

# BIG

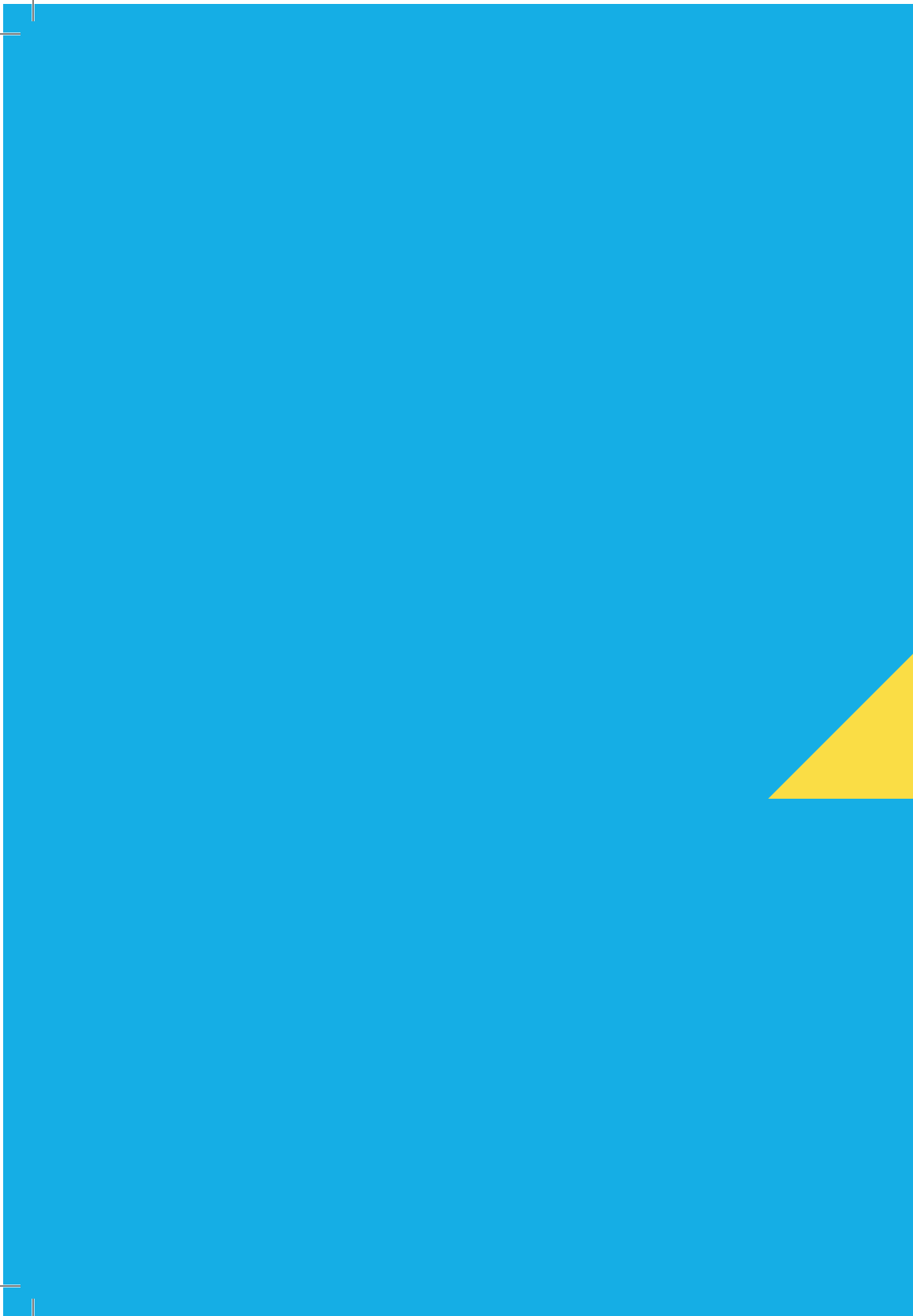
Bristol Interaction Group



**OUR  
PROJECTS**

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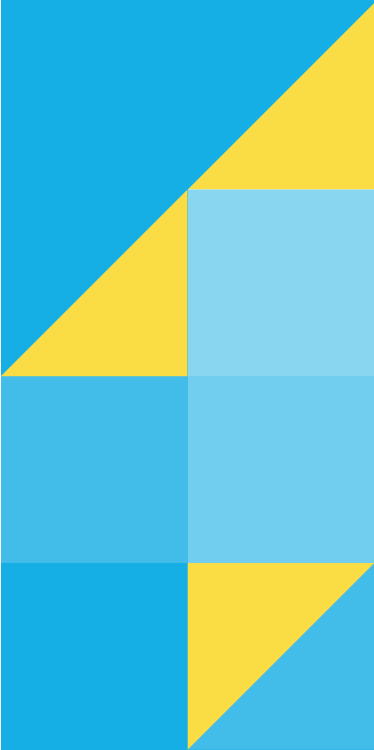




# BIG

Bristol Interaction Group

## ABOUT US



Bristol Interaction Group is united by a common interest in creative interdisciplinarity. We act as a hub for collaboration between social scientists, artists, scientists and engineers to combine efficient, aesthetic and innovative design. We are particularly interested in areas which couple the design of devices with deployment and evaluation in public settings. Members of the group have expertise in research areas spanning human-computer interaction, visual, auditory and haptic perception, visualisation and sonification, touch and gestural input, tangible interfaces, augmented and virtual reality, wearable and on-body computing, sustainable interaction design, digital engagement, interactive fabrication as well as flexible and actuated devices.

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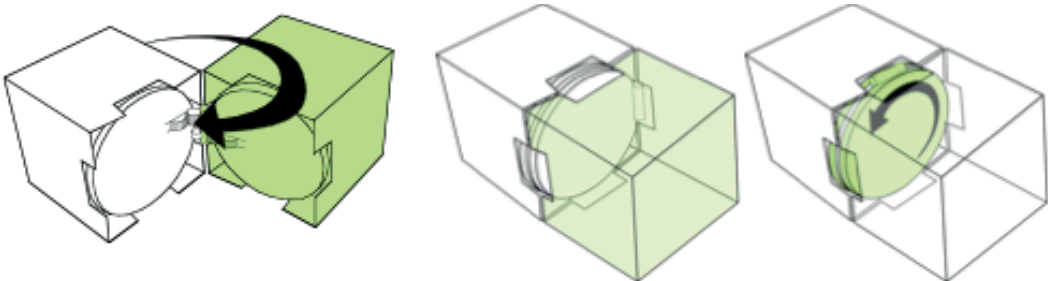
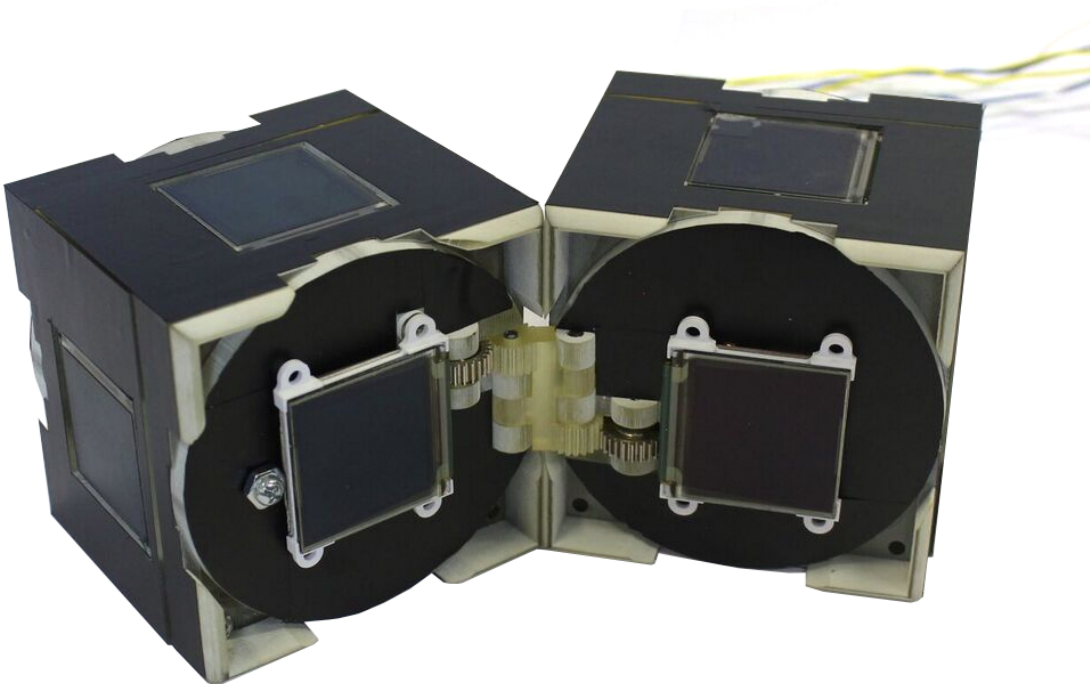
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# Cubimorph: Designing Modular Interactive Devices

