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Julia Eckel / Christoph Ernst / Jens Schröter (Eds.)

TECH | DEMO

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Introduction

JULIA ECKEL & CHRISTOPH ERNST

The public demonstration of technologies is an essential part of (digital) media culture. "Demo or die!" was a phrase commonly used at the MIT Media Lab in the 1980s, wrongly attributed to Nicholas Negroponte (Sterling 2019). Those who do not demonstrate – that is, exemplify the possibilities of their technology in front of an audience – may disappear. What has since been demonstrated in the domain of digital media and technologies is a broad spectrum of combinations of software and hardware in various 'devices' and, even more importantly, their uses and applications. The technical functions displayed in these demonstrations are as diverse as the forms and the social functions of the 'demos' themselves. At the same time, the 'public dimension' and 'social function' points to a wider notion of the term demonstration and a separate sphere in which *tech*(nology) and *demo*(nstration) collide – the field of politics in a broad sense and of street protest specifically. If we look at 'demonstration' from this perspective, it appears as a field in which technology and the political inevitably go hand in hand, because demonstrating always also means proving and executing power (be it *over* or *via* a technology). Both aspects – the *Demonstration of Technologies* and the *Technologization of Demonstrations* – are addressed in this volume of *Navigationen*.

DEMONSTRATIONS OF TECHNOLOGIES

From the perspective of social theory, tech demos create a common frame of reference for heterogeneous groups of actors, make abstract ideas concrete, are proof of concepts, staged in what have been called "theatres of proof" (Latour 1993 [1984]) or "theatres of use" (Smith 2009). They make something imaginable (e. g. with the help of prototypes) (Ernst/Schröter 2021a; Ernst/Schröter 2021b), bundle and structure expectations, are politically important and ideologically charged. Thus, tech demos are, in a way and in all their connotations, 'powerful' tools for the mediation of technology. They tend to operate as a 'show of force' in a supposed "demo-cracy" (Rosental 2013). At least as long as nothing goes wrong and, as in the case of Tesla's famous presentation of the Cybertruck in 2019, the supposedly bullet-proof glass actually withstands the impact with a metal ball (BBC News 2019). The risk of failure, malfunction, and disruption thus constantly resonates in tech demos. Given the fact that disruptions remind us of the otherwise 'invisible' or 'tacit' operations of underlying technologies, tech demos have both a media-reflexive and a media-constitutive side. This makes them significant sources for the historiography of technology and especially, in recent decades, for the history of digital media (Ernst/Schröter 2021a). Be it the so-called

'Mother of all Demos' by Douglas Engelbart (1968), the introduction of the iPhone by Steve Jobs (2007), or the presentations of the first prototypes for brain-computer-interfaces by Elon Musk (2020) and the "Metaverse" by Mark Zuckerberg (2021)[1] – tech demos are means by which (media-)technological change is anticipated, performed, and made tangible. Via tech demos, historiographical caesurae in the development of a technology are marked, its possibilities framed, and its sociotechnical futures designed. In the process of a retrospective perspectivization, tech demos appear as landmarks in the history of successful (or failed) development of a technology, as evidentiary and documentary practices which set and (re-)define what constitutes 'a (new) medium'. The multiple social functions and the relevance of tech demos can be observed in many cases such as the history of computer graphics and animation (Gowanlock 2019, Eckel 2021), digital gaming (Schröter 2017) and artificial intelligence (AI). Regarding the latter, the public image and understanding of AI is heavily dependent *on* and influenced *by* public demonstrations of AI as well as documented in them (see e.g. Eckel 2022, Eckel/Ehrlich 2022). Think, for example, of the sheer quantity of references the "AlphaGo versus Lee Sedol" event created in 2016.[2] The event was an AI-demonstration wrapped as a competition. The complexity of Go is now well known, but this event single handedly shaped public awareness of the possibilities of artificial neural networks (ANNs) as the dominant paradigm in AI. As such "AlphaGo versus Lee Sedol" mobilized a multitude of imaginaries around AI such as human vs. machine, intuition vs. calculation, spontaneity vs. pre-calculation etc. In the wake of the defeats of the human player, ANN-based technology was justified, at least from its proponents' perspective, as the most important technology of the 21st century – promises made, capabilities demonstrated, promises kept.

Given its history, this is a recent example for a public demonstration of AI. More could be found, reflecting the deep ties between demonstration and technology development. While tech demos necessarily presuppose a public (Ernst/Schröter 2021a, 82), their functions are not limited to communicating with society. One could ask, for example, whether technological development isn't intrinsically dependent on demonstrations. What was 'shown' when AlphaGo was presented in this event? Was it the demonstration of an intelligence that exists beyond the spotlight? Doesn't the very idea of AI consist in the capability of programmable machines to socially *demonstrate* 'intelligence' by solving problems in an understandable way and behave as an intelligent entity in a socially accepted manner? What echoes in these questions is the age-old difference between 'stage' and 'reality:' Is there an 'essence' or is it all 'show'? What is the possible 'fulfillment,' behind the 'promises' (Bachmann 2021) generated by the demonstration?

