Check Self Out: Subverting Supermarket Surveillance Through Critical Games Practice

Lucian Rodriguez Lovell
RMIT University
Melbourne, Australia
lucian.rodriguez.lovell@rmit.edu.au

Abstract

Check Self Out is a subversive art-game installation that critiques the growing presence of surveillance technologies in Australian supermarkets. By transforming the self-checkout into a playful and provocative interface, the project invites players to engage with the systems that categorise, track, and discipline consumers. Using facial recognition and speculative design, the game highlights the tensions between convenience, control, and datafication, creating space for audiences to reflect on their roles within these surveillant environments. This paper explores the philosophical grounding, design process, and audience responses to the work, reflecting on the success of its design and considering future directions.

Keywords

Supermarket surveillance, critical play, facial recognition, automation, subversive games, expository society, sensors, computer vision, speculative design

Figure 1. Checking you out: assembled screenshots from the Check Self Out installation at ACMI WIP Night. Link to video documentation of the work.

Introduction

This paper explores the philosophical intention, design considerations and process, behind the ongoing subversive art-game *Check Self Out.*

Check Self Out is an art-game installation that you play with your face, interrogating intense supermarket self-checkout surveillance in Australia. The game responds to your face, categorises, recommends products, rewards loyalty, provides advice, and reports theft. Checking you out while you check yourself out.

The artist-researcher reflects on observations from publicly playtesting the game at the 2024 Practice Research Symposium in Melbourne, and ACMI Screen Industry Work-In-Progress Night (early 2025), collegial feedback from the RMIT Centre of Digital Ecosystems, and in -studio testing.

The project primarily employs Bernard Harcourt's *Expository Society* theory, reflecting on our societies desire to be seen through the datafication of surveillance technologies. [1] The project folds this tension into its design; exploring how the face is trained into a readable structure and speculating on future-architectures of the supermarket. The project aims to heighten audiences' critical awareness for supermarket sensors by creating a repercussion-free play space for interacting with-and-through surveillance systems. By playing *Check Self* Out, audiences develop an aesthetic appreciation of the underlying logics of checkout facial recognition, afforded by the exaggeration of real-world technologies and frictional interactions.

Background

Check self out is a subversive art-game, interrogating potential futures in the Sensor Society, through contemporary surveillance technologies

found in the Australian supermarket. The *Sensor Society*, describes the automated and tangible turn of computing, drawing attention to the vast infrastructures of sensors existing in urban technologically-enabled environments, and the interactions that occur within them. [2] *Sensor* is a broad classification for any computational interface with the ability to capture data about users, e.g. a smartphone, camera, or Wi-Fi network. Sensors are increasingly *virtually transparent*, their tangible interfaces and underlying computations obfuscated. We see the world through sensors without seeing them, and they create distorted reflections of ourselves and the world. [1] In the sensor society, human-sense is displaced by quantifiable data-sense and algorithmic insights. [3]

Exhibiting the self in the Supermarket: The introduction of front-facing self-check-out cameras in Australian supermarkets was initially met with public backlash, but this facet of supermarket surveillance has quickly become normalised, with attention instead focused on physically obtrusive measures i.e. smart-gates. [5] [6] The *selfie* camera has fallen into the background, taken-for-granted in the technological landscape, and new interactive cultures have emerged around it. As posited by Mcluhan, shoppers might recognise the extension of themselves through the media of the checkout, using the security-camera as a mirror or a selfie surface, and folding in the associated interface, products, and loyalty rewards into the self. [7] The resulting images of a body embedded in the checkout interface are posted online with exhibitionist desire, producing entrepreneurial evidence of the interaction. [1] [8] Reflecting on this, the project critically positions the *self-checkout* as an opportunity to *check* the *self out*.

