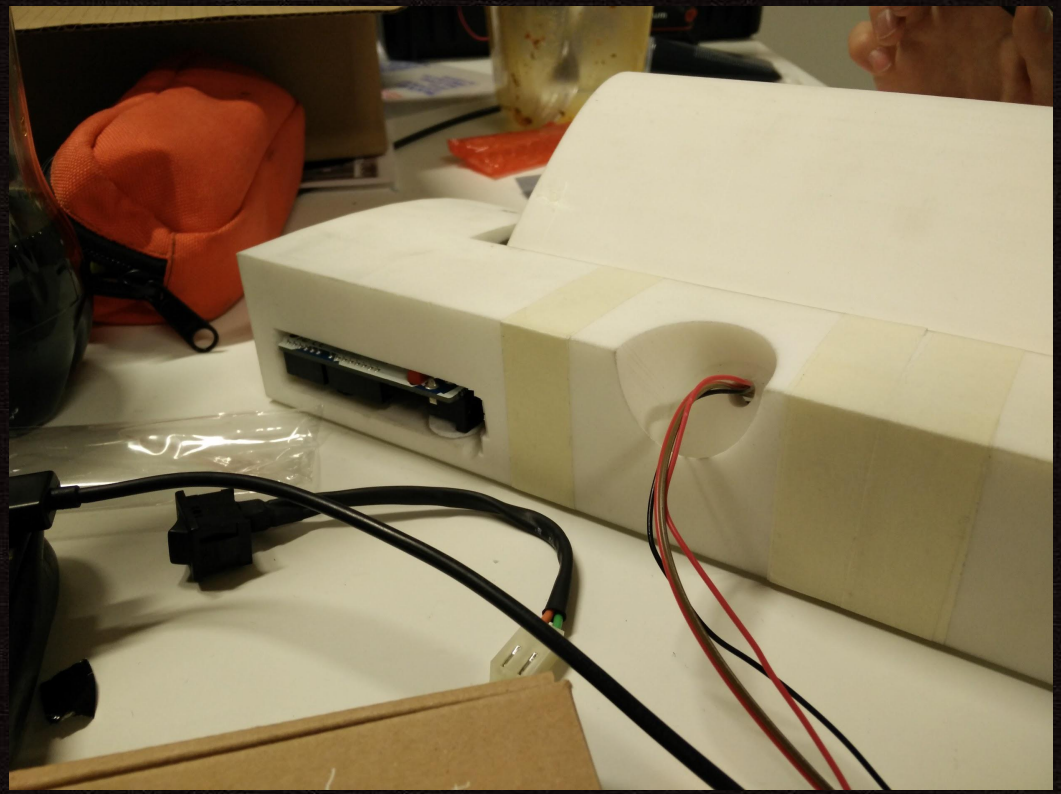


How do they work?