1 For video recordings of the events and/or the original demonstration videos see e.g.: Doug Engelbart Institute 2022a, 2022b, 2022c; SteveJobsArchives 2017; Neuralink 2020; Meta 2021.

2 For a video recording of the event see DeepMind 2016.

If one goes down this road, more fundamental issues concerning the epistemic relevance of various practices of 'demonstrating' for human culture and society arise. Practices like 'presenting,' 'displaying' or 'performing' are fundamental cognitive operations for collective knowledge production; one might think e. g. of Nelson Goodman's theory of "exemplification" in the context of aesthetics (Goodman 1968; see also Ernst/Schröter 2021a, 84, FN 23). Adding a different aspect to the mix, tech demos of AI are also interesting with regard to the mediality of these demos themselves. Not only does a tech demo have to be presented by media, but some of the demos, "AlphaGo versus Lee Sedol" being one of them, are famous because they are mediated *as* tech demos. Thus, even though many technology demonstrations are conceptualized as (huge) media events, 'documented' on multiple levels via other media,[3] additionally there are also huge numbers of tech demo images and videos that do not refer to public live presentations at tech-conferences or release events. Instead they function as media(l) documents of proof circulating on the internet and showcasing the practical as well as creative capabilities of technologies – especially in the field of computer graphics. Regarding the focus on AI approached so far and the demonstrative practices that gather around it, the vast field of text-to-image, text-to-video, or image-to-image generators and their demos come to mind – for example Nvidia's *GauGAN* (2022), OpenAI's *DALL·E 2* (OpenAI 2022), Meta's *Make-a-video* (Meta AI 2022), Google's *Imagen* (Google Research, Brain Team 2022), or projects like *CogVideo* (2022), *Midjourney* (2022), or *Stable Diffusion* (2022). These examples, which include more or less interactive 'demo sections' and 'demo materials' on their websites, show the huge role that especially digital image generation and animation plays for the constitution of what we – literally – 'imag(in)e' to be AI and how it works (Eckel 2022, Eckel/Ehrlich 2022). The mediality of tech demos therefore deserves its own theoretical consideration.

What these examples show, then, is that we know of tech demos and the technologies presented mostly through media. Thus, tech demos stand both systematically and historically in the overarching continuity of a "demonstration society" (Rosental 2021), for which demonstrations are crucial communicative actions which cannot be detached from the medial conditions of their public dissemination and broader questions of a 'sociability' of technology.

TECHNOLOGIZATIONS OF DEMONSTRATIONS

Following this idea, the connection between the technological and the 'demonstrative' becomes relevant in the second sense mentioned above. If one takes the concept of 'demonstration' in its broader understanding (Sarcinelli/Knaut 2012; Rosental 2013, 2021), it evokes not only the evidentiary presentation of technologies, but also demonstrations of political power and civil protest. Contemporary

3 In the case of "AlphaGo versus Lee Sedol" see e. g. the documentary *AlphaGo* by Greg Kohs 2017.

street demos can thus be conceived as another public and mediatized form of 'tech-demonstration', in the sense that technologies are means of constituting, observing, or obstructing a demonstration. Numerous publications in recent years have dealt with this wider notion of a mediatization of demonstration, e. g. by analyzing pictorial dimensions of the demonstrative (Fahlenbrach 2016, 2019), by focusing on 'image protests' ("Bildproteste"; Schankweiler 2019), 'movement images' ("Bewegungsbilder"; Eder/Hartmann/Tedjasukmana 2020) or the fact that "the people are not the image" (Snowdon 2020).

Furthermore, in the context of street protest, the phrase "Demo or die!" might take on a completely different, often existential horizon. Demonstrations can be (politically) necessary and urgent, be it for real or imagined reasons, for instance in a dictatorial regime or a humanitarian predicament. And at the same time, they are risky and hazardous in and of themselves. A demonstration can not only fail in its goals; it can also become a direct danger, if the state/police or counterprotesters resort to violence. Again, demonstrations and (media) technologies form an inseparable connection in that regard, e. g. when the protest takes place between "Twitter and Tear Gas" (Tufekci 2017) or when smartphones and social media platforms document the actual death of demonstrators (Meis 2021). And again, these (street) demonstrations, in their planning and execution, anticipate and imagine a desired and demanded future which is designed and negotiated via media – posters, chants, T-shirts, tweets, material and virtual banners, etc.

Under the title 'Tech | Demo', this issue of *Navigationen* intends to deal with this twofold connection between demonstration and technology. The focus is, on the one hand, on *technology demonstrations* as cultural and instrumental practices in the contexts of technology- and media-development. On the other hand, the volume highlights the *technologization of demonstrations* in the sense of (political) demonstrations reliance on media technologies and the political dimension of technology developments. Building on this nexus of power and technology, demonstrations appear as media-historically and -theoretically significant sites that reveal and negotiate intersections of technology, the individual, and society, politics, performance, and aesthetics, as well as the human and technical scopes of 'agency'.