Speculative Supermarket Futures: The Australian supermarket presents a mirage of a farmers' market. Translating images of rural Australian, shoppers when entering the supermarket are greeted with fresh fruit and vegetables, flowers, images of farmers and the land, they are promised a safe environment full of modern conveniences. [9] Operationally however, the contemporary supermarket is less like a market, and more like Amazon. Stock-fulfilment relies on extremely advanced automated supply-chains, that are constantly optimising towards larger-scale producers. Customers are going to the store less, instead turning to online orders that are picked and delivered from supermarket warehouses to their door. Workers in these 'dark supermarkets' are automatically monitored and disciplined based on their speed, breaks, and order fulfillment rate. [4] [10] Customer shopping habits are monitored, scrutinised, and predicted. Coles and Woolies create illusory 'price locks', fake home brand competition, and after price-increase sales, whilst in-reality gouging customers. [11] These tensions are bubbling under the surface of the supermarket checkout, a liminal artefact that is haunted by the demands of the market, while embodying the highly advanced data production and smarts of ecommerce. *Check Self Out* draws on these tensions, reflecting the capabilities of current technologies, speculating on future tactics, and rendering a hauntology of the hypermarket. [12]

Supermarket chains in Australia have become environments of heightened private surveillance with sensors fixating on the face and body of consumers and staff alike. Shoppers are scrutinised, buying habits tracked, every customer considered a potential thief to be funnelled through a series of automated checkpoints and gates. [4] [13]

Approach: *Check Self Out* draws on a tradition of critical art and design practice that engages emergent technologies and media to better understand and subvert them, echoing Nam June Paik's attitude of using "…technology in order to hate it properly". [14] [15] The project is informed by critical simulation and engineering methods, best embodied by schools such as Goldsmiths. [16] [17] Engaging with queer game-design philosophies such as *glitching* and *messiness* in the creative approach, allowing for unexpected forms of playing against, incompleteness, and for failure. [18] [19] [20] The design strategy is situated in a

digital game design practice, where audiences are given agency within a dynamic simulation. Game mechanics and worlds present the opportunity to feel the dynamics of a complex techno-political system, producing critical distance from what exists to provoke play with future imaginaries. [21] [22]

Community of Practice *Check Self Out* was inspired by a tradition of media artists and critical designers who engage with emergent technologies to trouble or work against them. Nam June Paiks' *TV Buddha (1974)* and Dan Grahams' *Time Delay Room (1974)* come to bear as installations that position the audience as a surveilled body within the artwork. [23] [24] Graham's work reveals underlying mechanics of the surveillance technology, by positioning audiences in an environment where meaning is produced by experimenting with the spatial and temporal qualities of the interactive systems. They aesthetically appreciate the time-delay in the system by tracking their own image as they move quickly from sensor to opposing monitor. Paiks' work reflects elements of an expository media culture. The audience appears within the work while examining the buddha, who is in turn examining themselves. The interactive component of *Check Self Out* positions the face as a surveilled object for tracking, whilst a secondary spectator display and wall-mounted camera surveilles the body, forming a dimension of sensing that attempts to produce uncomfortable affect through this separation and doubling of the self-image.

Rafael Lozano Hemmer continues this tradition with more contemporary surveillance methods in *Recognition (2018)* which I experienced at the Sydney Powerhouse *Atmospheric Memory* Exhibition in 2023. [25] [26] The audience is subtly photographed as they move through the broader exhibition. Upon reaching *Recognition,* an immersive projected simulation is activated, assembling images of the faces currently in the room to create a vast tapestry of identifiable data, using wifi-enabled cameras to zoom, match and track individuals as they traverse the space. Similarly *Check Self Out* employs facial recognition and uses the surveilled face as an aesthetic object and interactive surface throughout the work.

Speculative Architect Liam Young takes a different approach, in *Where the City Can't See LIDAR Camouflage Costumes (2019)* Young explores potentials to work against LIDAR Scanners by world-building a future atopia in which citizens are monitored by autonomous vehicles. [27] *Check Self Out* asks audiences to consider how to work against facial recognition at the check-out, not by engaging with an expansive speculated world but rather imagining interacting with an artefact spliced from a potential future.