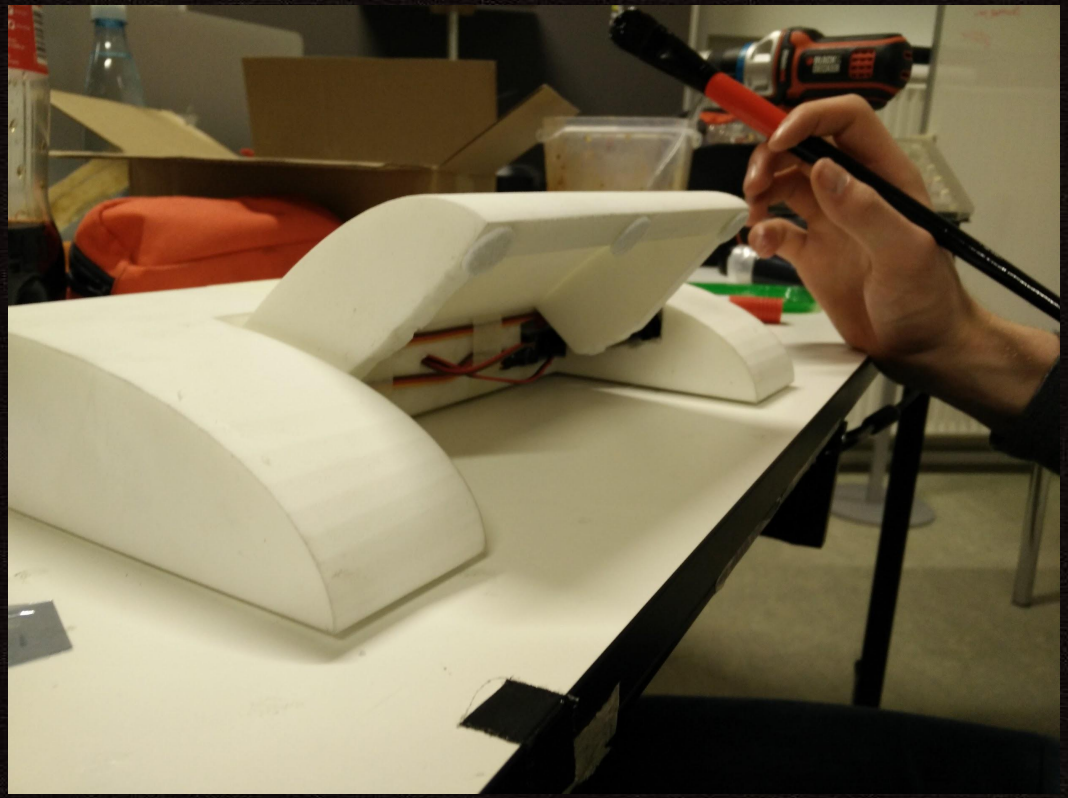




Final Prototype



Final Prototype

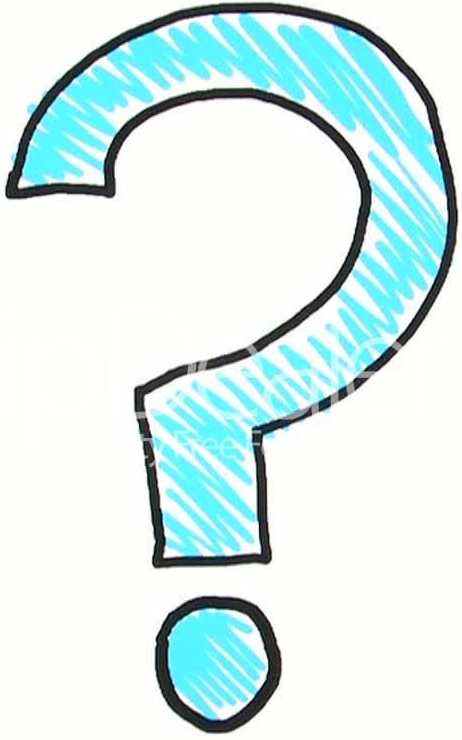


Future Work

Prototype incorporation

User evaluations

Material explorations



TEI10
TENTH ANNIVERSARY CONFERENCE ON TANGIBLE