Roudaut nne., Krusteva Diana, McCoy Mike,  
Karnik Abhijit, Ramani Karthik,  
Subramanian Sriram

## ABSTRACT

We introduce Cubimorph, a modular interactive device that accommodates touchscreens on each of the six module faces, and that uses a hinge-mounted turntable mechanism to self-reconfigure in the user's hand. Cubimorph contributes toward the vision of programmable matter where interactive devices reconfigure in any shape that can be made out of a chain of cubes in order to fit a myriad of functionalities, e.g. a mobile phone shifting into a console when a user launches a game. We present a design rationale that exposes user requirements to consider when designing homogeneous modular interactive devices. We present our Cubimorph mechanical design, three prototypes demonstrating key aspects (turntable hinges, embedded touchscreens and miniaturization), and an adaptation of the probabilistic roadmap algorithm for the reconfiguration.

At ICRA'16





# Garment level power distribution for wearables using inductive power transfer

Paul Worgan and Mike Fraser

## ABSTRACT

Wearable and smart devices are gaining in popularity, with many users now using multiple devices. Each of these devices requires individual charging and power maintenance. This paper proposes power sharing between multiple wearables to alleviate some of the burden of charging multiple devices. To achieve wearable and smart device power sharing, we propose using the garments we wear as a power distribution backbone. To allow non-contact power transfer between garments bi-directional inductive power transfer is used.

We demonstrate a novel coil topology constructed from flexible materials to aid garment integration and user comfort. Our system complies with international guidelines on time varying magnetic field exposure to human tissue, allowing the system to be operated in close proximity to the body. Three preliminary experiments are conducted to characterize the bi-directional inductive power sharing system and to investigate the feasibility and human factors impacting wearable and smart device power sharing.

**9th International Conference on  
Human System Interaction (HSI 2016)**





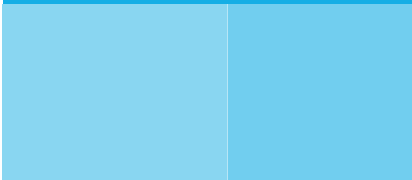


# Floating charts : Data Plotting using Free Floating Acoustically Levitated Representation

Themis Omirou, Asier Marzo,  
Sriram Subramanian, Anne Roudaut

## ABSTRACT

We introduce Floating Charts, a modular display that utilizes acoustic levitation for positioning free-floating objects. Multiple objects are individually levitated to compose a dynamic floating chart with the ability to move in real time to reflect changes in data. Floating objects can have different sizes and colours to represent additional information.





# **Musical Selfies: Feedback and Self-Reflection through Mobile Composition**

## **Workshop at ISEA 2016**

This workshop is part of a project that attempts to rethink our relationship with social media by conceiving of mediated social relations in terms of sound and music. It takes off from the assertion that social media continues to display a profoundly visual bias, and that exploring our mediated interactions with others (and ourselves) through sound can expand our understanding of social media. In the workshop we aim to explore a central theme of this work: the notion of the ‘musical selfie’. We see the selfie’s ‘fame’ as an outcome of the visual bias of social media, and seek to challenge some of the presumptions that underlie it by rethinking the selfie sonically.

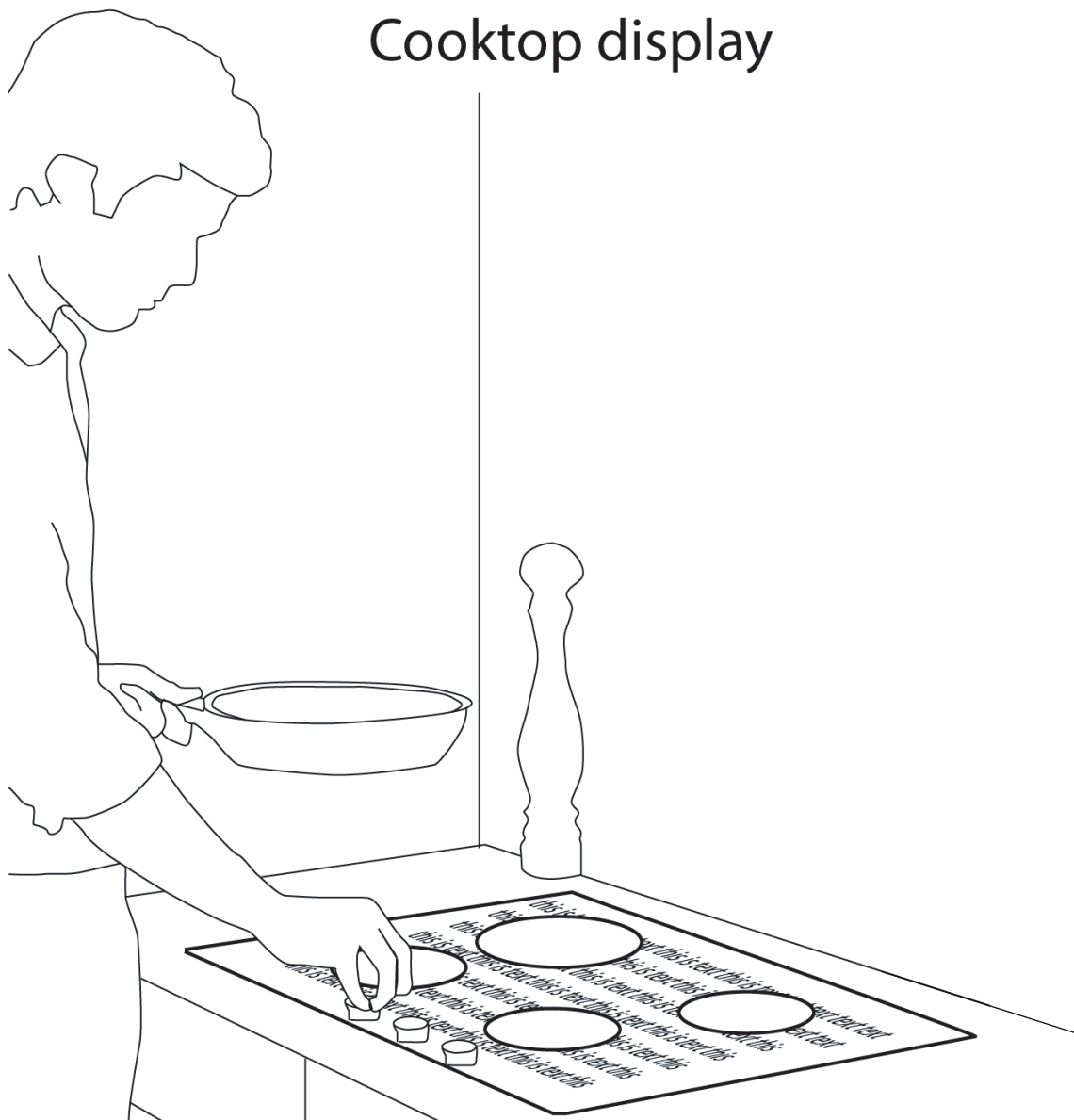
# **Tangibles for Health**

## **Workshop at CHI 2016**

Health research employing technology and HCI to support wellbeing, recovery and maintenance of conditions, has seen significant progress in recent years. However, such research has primarily focused on mobile “apps” running on commercial smartphones. We believe that Tangible User Interfaces (TUIs) offer many physical and interaction qualities that would benefit the eHealth community. Yet, there is little research that combines the two. Tangibles for Health will bring together leading researchers in tangible user interaction and health to explore the potential of tangibles as applied to healthcare and wellbeing.