Formally, *Check Self Out* draws on critical game designer Pippin Barrs' *It Is as If You Were Doing Work* (2017), presenting a desktop and pop-up metaphor that simulates a corporate computing user interface, positioning the player in a playful mode of labour whilst continuously disciplining their performance. [28]

The project recognises the subversive interaction design of facial-recognition artworks Paolo Cirio's *Lovely Faces* (2011); and Wouters et al. *Biometric Mirror* (2021), both which open a playful space between sensors, objective data, and the automatic meaning-making we apply to it. [29] [30]

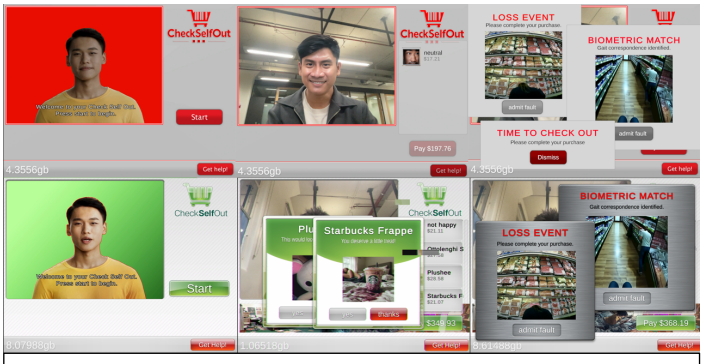

Figure 2. Check Self Out, comparing UI iterations (PRS top, ACMI bottom): idle page, scanning facial expressions and recommending items, theft event (left to right). Artist's face redacted with Photoshop generative fill.

Work Description and Process

Check Self Out is an installation made up of a 14" touchscreen, webcam, pc, speakers, and thermal printer, which run a 2D game developed in the *Unity Game Engine*. A secondary large 55" screen supports the central interface, mirroring the self-checkout interface, and streaming extra camera angles of the player and audience over the network. The user is immediately greeted by an idle welcome video featuring a handsome Asian man (Figure 1: left). This video is an AI generated portrait of the artist, who is of South-East Asian diaspora, produced by combining selfies with incorrect Korean racial markers in Stable Diffusion, with the resulting image fed to HeyGenAI to produce a video. By producing an image this way, I seek to expose my own face to the work and additionally attempt to produce an *odourless* (sic) Asian image. A term I invoke to reflect the softness, gentleness, and palatability of a Korean-racial image in Asian Australian culture, responding to my own struggles with identity-forming as Asian diaspora in Australia. [31]

The player taps start to play and is presented with their own image via a mounted webcam, embedded within a familiar check-out interface. As the player inspects their image, their facial expression is recognised, a scanner beep sounds, and a still image of their face populates the right-side product panel (Figure 2: middle). Each time the player holds a new facial expression for a few seconds, a new face is recorded, with an associated price. Facial expression recognition relies on the OpenCV *Face Detection Yunet* and *Progressive Teacher* libraries. [32] Facial expressions are matched against three libraries of labels, moving from the original training (e.g. neutral, fear, happy) to more subversive ones (e.g. stingy, suspicious). While the player continues to interact, products are recommended, triggering annoying popups that freeze the camera feed. The system responds to certain expressions with voice announcements, which might chastise or affirm the player e.g. 'please change your face in a timely manner' or perform Twitter/Twitch *copypastas*. [33]

Voice announcements employ two OpenAI *voice* models, both female-gendered, that present an out-of-place Californian valley-accent. Dialogue strings fed to the model are intentionally misspelled and poorly punctuated to encourage uncanny artefacts in the generated audio. HeyGenAI video generator is employed to produce the idle video of the welcoming character, and RunwayML was used to produce fake surveillance camera footage accusing the player of theft (Figure 2: right). The player is prompted to check-out if they spend too long playing, after pressing *Pay* a receipt is generated from their interaction (using the SyncFusionPDF library) and printed on thermal receipt roll for them to keep.