EMBEDDED AND EMBODIED INTERACTION


Intelligent lighting
Improving health and vitality

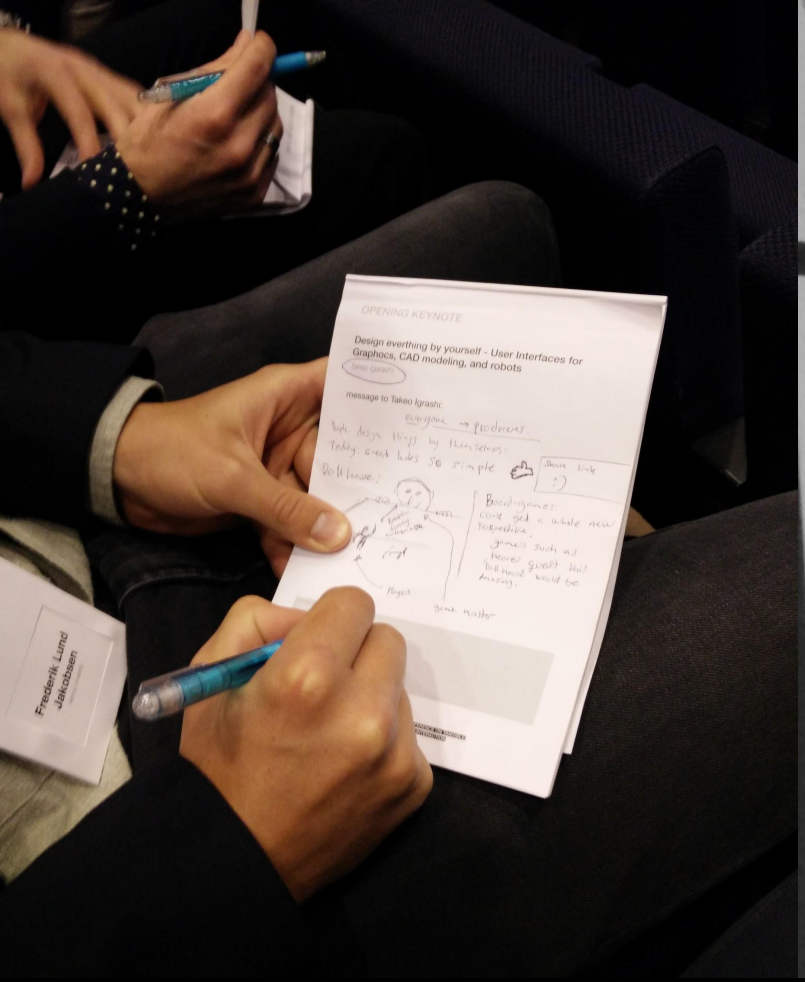
TEI 16
TENTH ANNIVERSARY CONFERENCE ON TANGIBLE
EMBEDDED AND EMBODIED INTERACTION