## Cooktop display



# Investigating Text Legibility on Non-Rectangular Displays

Marcos Serrano, Anne Roudaut, Pourang Irani

## ABSTRACT

Emerging technologies allow for the creation of non-rectangular displays with unlimited constraints in shape. However, the introduction of such displays radically deviates from the prevailing tradition of placing content on rectangular screens and raises fundamental design questions. Among these is the foremost question of how to legibly present text. We address this fundamental concern through a multi-part exploration that includes: (1) a focus group study from which we collected free-form display scenarios and extracted display shape properties; (2) a framework that identifies different mappings of text onto a non-rectangular shape and formulates hypotheses concerning legibility for different display shape properties; and (3) a series of quantitative text legibility studies to assess our hypotheses. Our results agree with and extend upon other findings in the existing literature on text legibility, but they also uncover unique instances in which different rules need to be applied for non-rectangular displays. These results also provide guidelines for the design of visual interfaces.









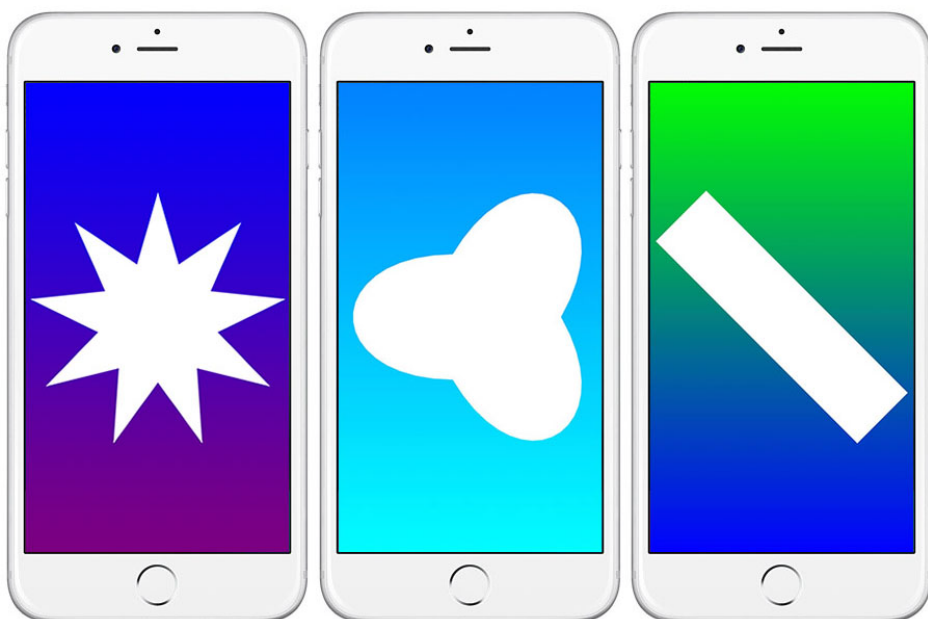
# Understanding and Mitigating the Effects of Device and Cloud Service Design Decisions on the Environmental Footprint of Digital Infrastructure

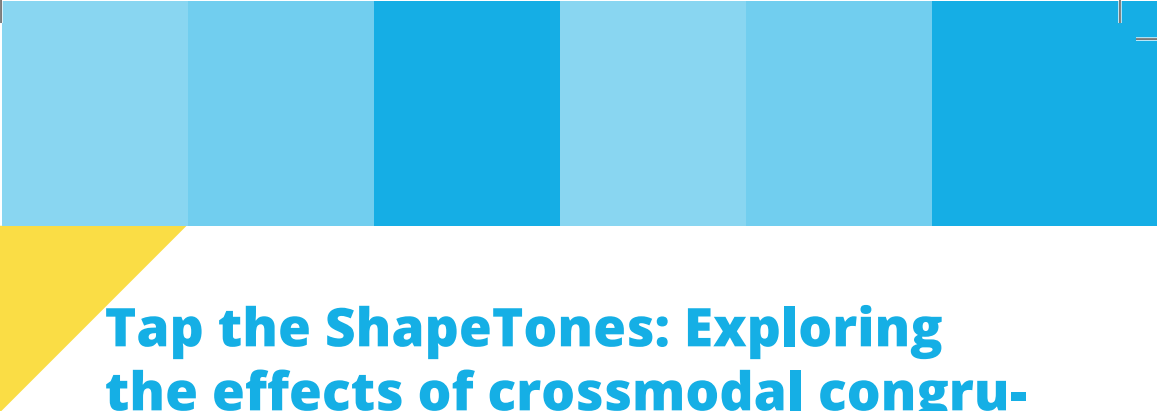
Chris Preist, Dan Schien, Eli Blevins

## ABSTRACT

Interactive devices and the services they support are reliant on the cloud and the digital infrastructure supporting it. The environmental impacts of this infrastructure are substantial—and for particular services the infrastructure can account for up to 85% of the total impact. In this paper, we apply the principles of Sustainable Interaction Design to cloud services use of the digital infrastructure. We perform a critical analysis of current design practice with regard to interactive services, which we identify as the cornucopian paradigm. We show how user-centered design principles induce environmental impacts in different ways, and combine with technical and business drivers to drive growth of the infrastructure through a reinforcing feedback cycle. We then create a design rubric, substantially extending that of Blevins [6], to cover impacts of the digital infrastructure. In doing so, we engage in design criticism, identifying examples (both actual and potential) of good and bad practice. We then extend this rubric beyond an eco-efficiency paradigm to consider deeper and more radical perspectives on sustainability, and finish with future directions for exploration.