Design Considerations – Interaction and UI

Visual Design The visual aesthetic of *Check Self Out* draws on nostalgia for Windows Vista's Frutiger Aero design language, characterised by its use of skeuomorphism, glossy textures, and vibrant utopianism. [34] However, the rendering of Frutiger here is devoid of the typical blue ethereal tones and optimism, rather it's dressed in *Coles* Red and *Woolworths* Green. Instead of imagining a bright future, the presentation is haunted by corporate-imagery, disciplinary metal textures, the failed promises of futures that have past. [35] [36] The promised gloss and smoothness of Frutiger is destabilised by unwanted popups reminiscent of early net-art. [37] Rigid technical warnings interrupt, exaggerated by accompanying screen shakes, a game-design tactic for increasing the aesthetic sensation of impact. [38] [39] The slick design sensibilities of early 2000s corporate branding sits as oil on the surface, obscuring the realities of automation, extreme surveillance, and control that lie beneath the contemporary check out.

Intensity-Based Interaction Driving the player interactions is an intensity-based gameplay system. The player's *loyalty level* increases at a rate determined by the sum of new facial expressions recognised, the number of products recommended, and the time spent playing. As loyalty increases, so does the interface's

intensity. Intensity runs on an exponentially increasing curve and drives a series of interactive variables e.g. sensing and product recommendation cooldowns, the degree of screen shake, and glitches. At early levels of intensity, the interconnected game-systems i.e. product recommendations and meditations fire one at a time, leaving room for the player to come to understand each interactive relationship independently e.g. 'if I hold this expression for a certain number of seconds it will be checked out'. As intensity increases, the guard-rails are removed, allowing game-systems to unexpectedly layer, producing a maximalist and messy interactive texture. [40] Each player experiences a familiar trajectory of increasing intensity, but at different rates, and with chaotically different outcomes. One PRS audience member anecdotally remarked that the design didn't feel dissimilar to interacting with a real self-check-out "*the rules are unclear, and they keep changing, it's like you're being quizzed and tested, I find it quite rude and offensive".*

Virtual Transparency - Checking out the Face

My intention with *Check Self Out* is to position the face as a readable structure or game interface. While the user initially recognises themselves in the game, the constant datafication of their expression, and the presentation of disruptive and incorrect labelling opens a space for them to consider the meaning their face produces as related-but-separate to the facial object.

Playing through the face Anecdotally, during public playtesting, different levels of player agency emerged depending on each players' readiness to perform new expressions. Some players, perhaps not as accustomed to taking selfies, waited for something to happen as their *neutral* expression was read, while other players, recognising the rules and context, immediately started pulling different expressions. If a player spent too long in a static expression, they would be chastised *'please change your face in a timely manner'* or, if the system had trouble reading them, *'please come closer'*. Anything obscuring the face, such as glasses or a beard also impacted the system's ability to recognise new expressions. In this fashion, the open and dynamic face becomes the game controller, benefiting some players over others. Rather than the system adapting to the face, the face contorts to the system, becoming *'a mask that needs to be readable'*. [41]

Readability In an automated system, the image of the face itself becomes *meaningless noise*, what is tangible is the data of the face, or the position of facial *landmarks*. This extends to the qualifiable affect the face represents and the history of associated purchases and products that can be targeted at that readable profile. [42] Playing with facial recognition as an obtuse interaction teaches the player a potential defacement strategy: rather than representing a natural expression when interacting with a check-out, a trained player could subvert the reading by *wearing* a false expression or obscuring readable landmarks. Artist Zach Blas takes a similar approach in their project "Facial Weaponization Suite". Blas produces a series of speculative masks that work against facial recognition systems by presenting a machine detectable but unrecognisable and confusing face. [43]