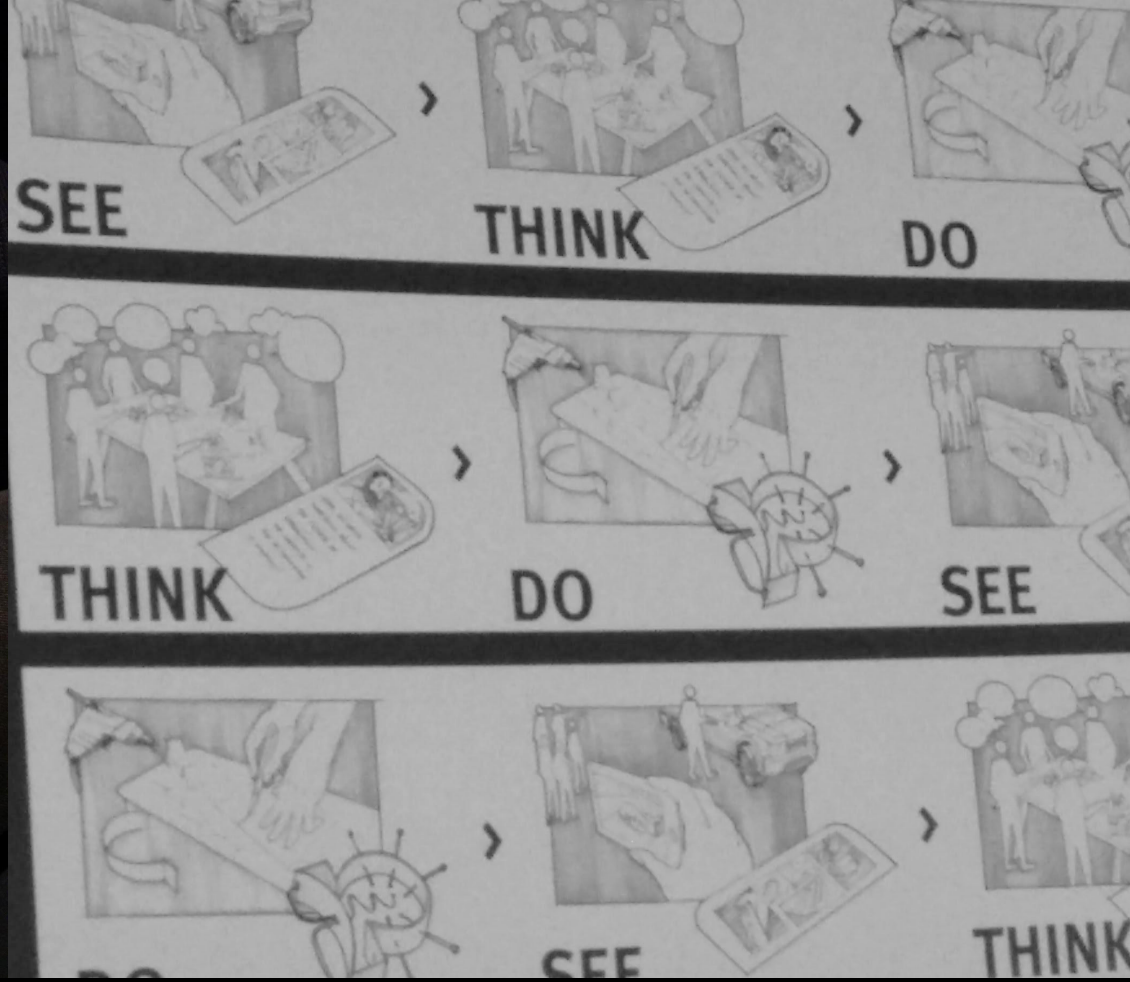

EXPLORING THE USE OF SHAPE CHANGE IN HOME APPLIANCES


KRS
ONE
EFFENAAR

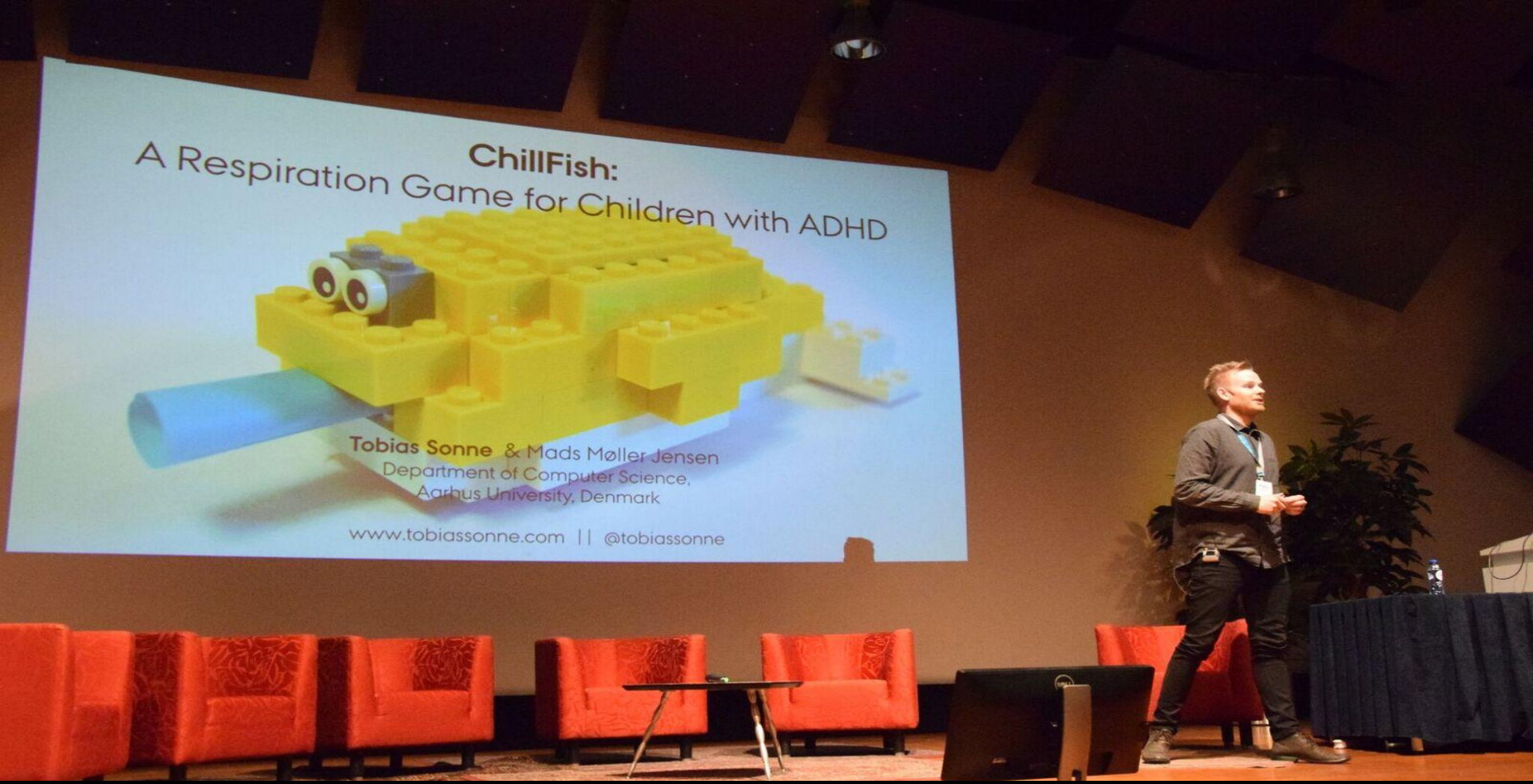

TU/e
Technische Universiteit
Eindhoven
University of Technology
Gereserveerd
HEISS · CHAUD

TEI'16
TENTH ANNIVERSARY CONFERENCE ON TANGIBLE
EMBEDDED AND EMBODIED INTERACTION


OPENING KEYNOTE
Design everthing by yourself - User Interfaces for Graphocs, CAD modeling, and robots
message to Takeo Igrashi:
Frederik Lund
Jakobsen