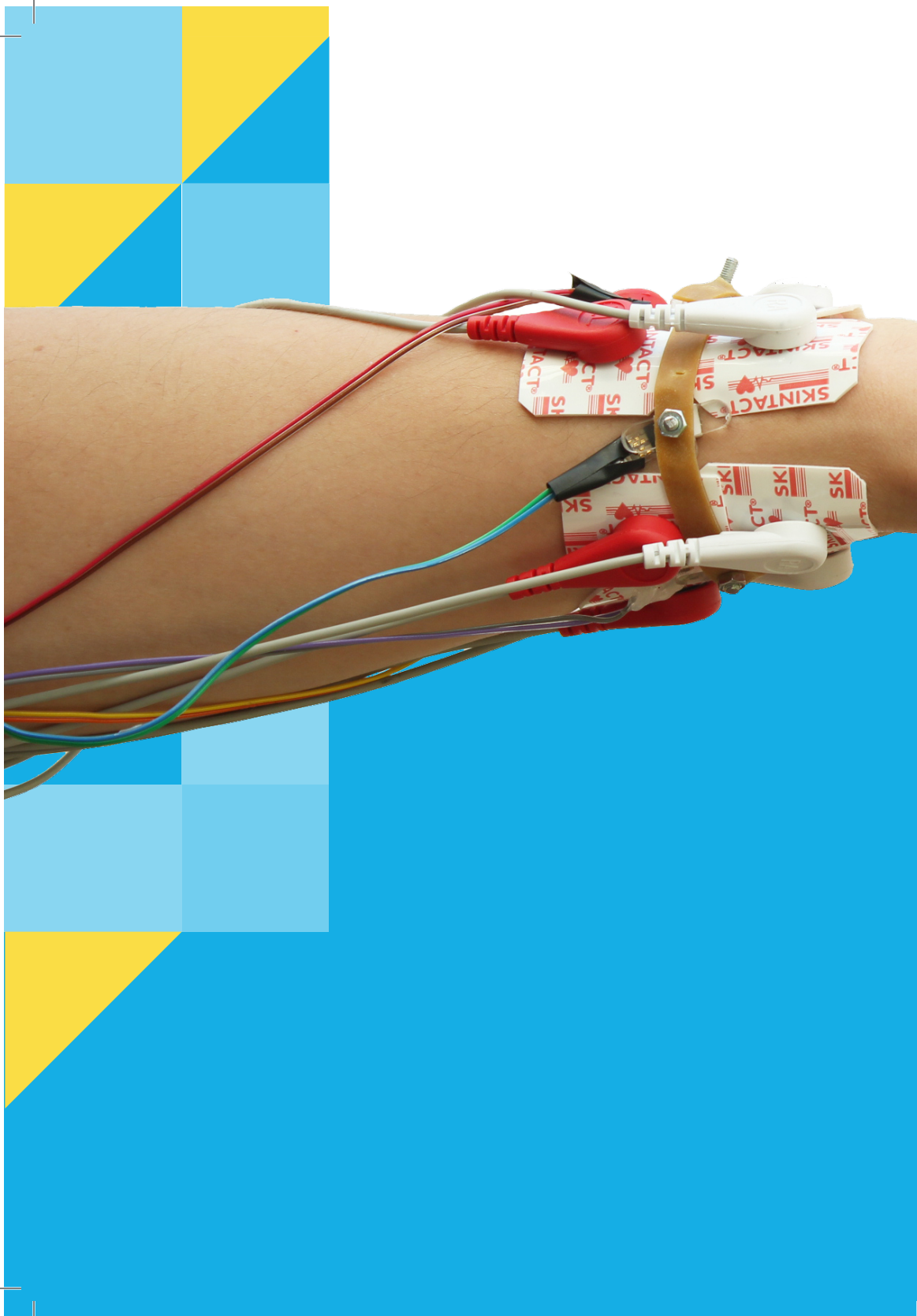


# **Tap the ShapeTones: Exploring the effects of crossmodal congruence in an audio-visual interface**

Oussama Metatla, Nuno Correia, Fiore Martin,  
Nick Bryan-Kinns, Tony Stockman

## **ABSTRACT**

There is growing interest in the application of crossmodal perception to interface design. However, most research has focused on task performance measures and often ignored user experience and engagement. We present an examination of crossmodal congruence in terms of performance and engagement in the context of a memory task of audio, visual, and audio-visual stimuli. Participants in a first study showed improved performance when using a visual congruent mapping that was cancelled by the addition of audio to the baseline conditions, and a subjective preference for the audio-visual stimulus that was not reflected in the objective data. Based on these findings, we designed an audio-visual memory game to examine the effects of crossmodal congruence on user experience and engagement. Results showed higher engagement levels with congruent displays with some reported preference for potential challenge and enjoyment that an incongruent display may support, particularly for increased task complexity.



# EMPress: Practical Hand Gesture Classification with Wrist-Mounted EMG and Pressure Sensing



Jess McIntosh, Charlie McNeill, Mike Fraser,  
Frederic Kerber, Markus Löchtefeld, Antonio Krüger

## ABSTRACT

Practical wearable gesture tracking requires that sensors align with existing ergonomic device forms. We show that combining EMG and pressure data sensed only at the wrist can support accurate classification of hand gestures. A pilot study with unintended EMG electrode pressure variability led to exploration of the approach in greater depth. The EMPress technique senses both finger movements and rotations around the wrist and forearm, covering a wide range of gestures, with an overall 10-fold cross validation classification accuracy of 96%.

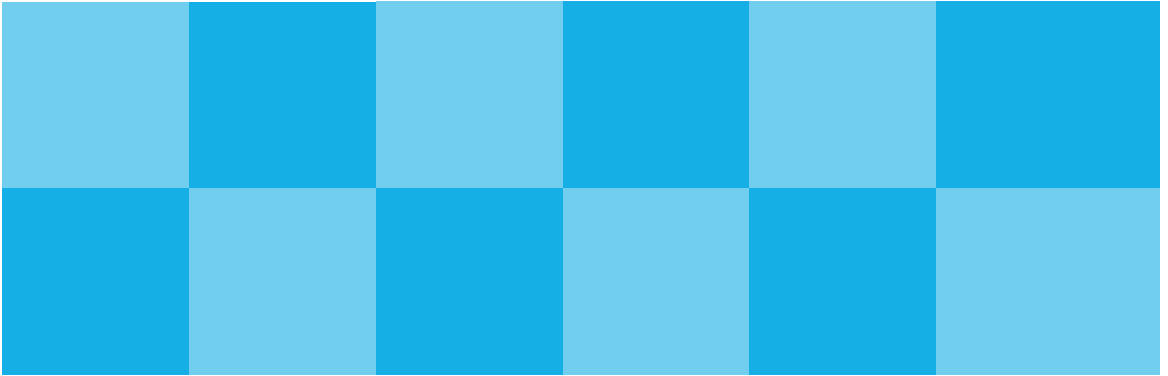
We show that EMG is especially suited to sensing finger movements, that pressure is suited to sensing wrist and forearm rotations, and their combination is significantly more accurate for a range of gestures than either technique alone. The technique is well suited to existing wearable device forms such as smart watches that are already mounted on the wrist.

CHI Paper 2016





# Office Social: Presentation Interactivity for Nearby Devices



Debaleena Chattopadhyay, Kenton O'Hara,  
Sean Rintel, Roman Rädle

## ABSTRACT

Slide presentations have long been stuck in a one-to-many paradigm, limiting audience engagement. Based on the concept of smartphone-based remote control of slide navigation, we present Office Social—a PowerPoint plugin and companion smartphone app that allows audience members qualified access to slides for personal review and, when the presenter enables it, public control over slide navigation. We studied the longitudinal use of Office Social across four meetings of a workgroup. We found that shared access and regulated control facilitated various forms of public and personal audience engagement. We discuss how enabling ad-hoc aggregation of co-proximate devices reduces 'interaction costs' and leads to both opportunities and challenges for presentation situations.

**CHI Paper 2016**









# GauntLev: A Wearable to Manipulate Free-floating Objects

Asier Marzo



## ABSTRACT

A tool able to generate remote forces would allow us to handle dangerous or fragile materials without contact or occlusions. Acoustic levitation is a suitable technology since it can trap particles in air or water. However, no approach has tried to endow humans with an intertwined way of controlling it. Previously, the acoustic elements were static, had to surround the particles and only translation was possible. Here, we present the basic manoeuvres that can be performed when levitators are attached to our moving hands. A Gauntlet of Levitation and a Sonic Screwdriver are presented with their manoeuvres for capturing, moving, transferring and combining particles. Manoeuvres can be performed manually or assisted by a computer for repeating patterns, stabilization and enhanced accuracy or speed. The presented prototypes still have limited forces but symbolize a milestone in our expectations of future technology.





Photo credit: FreeImages.com/novak kulina

# Rick Fletcher

## Technology

Even though Rick owns a laptop and a tablet, they are mostly used by his daughter. Rick lives with dyslexia and this has affected his use of technology. He likes watching TV in the evenings, but he has to scroll through the channels because he can't read the menu. Since he's had a smart energy monitoring system, Rick has become very conscious about saving energy.