Products in *Check Self Out* represent a second-order sensing of facial data, the player is seen through homeware, cosmetics, supplements, and prescribed mindfulness practices. These recommendations play with insecurities a player might have about their appearance e.g. concealing skin imperfections, bad breath, uncool interior decoration. Programmatically, the recommendations are a *Mechanical Turk* or *Wizard of Oz*, they hold no real relation to the sensed data and are completely random, yet maintain the illusion of machine intelligence, provoking the player to contemplate the logic behind the recommendations. Players might imagine their underlying *Why am I seeing this Ad* (WAIST) data, questioning, what does my face tell others about me? [44]

Labelling of the face begins in the familiar. If the player smiles, they are labelled as *happy*, and a new product is checked out with the

corresponding label. This reflects current facial expression recognition, however, as the intensity level increases through play, these expressions are swapped for more subversive labels. The library of labels corresponds with nuanced shopper dispositions: *stingy; suspicious; naïve; suggestible*.

Later, the user is profiled based on the expressions they have held for the longest time, imagined as potential customer segments i.e. *Meat Master, Bed Rotter, Green Queen, Value Champion.* Each profile comes with specific products and banner advertisements that play into the desires and aesthetics of each segment. This design decision is informed by the approach ecommerce platforms take when targeting shoppers based on their metadata and site behaviours.

Figure 3. Check Self Out receipts: printed thermal receipts, colour pdf generated through play (left to right).

The Receipt's Roll With more shoppers having a loyalty card and digital profile that records all transactions, the physical receipt is becoming less essential. Supermarkets already maximise this physical real-estate, printing advertisements and coupons on the receipt to draw customers to return. *Check Self Out* provides players with a receipt of their interactive sessions (Figure 3), generated live through play. When the player checks out, the receipt is printed on a thermal roll, including an itemised list of all facial expressions recorded by the game and any recommended products, disrupted by speculative biometric and health data the system might have recorded. This feature in its current state is a mechanical turk, but there is room to expand the sensing capabilities of the system to render more of the players data, such as blink count, and time spent in different expressions. All receipts are also stored in a local database by the artist, and these could be repurposed in the future for further subversions, e.g. loading the 'wrong' players shopping profile.

Reflection and Future

Check Self Out has been play-tested privately in-studio, and publicly at the *Practice Research Symposium Australia 2024,* and *ACMI Screen Industry Work-In-Progress Night February 2025*. Screen recordings were taken of each play session, and audiences' responses to the concept and quality of the interaction design was surveyed. In this section I pen reflections and anecdotes from observing players, which I have arrived at from an intrinsic designerly way of reflecting-and-knowing in-action, rather than a rigorous analysis of research data, which is something to be revisited in the future. [45]

Second-order Interaction: At PRS Australia, audiences watching another player playing became an important element of the work. Something I did not originally consider in the projects' design. While one player plays, others watching from the side can enjoy examining how the system reads the player, echoing Bernard Harcourt's critique of spectacle in social media, we like to use technology to not only see reflections of ourselves but others too. [1] There is a certain social pressure that this relationship inflicts on the player, some players quickly skip through the experience afraid of 'playing incorrectly' in front of a crowd. Though initially unintended, this echoes the experience of using a real self-checkout while other shoppers and staff wait for you to finish.

At ACMI, this element was played into, I developed a secondary large-screen display that would mirror the player, but also feed in another camera angle that captured the profile of the player and part of the crowd. Audiences could always see themselves in the work, whilst mechanically seeing other people.

Supermarket Attendant: At ACMI I implemented a low-chance pop-up that would trigger an error, calling for an attendant to rectify the

issue. I performed as part of the work, dressed as a supermarket attendant, intervening in the players' experience to 'fix' the problem, which involved reviewing the players face and choosing whether to keep or dispose of the 'bad data'.

Future iterations of the project could build on its current ideas in several ways: **Adding multiple live camera perspectives** could offer players a more disorienting sense of being seen. Helping to emphasise the presence of the other data-body or data-doppelganger in the experience. [1] [46]

Encouraging Group Play While the game was initially designed for solo engagement, group play turned out to be a surprisingly rich experience. When groups play together faces are randomly picked and scanned, and they create a group profile. Building surprising mechanics that better embrace this form of interaction could be useful. **Public Installation** Placing the installation in a public space, such as a suburban square or an everyday shopping environment would be useful to challenge a broader range of people, rather than a safer gallery context, where audiences might already be surveillance critical.