SEE
THINK
DO
THINK
DO
SEE
SEE
THINK

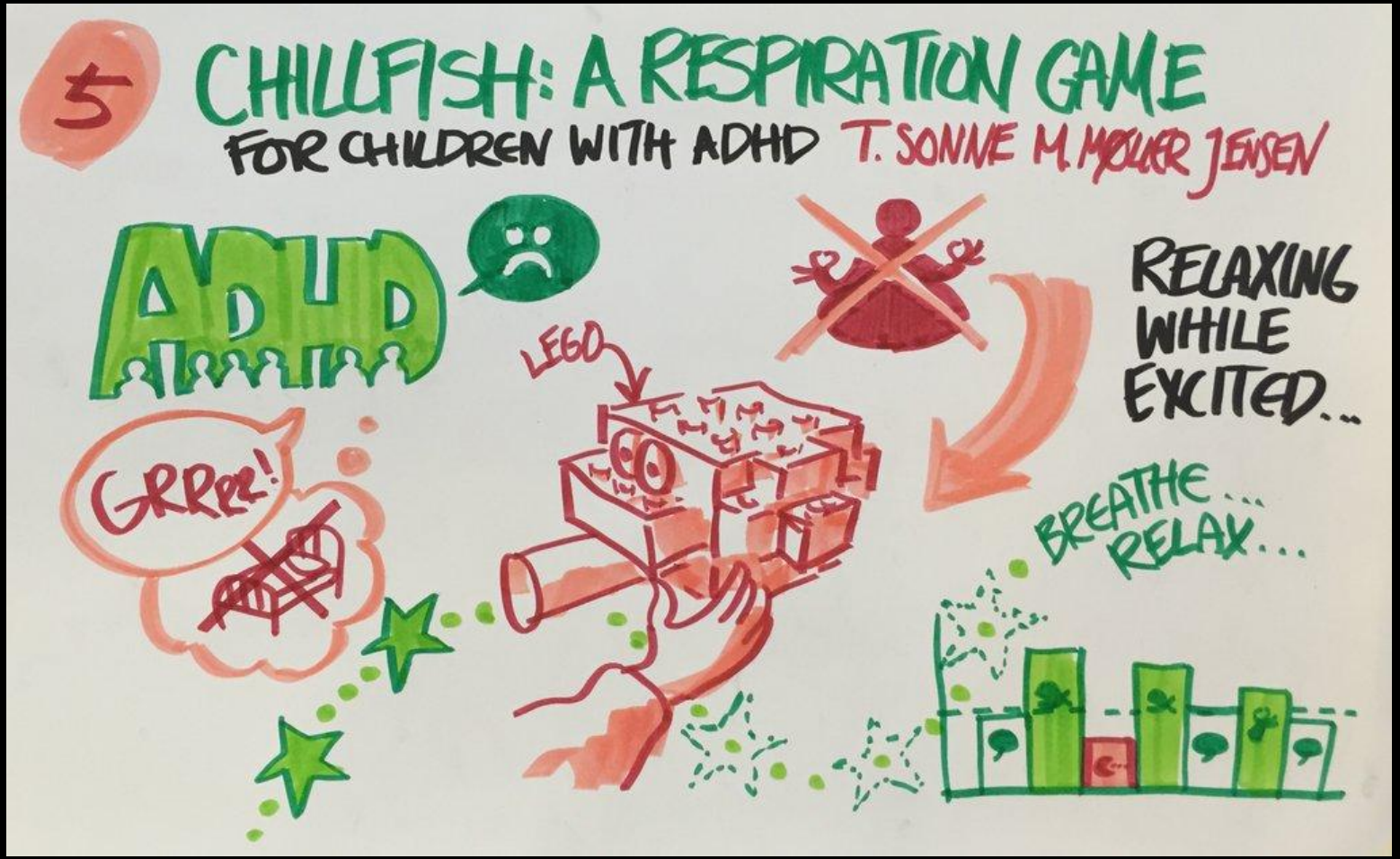

Fontys
Tangible Display
SIGCHI

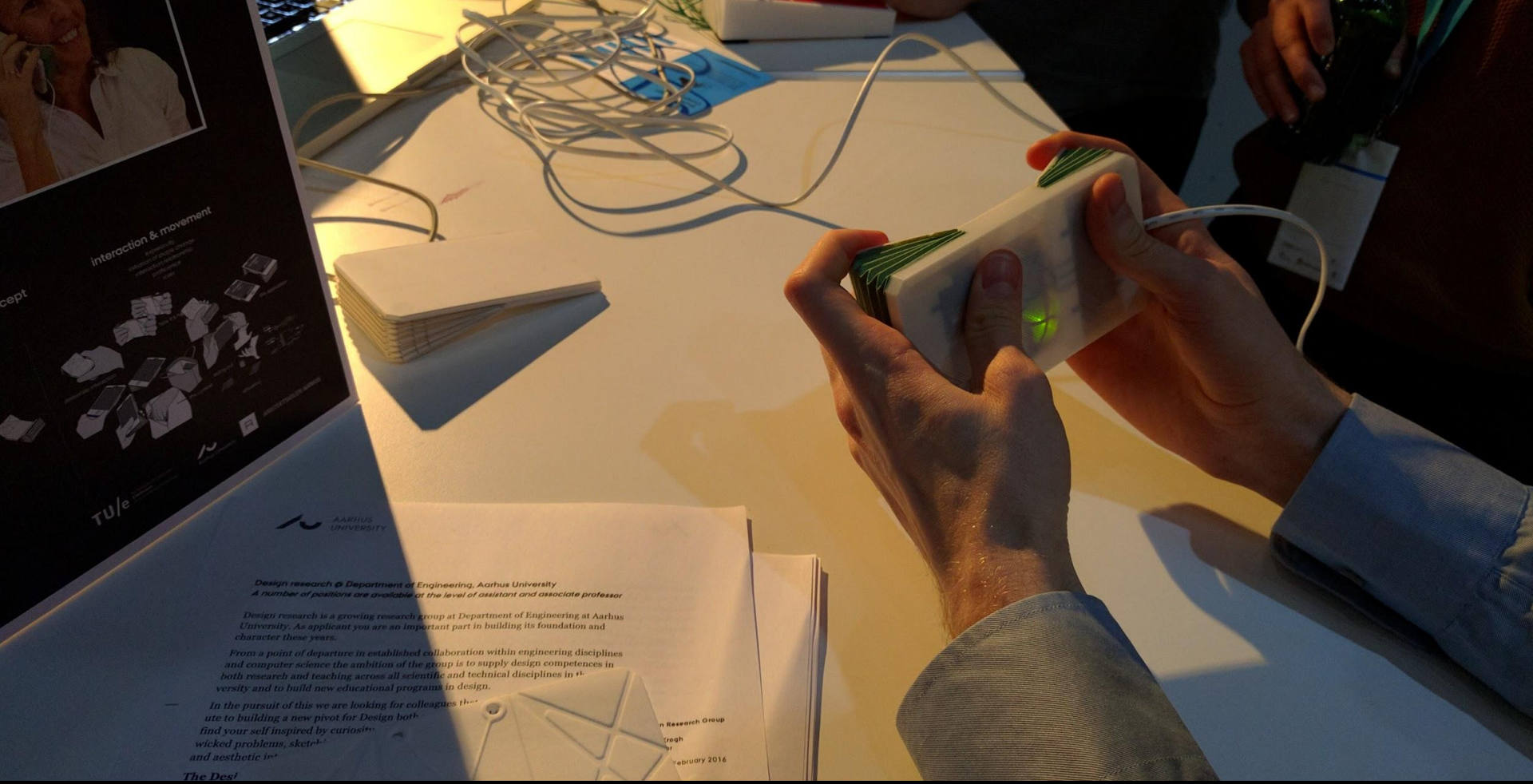

ChillFish:
A Respiration Game for Children with ADHD
Tobias Sonne & Mads Møller Jensen
Department of Computer Science,
Aarhus University, Denmark
www.tobiassonne.com || @tobiassonne