## Health

Rick sees himself as healthy for his age. When he had health concerns in the past, it was always his wife who made him go to the GP. However, now that he is divorced, he is very reluctant to seek medical advice and care. Rick has an old ankle injury that has flared up recently. His doctor warned him that he will eventually need surgery if he doesn't rest the ankle to allow it to heal properly, but Rick doesn't want to take time off work. For Rick, being able to work is what makes him feel healthy and well.

## Thoughts about smart home technology for health and wellbeing

**Age:** 53

**Occupation:** Warehouse operative

**Education:** No formal qualifications

**Household:** Lives in a 2-bedroom Council house with his teenage daughter

**Smart/health tech.:** Smart energy monitoring linked to an app, which allows household data to be visualised

### Motivation

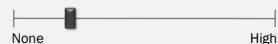
- Learning how to be more energy efficient
- Saving money on utility bills
- Knowing what his daughter gets up to while he is at work

### Barriers

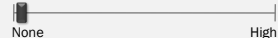
- Not being able to read information from the system
- Fear that the system will detect a chronic or terminal condition that would prevent him from working

### Attitude

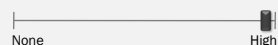
Expectation of benefits for self



Interest in seeing personal data



Interest in seeing household data



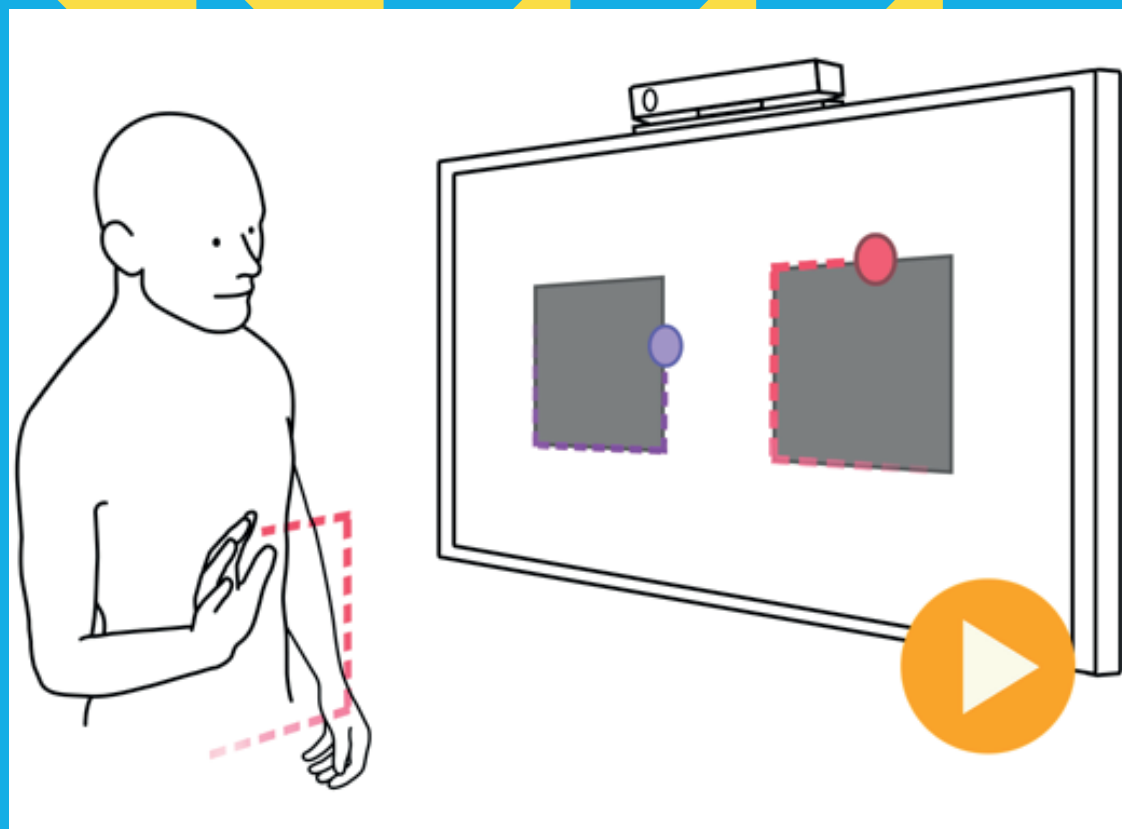


# Shared Language and the Design of Home Healthcare Technology

Alison Burrows, Rachael Goberman-Hill, David Coyle

## ABSTRACT

Words and language are central to most human communication. This paper explores the importance of language for the participatory design of smart home technologies for healthcare. We argue that to effectively involve a broad range of users in the design of new technologies, it is important to actively develop a shared language that is accessible to and owned by all stakeholders, and that facilitates productive dialogues among them. Our discussion is grounded firstly in work with end users, in which problematic language emerged as a key barrier to participation and effective design. Three specific categories of language barriers are identified: jargon, ambiguity, and emotive words. Building on this we undertook a workshop and focus group, respectively involving researchers developing smart health technologies and users, where the focus was on generating a shared language. We discuss this process, including examples that emerged of alternative terminology and specific strategies for creating a shared language.





# **PathSync: Multi-User Gestural Interaction with Touchless Rhythmic Path Mimicry**

Marcus Carter, Eduardo Velloso, John Downs,  
Abigail Sellen, Kenton O'Hara, Frank Vetere

## **ABSTRACT**

In this paper, we present PathSync, a novel, distal and multi-user mid-air gestural technique based on the principle of rhythmic path mimicry; by replicating the movement of a screen-represented pattern with their hand, users can intuitively select an on-screen object quickly, and with a high level of accuracy. We present three studies that each contribute (1) improvements to how correlation is calculated in path-mimicry techniques necessary for touchless interaction, (2) a validation of its efficiency in comparison to existing techniques, and (3) a demonstration of its intuitiveness and multi-user capacity 'in the wild'. Our studies consequently demonstrate PathSync's potential as an immediately legitimate alternative to existing techniques, with key advantages for public display and multi-user applications.



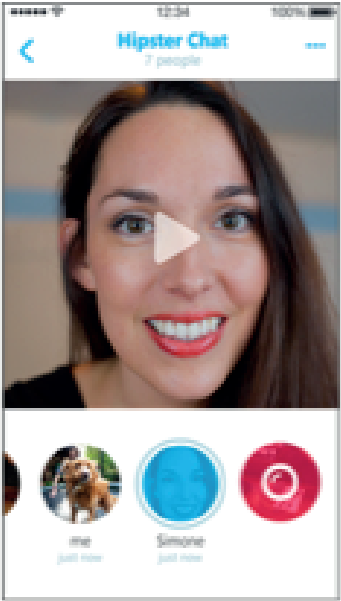
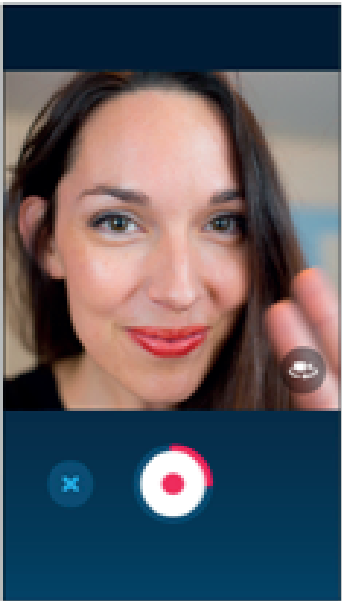
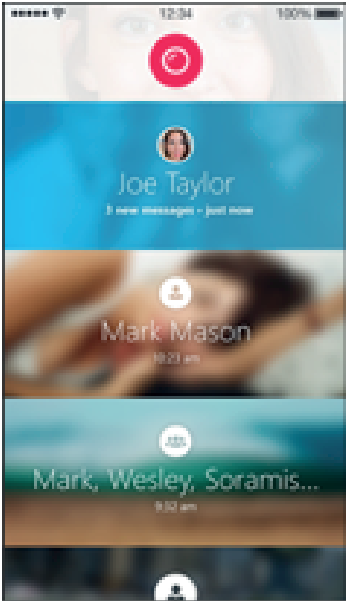
# PowerShake: Power Transfer Interactions for Mobile Devices

Paul Worgan, Jarrod Knibbe,  
Mike Fraser, Diego Martinez Plasencia

## ABSTRACT

Current devices have limited battery life, typically lasting less than one day. This can lead to situations where critical tasks, such as making an emergency phone call, are not possible. Other devices, supporting different functionality, may have sufficient battery life to enable this task. We present PowerShake; an exploration of power as a shareable commodity between mobile (and wearable) devices. PowerShake enables users to control the balance of power levels in their own devices (intra-personal transactions) and to trade power with others (inter-personal transactions) according to their ongoing usage requirements.

