
humanaquarium: Exploring Audience, Participation, and Interaction

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Abstract

humanaquarium is a movable performance space designed to explore the dialogical relationship between artist and audience. Two musicians perform inside the cube-shaped box, collaborating with participants to co-create an aesthetic audio-visual experience. The front wall of the *humanaquarium* is a touch-sensitive FTIR window. Max/MSP is used to translate the locations of touches on the window into control data, manipulating the tracking of software synthesizers and audio effects generated in Ableton Live, and influencing a Jitter visualization projected upon the rear wall of the cube.

Keywords

Participatory performance, experience-centered design, practice-based research, interdisciplinary design, busking, FTIR

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces (D.2.2, H.1.2, I.3.6); J.5 [Arts and Humanities]: Performing arts (e.g., dance, music)

General Terms

Design

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The *humanaquarium* Project

humanaquarium was devised in order to explicitly explore the dialogical relationship between artist and audience [16]. Created by a team of performers, artists, interaction designers and computing scientists, *humanaquarium* draws upon the theatrical traditions of street performance and busking, situating the *humanaquarium* artefact in unprepossessing settings such as streetfronts or pathways where it can be encountered by passersby in a non-theatrical context.

humanaquarium's custom-built hardware interface [19] consists of a 1.5m cube which sits directly on the ground. The front face of the cube is made of transparent acrylic, revealing two performers inside (authors Taylor – a classical soprano, and Schofield – an electronic musician and guitarist) who encourage passersby to approach the cube structure and to place their hands upon the transparent front. Touches on the surface control electronic effects that modify the acoustics of the live performance content and the visual

content projected inside the performance space, changing the sonic and visual properties of the performance.

The touch-sensitive *humanaquarium* interface allows members of the public to enter the performance frame [2] and take an active role in the co-creation of a live audio-visual performance. Thus, the system's interactivity allows audience members to transition from passive spectators to active participants [13,14] and enables them to enter into a dialogue with the live performers who improvisationally adapt their musical performance in response to participant contributions. Interaction and dialogue between performers and participants is made direct via the transparent front screen of the box, which functions both as the tangible membrane of interaction and as a focal point to encourage participant/performer eye contact and communication. Necessitating a physical connection between participants' hands and the *humanaquarium* artefact in order to co-create the musical content is in keeping with our desire to make legible the precept that performance is not a unidirectional practice whereby producer targets consumer, but rather a receptive, reactive ecology whereby artists and audience take turns proposing and responding to one another's contributions. The nuances of *humanaquarium* performances are stimulated directly by this dialogue, as each performance is uniquely shaped and controlled by the actions of the participants who choose to interact.

Technical Description

As *humanaquarium* is intended to be encountered in non-theatrical public spaces, the cube structure is manufactured with lightweight aluminium and plywood,

so that it may be easily dismantled for transport and reassemblage 'in the wild'.

The *humanaquarium* is big enough for two musicians to sit comfortably inside with their laptops, microphones, and acoustic instruments. The front of the cube is faced with a transparent acrylic screen. The top and bottom edges of the screen are outfitted with an array of infrared LEDs, which fill the thickness of the perspex with invisible IR light. The frustrated total internal reflection effect [9] occurs when participants touch the glass surface, reflecting the contained IR light backwards towards a camera that is mounted upon the rear wall of the cube. This allows touches on the FTIR screen to be recognized and sent to an image tracking package, Creative Core Vision, for processing and analysis.

Max/MSP is used to translate the locations of touches into control data which manipulate the tracking of software synthesizers and audio effects generated in Ableton Live. When composing content for the *humanaquarium* [18], compositions are crafted as skeletal audio frameworks within which participant contributions reside. Participants manipulate the parameters of the sonic output in order to adjust the timbre of the soundscape, and determine the way composed tracks and live elements (voice, guitar and keyboard input) are layered upon one another and affected by audio filters and controls. The live interactions between participants and performers therefore determine how the composition is negotiated and enacted in real-time, making each repetition of the performance unique. The aesthetic content is designed while being mindful of the inherent unpredictability of audience participation, resulting in a composition

framework which allows participants' actions to form part of a coherent audio-visual production.