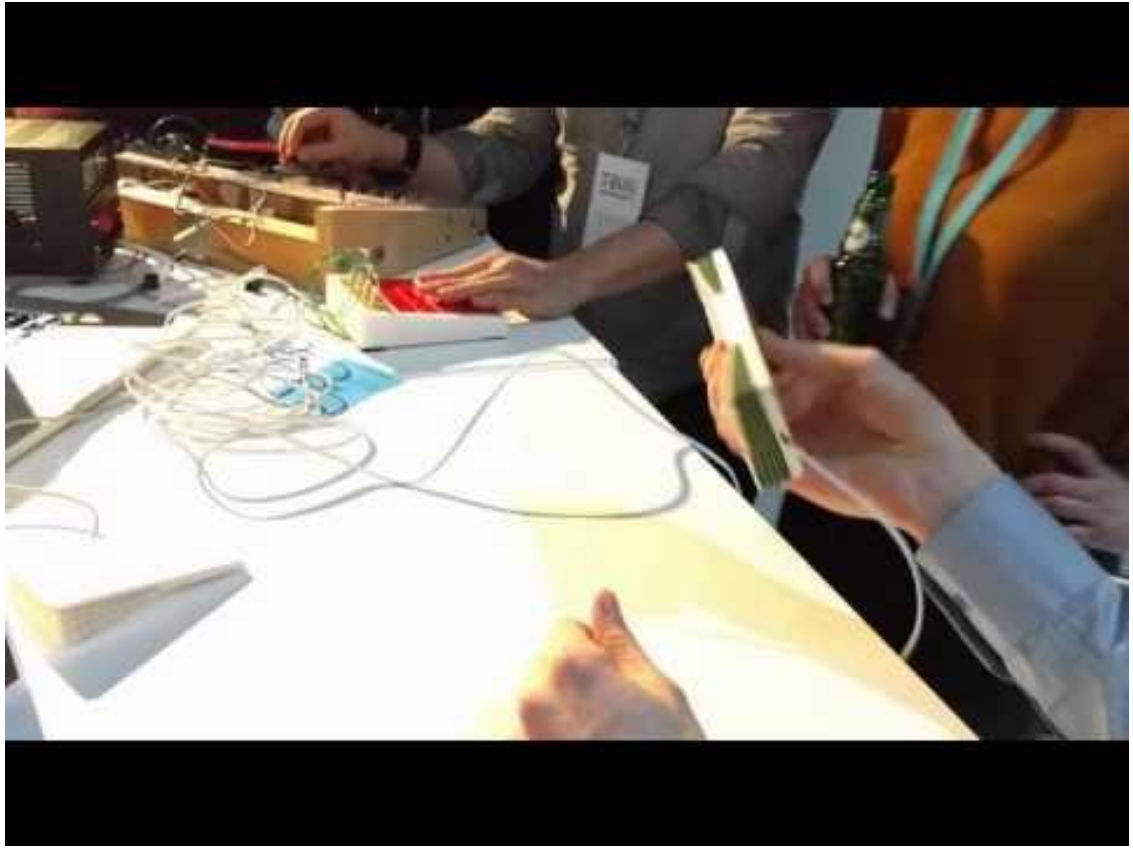

Coca-Cola
Pringles
Pringles


STUFF THAT WORKS
I SEEM TO BE ALL OVER THE PLACE!
ITERATION...
IMPROVING THE SELF FEEDING PROCES
WORKING WITH THERAPISTS
T4 TAGS 2.0: A TANGIBLE SYSTEM
OPEN-ENDED, EASY PROGRAM, TANGIBLE & FAILED BY CROWD!
opening keynote Take
10TH ANNIVERSARY!
OUR BODY IS OUR MANUAL
EMBEDED & EMBODIED
TAKEO IGARASHI
EVERYTHING BY YOURSELF
SOMETHING IS WRONG IN IT...
SKETCHING IS EASY!

session 1 Stuff That Works


5
CHILLFISH: A RESPIRATION GAME
FOR CHILDREN WITH ADHD
T. SONNE M. MØLLER JENSEN
ADHD
GRRR!
LEGO
RELAXING WHILE EXCITED...
BREATHE...
RELAX...


interaction & movement
TU/e
AARHUS UNIVERSITY
Design research @ Department of Engineering, Aarhus University
A number of positions are available at the level of assistant and associate professor
Design research is a growing research group at Department of Engineering at Aarhus University. As applicant you are an important part in building its foundation and character these years.
From a point of departure in established collaboration within engineering disciplines and computer science the ambition of the group is to supply design competences in both research and teaching across all scientific and technical disciplines in the university and to build new educational programs in design.
In the pursuit of this we are looking for colleagues that
ute to building a new pivot for Design both
find your self inspired by curiosity
wicked problems, sketch
and aesthetic in
The Des
February 2016




Future of TEI
embody is the root
bio is the new interface
trans-disciplinary is the soil

MIT's Vision for the SCI Field


“Intellectual masturbation for academics”
task / chunk of information
natural mapping
between input and output (physical | virtual)
Co-location
action & reaction
Physical actuation
Autonomously moving / shape changing objects

Demo