This paper demonstrates Wireless Power Transfer (WPT) between mobile devices. PowerShake is: simple to perform on-the-go; supports ongoing/continuous tasks (transferring at ~3.1W); fits in a small form factor; and is compliant with electromagnetic safety guidelines while providing charging efficiency similar to other standards (48.2% vs. 51.2% in Qi). Based on our proposed technical implementation, we run a series of workshops to derive candidate designs for PowerShake enabled devices and interactions, and to bring to light the social implications of power as a tradable asset.





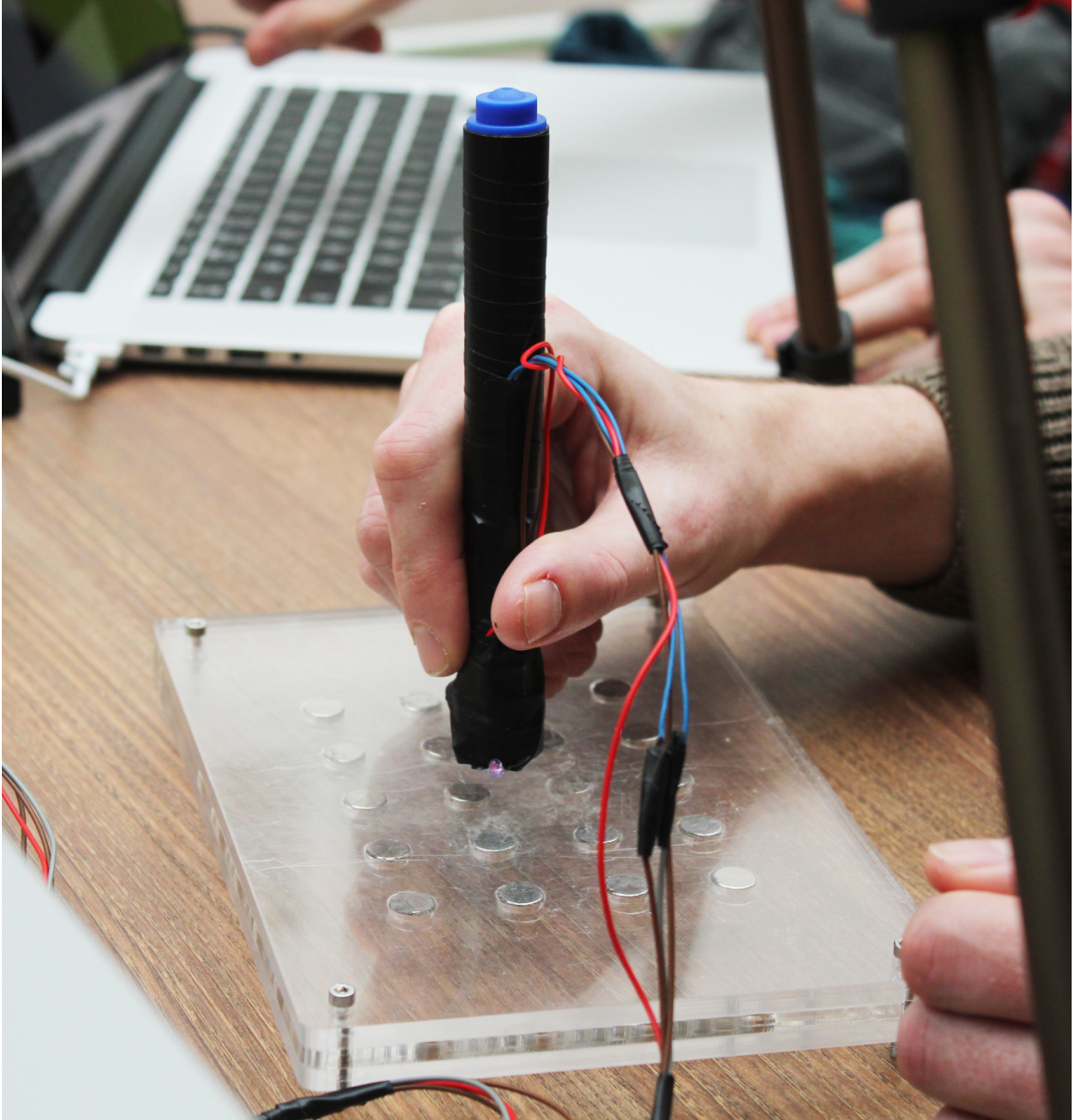
# The Tyranny of the Everyday in Mobile Video Messaging

Sean Rintel, Richard Harper, Kenton O'Hara

## ABSTRACT

This paper reports on how asynchronous mobile video messaging presents users with a challenge to doing 'being ordinary'. 53 participants from three countries were recruited to try Skype Qik at launch for two weeks. Some participants embraced Skype Qik as a gift economy, emphasizing a special relationship enacted through crafted self-presentation. However, gift exchange makes up only a small proportion of conversation. Many participants struggled with the self-presentation obligations of video when attempting more everyday conversation. Faced with the 'tyranny of the everyday', many participants reverted to other systems where content forms reflected more lightweight exchange. We argue that designing for fluid control of the obligations of turn exchange is key to mobile applications intended to support everyday messaging.





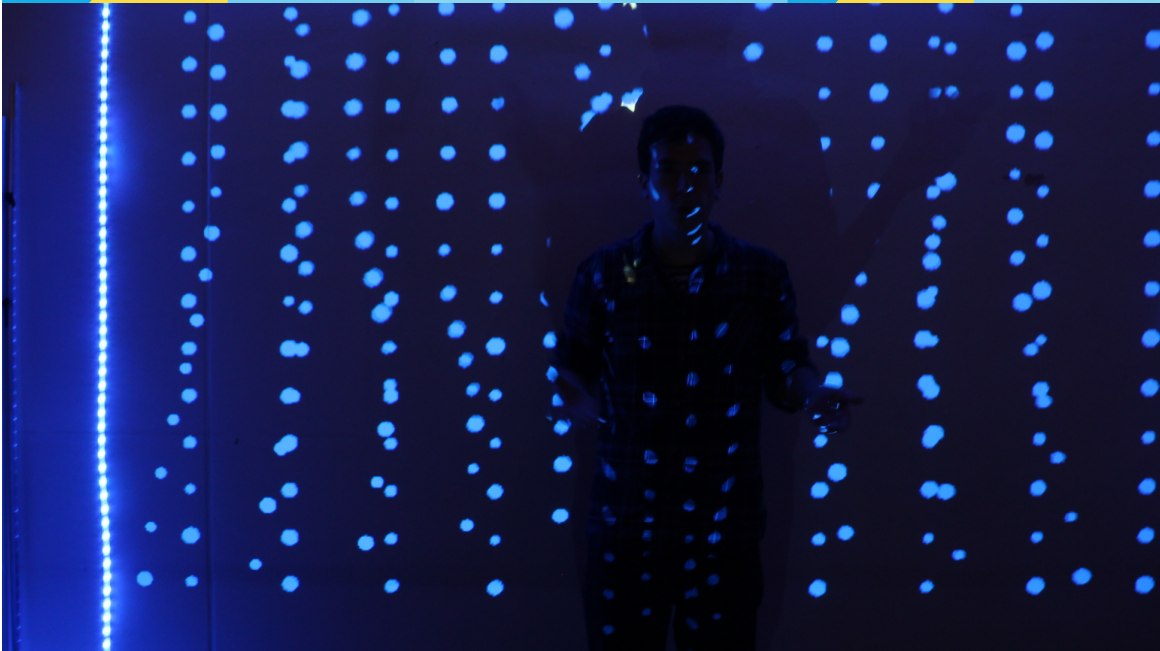


# Force Attraction Pen: A Haptic Pen with Variable Attraction Force

James Burnside, Zac Ioannidis, Ben Elgar,  
Luke Mitchell, Sam Healer, Paul Worgan,  
Alexander Hill, Anne Roudaut