Conclusion

Check Self Out playfully reframes the everyday technologies that shape our interactions in the highly surveillant Australian supermarket environment. By leveraging familiar interfaces and repurposing them into a provocative experience, the project invites audiences to reconsider their roles as surveilled bodies, and to question the present logics and potential futures bubbling under the surface of the contemporary checkout. Through humour, discomfort, nostalgic interface design, and speculative storytelling, the work explores the tensions between convenience, control, and resistance in the sensor society.

Looking towards the future, I seek to deepen the art-game's engagement with these themes by refining its mechanics, extending its audience reach, and continuing to provoke critical conversations.

Facing the increasing obfuscation of sensors and their deepening integration in familiar urban spaces, *Check Self Out* compels us to confront the architectures of power embedded within the mundane. Provoking audiences to reimagine their disruptive potentials.

References

[1] Harcourt, Bernard E. *Exposed: Desire and Disobedience in the Digital Age*. Harvard University Press, 2015.

[2] Andrejevic, Mark, and Mark Burdon. "Defining the Sensor Society." *Television and New Media* 16, no. 1 (2015): 19–36. https://doi.org/10.1177/1527476414541552.

[3] Hong, Sun-ha. "Data-Sense and Non-Sense." In *Technologies of Speculation: The Limits of Knowledge in a Data-Driven Society*, 156–80. New York: NYU Press, 2020.

[4] Kelly, Lauren Kate. "The Secret Sauce of Coles' and Woolworths' Profits: High-Tech Surveillance and Control." The Conversation, February 22, 2024. http://theconversation.com/the-secret-sauce-of-coles-and-woolworths-profits-high-tech-surveillance-and-control-224076.

[5] Barrett, Jonathan, and Josh Taylor. "A Rise in Shoplifting Has Australian Supermarkets Ramping up Surveillance." *The Guardian*, September 10, 2023, sec. Australia news. https://www.theguardian.com/australia-news/2023/sep/10/coles-woolworths-theft-measures-security-self-checkout-camera-trackers.

[6] Biggs, Tim. "The Self-Serve Is Frustrating, but It's Not the Biggest Supermarket Privacy Concern." The Sydney Morning Herald, November 30, 2023. https://www.smh.com.au/technology/the-self-serve-is-frustrating-but-it-s-not-the-biggest-supermarket-privacy-concern-20231129-p5ensd.html.

[7] McLuhan, Marshall. *Understanding Media: The Extensions of Man*. UNITED STATES: Gingko Press, 2013: 36-40. http://ebookcentral.proquest.com/lib/rmit/detail.action?docID=1222206.

[8] Fernández-Herrería, A., and F.M. Martínez-Rodríguez. "Deconstructing the Neoliberal 'Entrepreneurial Self': A Critical Perspective Derived from a Global 'Biophilic Consciousness.'" *Policy Futures in Education* 14, no. 3 (2016): 314–26. https://doi.org/10.1177/1478210316631709.

[9] Shaw, Hillary. "Resisting the Hallucination of the Hypermarket." International Journal of Baudrillard Studies, 2008. https://baudrillardstudies.ubishops.ca/resisting-the-hallucination-of-the-hypermarket/.

[10] Kelly, Lauren Kate. "Why Woolworths Workers Can't Sleep at Night: Inside the Supermarket Giant's Controversial 'Framework.'" The Conversation, October 24, 2024. http://theconversation.com/why-woolworths-workers-cant-sleep-at-night-inside-the-supermarket-giants-controversial-framework-242015.