Touch data is also used to interact with a Jitter visualization projected upon the rear wall of the cube. Video is mixed on-the-fly, layering elements of abstract and figurative imagery (including drifting jellyfish, surreal architectural landscapes, and grainy 1920's silent film footage) in response to participant touches. Floating images follow the touches of the users' fingers, helping them recognize that their touches are being registered by the system. Additionally, the singer inside the box can manipulate the visualizations, chromakeying image elements together using a mapping between the singer's voice and the video layer selections. The illuminated visualizations emanate from the box's darkened insides, flickering and shimmering through the acrylic screen, attracting the attention of passersby. Participant touches also affect the color and intensity of a responsive DMX-controlled lighting system used to illuminate the surroundings in which the *humanaquarium* installation is situated.

Performance and HCI Design Research

There is a growing interest in the CHI community in issues such as whole-body interaction [5], digital performance [13,14], public displays and installations [3, 10], and the new conceptions of the human in human-computer interaction which focus not only how to design for experience but also how to design for the multiple roles of the user: as consumer, co-producer, author and performer [12].

As a design- and performance- led enquiry, *humanaquarium* relates to these issues through the way it creates a platform in which users can explore, in incremental ways, transitions between the roles of those involved as audience, participant, interactant and collaborator.

Using the medium of interactive performance to observe public behaviour, *humanaquarium* is a ludic [6], playful artefact whose aesthetic content entices people to explore its ambiguous, uncanny interface within the legitimate sociocultural context under investigation – the public sphere. Situating the *humanaquarium* in public spaces in order to observe and obtain insight from participant behaviour allows us to use the *humanaquarium* artefact as a sort of ‘cultural probe’ [7], investigating how people interact with playful technologies encountered in social spaces.

Previous research has recognized the potential for leveraging interdisciplinary expertise to augment HCI investigations. Inviting external ‘cultural commentators’ [8] to lend their practice-honed skills (such as documentary filmmaking or screenwriting) to the evaluation process of interface design allows for a multiplicity of perspective to be represented in the

design process. In the *humanaquarium* project, the core design team (performers Taylor and Schofield and colleague Shearer who participates in on-site performances) encompass an interdisciplinarity both of background (Taylor and Schofield are experienced professional musicians while Shearer specializes in interaction design and research) and in practice – they experience *humanaquarium* both literally embodied [4] as participants during the enactment of performances in which they all take part, and as HCI researchers during subsequent evaluation and revision of the system design.



humanaquarium was intended from the outset to be a continuously evolving performance system. *humanaquarium* is deliberately designed to be highly reconfigurable, so that the team can easily adjust the interaction strategies and aesthetic content to address issues of participant satisfaction which surface during

performance iterations. This adaptability allows *humanaquarium* to have an extremely rapid design and redeployment cycle, where ideas can be developed and prototyped on the fly.

The intimate nature of interactive performance demonstrated in *humanaquarium* functions as an extremely direct form of what Wright *et al.* term 'dialogical design' [20] whereby the designer and user meet face to face, separated only by the interface. This approach collapses the traditional turn-based structure of design into a space where user and designer can simultaneously propose and respond to design decisions.



Performance History and Context

While we have been mindful in the design of *humanaquarium* to facilitate the use of the performance as a probe to investigate public behaviour and HCI design, *humanaquarium* is fundamentally an art piece intended to be exhibited and appreciated as a standalone aesthetic work. We have toured internationally with the *humanaquarium* performance, presenting it over forty times in the UK, France, Canada, and Germany. *humanaquarium* has received coverage from prestigious media publications, including Wired UK, who described it as a "compelling, if slightly sinister-sounding piece of psychedelic ambience" [11], the BBC who promoted it as part of their 2010 Free Thinking Festival [1], and Steampunk Magazine, who called *humanaquarium* "an interactive musical performance that was beautiful, breathtaking and utterly haunting" [15].