## ABSTRACT

We present the Force Attraction Pen, a haptic stylus that encourages the users to move in a particular direction by providing variable attraction force feedback based on their actions. The tip of the stylus is augmented with an electromagnet that can repel or attract the stylus to a metallic surface. By altering the polarity and voltage, we change the amount and direction of the force produced. The tactile expressions of the stylus may enable a higher grain of control during tasks such as tracing an image, performing selection, and other high precision tasks. In this paper we present the design and implementation of such a system, along with a formative study as a preliminary investigation into the haptic feedback generated by our system.





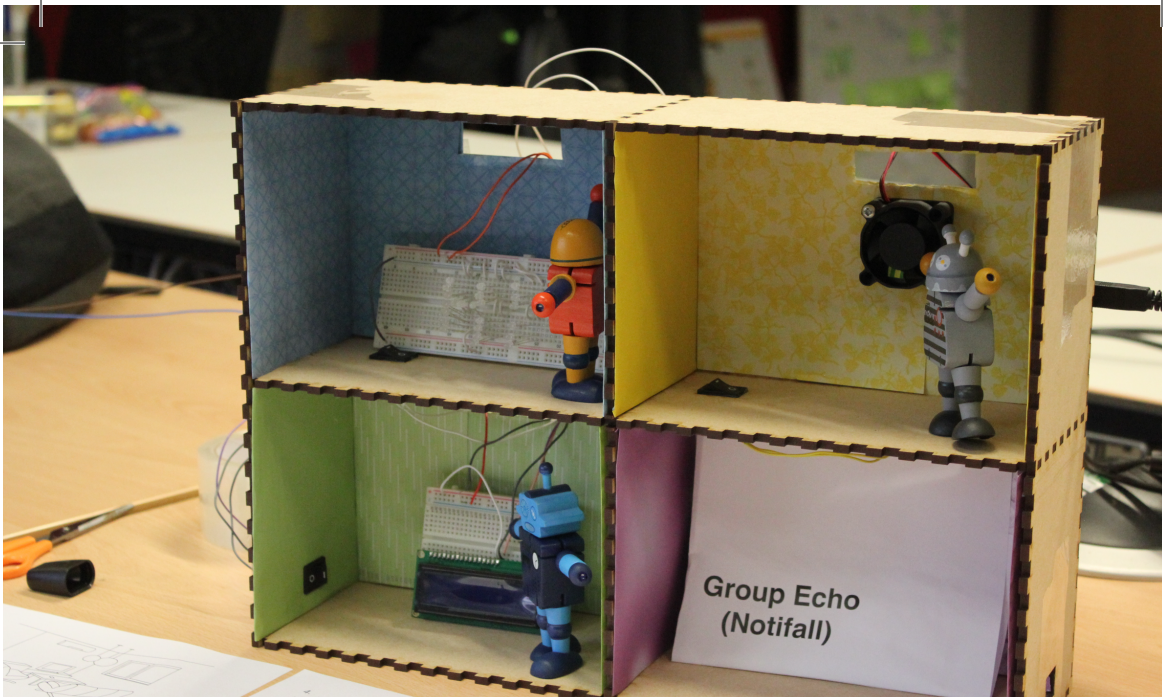
# IStage: An Interactive Stage System

Christos Chacholiades, Cesar Flores Cano,  
Yuying Wang, Eman Meldah,  
Themis Omirou, Anne Roudaut

## ABSTRACT

At present, performers need a technical team of experts to control lights, on-stage displays, and to actuate multiple devices simultaneously. All these activities have to be arranged in a complex choreography in order to allow the audience to experience the illusion of the interaction between these devices and the performer's movements. IStage is an interactive system that allows controlling the on-stage equipment through the use of body movements and gestures. The aim is to enhance the performance on-stage and at the same time to enrich the audience's overall engagement with the show. The project contributes by presenting a generic toolkit for artists; to enable interactive performances, as well as that it is cost-effective, easy-to-use, and easy-to-install. The initial prototype involves a Microsoft Kinect 2 used as the primary sensing device to track the body gestures, in combination with a sound impact sensor. IStage uses a set of output devices: a projector, led strips, a bubble machine and audio. Lastly, we also present the results of a formative study.





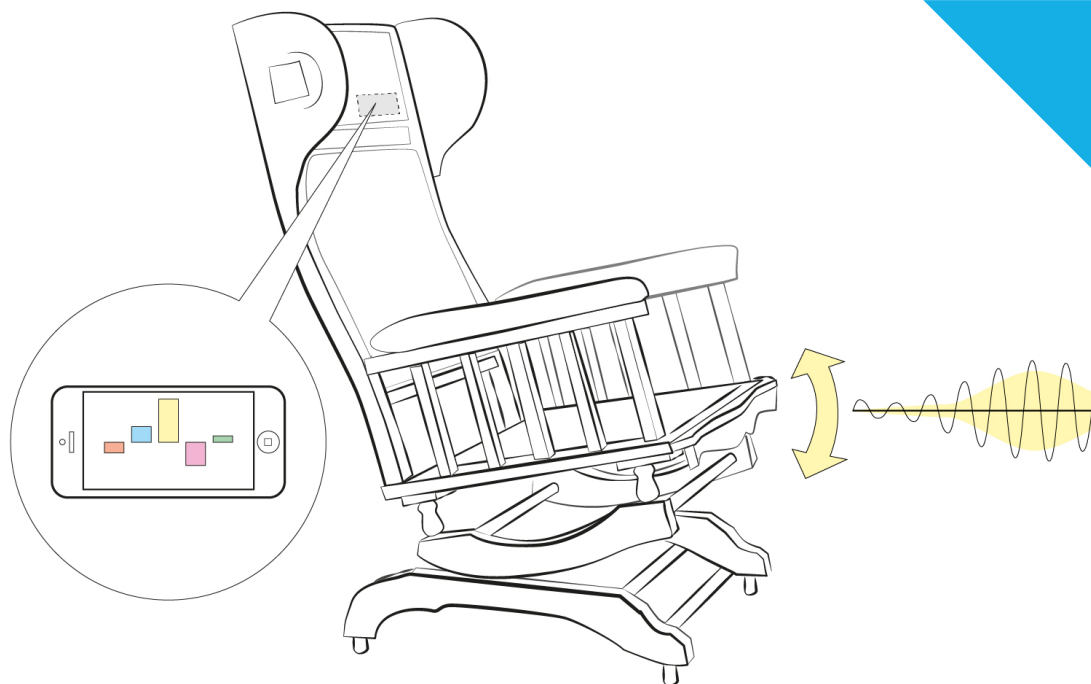
# NotiFall – Ambient Sonification System Using Water

Alex Harman, Hristo Dimitrov, Ruisha Ma,  
Sam Whitehouse, Yiu Li, Paul Worgan,  
Themis Omirou, Anne Roudaut

## ABSTRACT

This paper presents NotiFall, an experimental prototype of an ambient auditory notification system. NotiFall uses the sound of falling water to subtly notify users for non-urgent matters, such as weather alerts or emails in an unobtrusive manner. These sounds are controlled and altered in order to convey a wider range of auditory cues and information. Traditionally, ambient notification systems are application specific and are limited in the way they can transmit information. In comparison, NotiFall is easily programmable, suitable for a wide range of home and work environments, and makes use of both visual and audio cues in order to impart information.