[11] Morris-Grant, Brianna. "Coles and Woolworths Campaigns Promised Cheaper Prices for Years. Now They're Accused of 'misleading' Customers on More than 500 Products." *ABC News*, September 23, 2024. https://www.abc.net.au/news/2024-09-23/coles-woolworths-price-hike-accusations-accc/104383906.

[12] Fisher, Mark. "What Is Hauntology?" *Film Quarterly* 66, no. 1 (2012): 16–24. https://doi.org/10.1525/fq.2012.66.1.16.

[13] Conchie, Sandra. "Facial Recognition: Mum's 'horrible' Mistaken Identity Ordeal at New World." NZ Herald, November 20, 2024. https://www.nzherald.co.nz/rotorua-daily-

post/news/supermarket-facial-recognition-trial-rotorua-mothers-discrimination-ordeal/IK4ZEJHLQVFRLMDE6LX4AR57PE/
[14] Hsu, Hua. "How Nam June Paik's Past Shaped His Visions of the Future." *The New Yorker*, March 29, 2023. https://www.newyorker.com/culture/culture-desk/how-nam-june-paiks-past-shaped-his-visions-of-the-future.
[15] Wark, McKenzie. "Critical (Auto) Theory - Journal #140," 2023. https://www.e-flux.com/journal/140/572300/critical-auto-theory/.
[16] Brunton, Finn. "Hacking." In *Routledge Handbook of Digital Media and Communication Lievrouw*, edited by Leah and Brian Loader. Oxford: Taylor & Francis Group, 2019.
[17] Oliver, Julian, Gordan Savičić, and Danja Vasiliev. "The Critical Engineering Manifesto," 2021. https://criticalengineering.org/.
[18] Burgess, Jean, Daniel Angus, Nicholas Carah, Mark Andrejevic, Kiah Hawker, Kelly Lewis, and Abdul K. Obeid. "Critical Simulation as Hybrid Digital Method for Exploring the Data Operations and Vernacular Cultures of Visual Social Media Platforms." *SocArXiv. November* 6 (2021). https://doi.org/10.31235/osf.io/2cwsu.
[19] Ruberg, Bo. *Video Games Have Always Been Queer. Post-millennial Pop*. New York: NYU Press, 2019. https://search.ebscohost.com/login.aspx?direct=true&AuthType=shib&db=nlebk&AN=1909756&site=ehost-live.
[20] Juul, Jesper. *The Art of Failure : An Essay on the Pain of Playing Video Games. Playful Thinking*. Cambridge, Mass: The MIT Press, 2013.
[21] Flanagan, Mary. *Critical Play: Radical Game Design*. The MIT Press, 2009, 6-7.
[22] Young, Liam. "In Other Worlds: Cities Shaped Like Fiction." In *Design Studio Vol. 5: Experimental Realism*. RIBA Publishing, 2022.
[23] Paik, Nam June. "TV Buddha" Nam June Paik Art Center, 1974. https://njpart.ggcf.kr/collections/205.
[24] Net, Media Art. "Media Art Net | Graham, Dan: Time Delay Room." Text. Media Art Net, February 18, 2025. http://www.medienkunstnetz.de/works/time-delay-room/.
[25] "Rafael Lozano-Hemmer - Atmospheric Memory." Accessed February 18, 2025. https://www.lozano-hemmer.com/exhibitions/atmospheric_memory_sydney_2023.php.
[26] "Rafael Lozano-Hemmer - Recognition." Accessed February 18, 2025. https://www.lozano-hemmer.com/recognition.php.
[27] Young, Liam. "Where the City Can't See LIDAR Camouflage Costumes." Liam Young. Accessed February 18, 2025. https://liamyoung.org/projects/where-the-city-can-t-see-lidar-camouflage-costumes.
[28] Barr, Pippin. "It Is as If You Were Doing Work," 2017. https://pippinbarr.com/itisasifyouweredoingwork/.
[29] Gleisner, Jacquelyn. "Paolo Cirio's Lovely Faces - Art21 Magazine." August 12, 2013. https://magazine.art21.org/2013/08/12/new-kids-on-the-block-paolo-cirios-lovely-faces/.