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References

- [1] BBC Radio 3. Free Thinking Festival 2010. <https://www.bbc.co.uk/radio3/freethinking/>
- [2] Benford, S., Crabtree, A., Reeves, S., Sheridan, J., Dix, A., Flintham, M. and Drozd, A. The Frame of the Game: Blurring the Boundary between Fiction and Reality in Mobile Experiences. In Proceedings of the SIGCHI conference on Human Factors in computing systems, pages 427–436. ACM New York, NY, USA, 2006.

- [3] Crabtree, A and Rodden, T. Understanding interaction in hybrid ubiquitous environments. In Proceedings of 8th International conference on mobile and ubiquitous multimedia. ACM pp. 846-9, 2009.
- [4] Dourish, P. Where the Action Is: The Foundations of Embodied Interaction. MIT Pr, 2001.
- [5] England, D., Sheridan, J., and Crane, B. Whole-Body Interaction 2010 Proceedings of the 28th Conference on Human Factors in Computing Systems CHI 2010. ACM pp.4465-4468, 2010.
- [6] Gaver, W. The video window: my life with a ludic system. *Personal and Ubiquitous Computing*, 10(2):60-65, 2006.
- [7] Gaver, W., Boucher, A., Pennington, S. and Walker, B. Cultural probes and the value of uncertainty. *interactions*, 11(5):53-56, 2004.
- [8] Gaver, W. Cultural commentators: Non-native interpretations as resources for polyphonic assessment, *International Journal of Human-Computer Studies*, v.65 n.4, p.292-305, April, 2007.
- [9] Han, J.Y. Low-cost multi-touch sensing through frustrated total internal reflection. In Proc. of UIST'05. pp. 115-118.
- [10] Hosio, S., Jurmu, M., Kukka, H., Reikki, J., Ojala, T. Supporting distributed private and public user interfaces in urban environments. IN Proceedings of the eleventh workshop in mobile computing systems and applications. ACM pp25-30, 2010.
- [11] Lanxon, N. *Humanaquarium*: Two musicians, one large box. *Wired.co.uk*. March 16, 2010. <http://www.wired.co.uk/news/archive/2010-03/16/humanaquarium-two-musicians,-one-large-box>
- [12] McCarthy, J. and Wright, P. *Technology as experience*. The MIT Press, 2004.
- [13] Sheridan, J., Dix, A., Lock, S. and Bayliss, A. Understanding Interaction in Ubiquitous Guerrilla Performances in Playful Arenas. In Proceedings of HCI, pages 3-18. Springer, 2004.
- [14] Sheridan, J.G., Bryan-Kinns, N. and Bayliss, A. Encouraging witting participation and performance in digital live art, Proc. of the 21st British CHI Group Annual Conference on HCI. United Kingdom, 2007.
- [15] Steampunk Magazine. <http://www.steampunkmagazine.com>
- [16] Taylor, R., Boulanger, P., Olivier, P. Creating dream.Medusa to Encourage Dialogue in Performance. *Smart Graphics 2009*: 275-278.
- [17] Taylor, R., Boulanger, P., Olivier, P. Exploring participatory performance to inform the design of collaborative public interfaces. *CHI Extended Abstracts 2009*: 3721-372
- [18] Taylor, R., Schofield, G., Shearer, J., Boulanger, P., Wallace, J., Olivier, P. Phantasmagoria: Composing Interactive Content for the *humanaquarium*. Robyn Taylor, Guy Schofield, John Shearer, Pierre Boulanger, Jayne Wallace, Patrick Olivier. In Proceedings of the 10th International Symposium on Smart Graphics (SG 2010), Banff, Canada, pp. 269-272.
- [19] Taylor, R., Schofield, G., Shearer, J., Boulanger, P., Wallace, J., Olivier, P. *humanaquarium*: A Participatory Performance System. In Proceedings of the 2010 Conference on New Interfaces for Musical Expression, Sydney, Australia, pp. 440-443, 2010.
- [20] Wright, P. and McCarthy, J. *Experience-Centered Design: Designers, Users, and Communities in Dialogue*. Morgan Claypool, 2010.