# Rekindling Imagination in Dementia Care with the Resonant Interface Rocking Chair

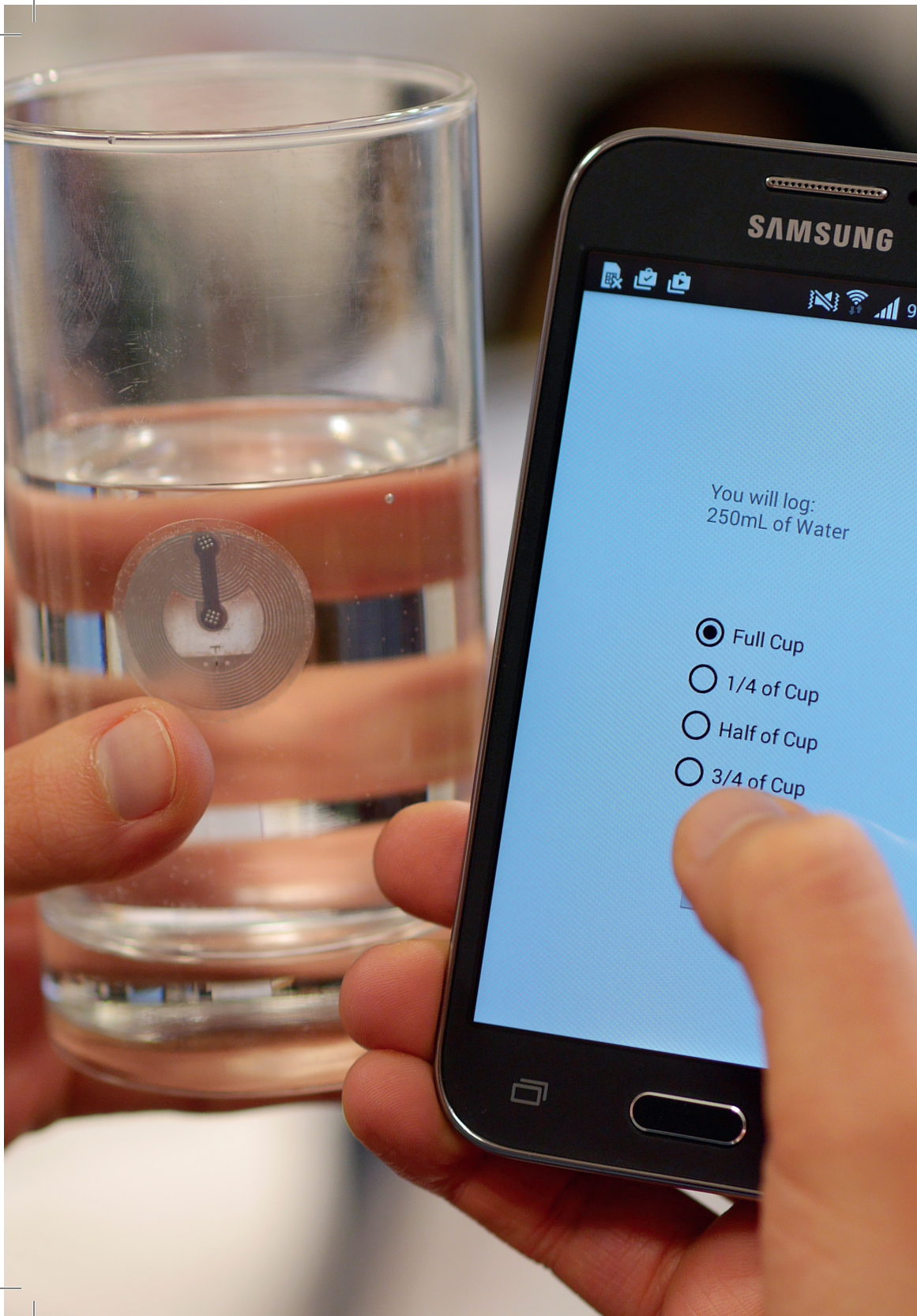
Peter Bennett, Kirsten Cater, Heidi Hinder

## ABSTRACT

In this paper we present the Resonant Interface Rocking Chair, interactive furniture designed for sparking the imagination of residents in dementia care. We show how the chair, sitting at the intersection of slow technology, reminiscence research and elder care, creates an environment that encourages storytelling, interaction and conversation between care home residents, family and staff. Our aim is to develop the resonant home, envisioning a future care environment that draws upon current research into resonant user interfaces to create an environment that is alive with subtle, playful and engaging interactions that support and stimulate memories and storytelling.







SAMSUNG

You will log:  
250mL of Water

- ☒ Full Cup
- ☐ 1/4 of Cup
- ☐ Half of Cup
- ☐ 3/4 of Cup

# **SPLASH: Smart-Phone Logging App for Sustaining Hydration Enabled by NFC**

Xu Luo, Przemyslaw Woznowski, Alison Burrows,  
Mo Haghighi, Ian Craddock

## **ABSTRACT**

Maintaining good hydration is crucial for adequate physical and mental performance for all human beings. In this paper we present SPLASH, an Android app that enables users to set daily goals and to keep track of their liquid intake through a combination of smart-phone NFC technology and NFC-tagged cups. We conducted several experiments to verify the robustness of the technology, which indicated that the selected NFC tags had acceptable robustness, operational distance and good penetration ability to meet the intended requirements for monitoring hydration. To further assess the feasibility of our concept, we evaluated SPLASH with ten users who gave feedback on its usability. We discuss the current prototype's advantages and limitations, as well as possible improvements and potential capabilities. At the end of this paper, we propose additional Poshealthcare application scenarios for our concept.





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The power to  
**EXPLORE**

100 100%

### Big issues with energy

Recycling one aluminium can saves enough energy to power a 100W light bulb for 24 hours.

Save energy and recycle all of your aluminium.

Recycling aluminium uses only around 5% of the energy required to produce it from raw materials. It can be recycled again and again.

People have been recycling aluminium for over 100 years.

### Big issues with energy

Recycling one aluminium can  
run a TV for three hours.



100 100%

FEEDBACK

# The use of digital technology to evaluate school pupils' grasp of energy sustainability

Christopher Weeks, Charles Delalonde,  
Chris Preist

## ABSTRACT

This paper discusses the implementation of a smartphone application designed to help develop school pupils' knowledge in relation to a number of energy sustainability questions. This was then used as a method for collecting both quantitative and qualitative data from teachers to help us better understand the school pupils' levels of knowledge, engagement and awareness of energy sustainability. The paper then takes a critical review of the application and shows that it succeeded in spreading the expert knowledge of EDF Energy's staff members, but failed to generate new habitual sustainable behaviours in the school pupils.



# Tangible Interfaces for Interactive Evolutionary Computation

Tom Mitchell, Peter Bennett, Seb Madgwick,  
Edward Davies, Phillip Tew

## ABSTRACT

Interactive evolutionary computation (IEC) is a powerful human-machine optimisation procedure for evolving solutions to complex design problems. In this paper we introduce the novel concept of Tangible Interactive Evolutionary Computation (TIEC), leveraging the benefits of tangible user interfaces to enhance the IEC process and experience to alleviate user fatigue. An example TIEC system is presented and used to evolve biomorph images, with a recreation of the canonical IEC application: The Blind Watchmaker program. An expanded version of the system is also used to design visual states for an atomic visualisation platform called danceroom Spectroscopy, that allows participants to explore quantum phenomena through movement and dance. Initial findings from an informal observational test are presented along with the results from a pilot study to evaluate the potential for TIEC.

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