[30] Wouters, Niels. "Biometric Mirror: Human-Computer Interaction, The University of Melbourne." School of Computing and Information Systems, August 12, 2021. https://cis.unimelb.edu.au/hci/projects/biometric-mirror.
[31] Hjorth, Larissa. "Odours of Mobility: Mobile Phones and Japanese Cute Culture in the Asia-Pacific." *Journal of Intercultural Studies* 26, no. 1–2 (February 1, 2005): 39–55. https://doi.org/10.1080/07256860500074003
[32] OpenCV. "OpenCV." OpenCV, 2024. https://opencv.org/.
[33] Topinka, Robert. "The Politics of Anti-Discourse: Copy-pasta, the Alt-Right, and the Rhetoric of Form." *Theory & Event* 25, no. 2 (2022): 392–418.
[34] Frutiger Aero 2023. *Aesthetics Wiki, 2023*. Available at: https://aesthetics.fandom.com/wiki/Frutiger_Aero
[35] Brown, Maria Gemma, Nicholas Carah, Xue Ying (Jane) Tan, Daniel Angus, and Jean Burgess. "Finding the Future in Digitally Mediated Ruin: #nostalgiacores and the Algorithmic Culture of Digital Platforms." *Convergence* 30, no. 5 (October 1, 2024): 1710–31. https://doi.org/10.1177/13548565241270669.
[36] Brown, Maria-Gemma. "Ghost in the Mall: The Affective and Hauntological Potential of Dead Mall Ruins," 2023. https://capaciousjournal.com/article/ghost-in-the-mall/.
[37] Schmidt, Kristi E., Yili Liu, and Srivatsan Sridharan. "Webpage Aesthetics, Performance and Usability: Design Variables and Their Effects." *Ergonomics* 52, no. 6 (June 1, 2009): 631–43. https://doi.org/10.1080/00140130802558995.
[38] Pichlmair, Martin, and Mads Johansen. "Designing Game Feel: A Survey." *IEEE Transactions on Games* 14, no. 2 (June 2022): 138–52. https://doi.org/10.1109/TG.2021.3072241.
[39] "Usability and Game Feel | 7 | v2 | Game Usability | Steve Swink | Tayl." Accessed November 11, 2024. https://www.taylorfrancis.com/chapters/edit/10.1201/9781003109389-7/usability-game-feel-steve-swink.
[40] McGee, Llaura. "4. Leaving Space for Messiness, Complexity, and Chance." In *The Queer Games Avant-Garde: How LGBTQ Game Makers Are Reimagining the Medium of Video Games*, 63–72. Duke University Press, 2020. https://doi.org/10.1515/9781478007302-008.
[41] Stern, Joel. *Personal communication.*
[42] Salvaggio, Eryk. "The Age of Noise." Substack newsletter. *Cybernetic Forests* (blog), March 3, 2024. https://cyberneticforests.substack.com/p/the-age-of-noise.
[43] Blas, Zach. "Facial Weaponization Suite." *Zach Blas* (blog), 2014 2012. https://zachblas.info/works/facial-weaponization-suite/.
[44] Angus, Daniel, Jean Burgess, Nicholas Carah, and Abdul K. Obeid. "Facebook's Advertising WAIST Tags - ADM+S Centre," 2023. https://www.admscentre.org.au/adobservatory/facebooks-advertising-waist-tags/.
[45] Cross, Nigel. "Designerly Ways of Knowing." *Design Studies*, Special Issue Design Education, 3, no. 4 (October 1, 1982): 221–27. https://doi.org/10.1016/0142-694X(82)90040-0.
[46] Pedersen, Isabel. "Will the Body Become a Platform? Body Networks, Datafied Bodies, and AI Futures." In *Embodied Computing: Wearables, Implantables, Embeddables, Ingestibles*, edited by Isabel Pedersen and Andrew, 2020. https://doi.org/10.7551/mitpress/11564.003.0004.