ABOUT THE CONTRIBUTIONS

This volume of *Navigationen* gathers seven articles that deal with different aspects of the nexus of *Tech* and *Demo*. **Claude Rosental** focuses on "Demonstration Dynamics at a High-Tech Event" by providing ethnographical and media-sociological insights into a tech conference and its related demonstrative practices. The text offers a basic conceptual differentiation for this purpose. The relationship implied in 'tech | demo' is differentiated into the term "public demonstrations", addressing in a broad sense social 'demonstrations' of very different kinds (e.g. a military parade). In addition, "demos", in a narrower sense, stand *(in-*

ter alia) for the economically motivated presentation of technology. In-depth analysis of a tech conference in Jerusalem in 2020 explicates the different social functions that demos have. Given the variety of the observed contextualizations and settings of demos, it becomes clear that demos, thanks to their performative qualities, take on a constitutive and mediating function for the social relations and interactions and, in particular, the "sociotechnical imaginaries" (Jasanoff and Kim 2015) surrounding a technology. They thus form an integral part of our "demonstration society" (Rosental 2021).

Jordan Gowanlock's contribution deals with demonstrative practices in the context of hardware and gaming culture by examining YouTube channels that demonstrate, test, and measure the performance of technologies, e.g. through benchmarking (giving identical calculation tasks to different hardware configurations to see how [differently] they perform). Gowanlock shows not only the strong entanglement between hardware testing and gaming and thus the inherently demonstrative character of both fields, but also the social dimensions implied, especially when it comes to gender biases or discussions of class and race.

Canan Hastik's text revolves around another sphere located at the intersection of hardware, gaming, performance, and demonstration: the so-called 'demoscene'. Her text offers an overview of the 'scene's' characteristics, its aesthetic and communicative structures, and its defining demonstrative dimensions which are centererd around the production of real-time computer generated animated audiovisuals within the restricted framework of game engines and other hardware environments. Interestingly, what is demonstrated with the demoscene's creative output are not so much the capabilities of the technology but those of the individual or collaborative artists that deal with technological limitations (e.g. in competitions that build on the restricted size of an artwork).

This entanglement of demonstration, subject, technology, and power, which includes restrictions, as well as potentials, leads into the contribution by **Katharina Rein**, who focuses on the magical aspects of demonstrations. Her study analyzes the relations between stagings of gestural human-machine interfaces, e.g. the well-known interface in Steven Spielbergs *Minority Report* (2002), and stage magic. Against the backdrop of the history of performance magic, media-technologies associated with the 'internet of things' are characterized by, as Rein points out, a dynamic of "simulation" and "dissimulation." During the various forms of demonstrating these technologies, a sense of wonder at how this specific media technology works is created. Not only is the theatrical and rhetorical power, especially of demonstrations of gestural interfaces, informed by the long tradition of stage magic and its uses of gestures. But the promise is also established that along with these technological innovations 'magical' powers will become widely available in daily life.

A specific form of 'magic' is often attributed to the subject of the next contribution too; **Jens Schröter** discusses 'machine vision' as a specific aspect of artificial intelligence. Reconstructing the 'imaginaries' around the idea of machine vision,

the article focuses on canonical examples from film history as well as from literature, thereby emphasizing the importance of fictional narratives for the understanding of new technologies. Relying on the notion of "diegetic prototypes", developed by David Kirby (2010), the text considers fictional representations of machine vision as a form of demonstrating (future) technologies.

The contribution by **Sven Grampp** discusses the *Apollo-Soyuz Test Project* as a form of political power projection by the two 'superpowers' USA and USSR at the height of the Cold War. The particular technological demonstration in this project was the docking maneuver between space capsules of the competing nations. Obviously, there were ideological instrumentalizations of the event by both parties. However, instead of reconstructing these ideological messages, the article analyses the example by establishing a different focus. Using Georg Simmel's concept of the 'third party' as a form of 'mediator' in the sense of Bruno Latour, it is shown how various media themselves appropriate the ideologically charged technology demonstrations. Elaborating this argument, the study lays the groundwork for a media theoretically informed understanding of technology demonstrations.

Grampp's focus on the demonstration of political power relations through media technological performances leads into the final contribution by **Mareike Meis**, who also concentrates on the impact of technological artifacts on demonstrations of political power, her topic being the technologization of street protests (particularly through the use of mobile phones). By focusing on smartphone-based documentary practices in the context of public street demonstrations, especially in the Syrian Civil War, she raises questions about media witnessing and the role of digital testimonial evidence in court proceedings. Moreover, in order to adequately describe and analyze the intersections between technical and demonstrative dimensions that constitute an essential dimension of the politics of contemporary street protest, she proposes a diffractive method-(ology) that accounts for the fact that analyzing these movements means engaging with a complex sociotechnical formation – composed of human as well as non-human agents and materials – with lasting implications e.g. for the realm of state violence and international jurisdiction.

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DEMONSTRATION DYNAMICS AT A HIGH-TECH EVENT.

Exploring a High-Stakes Spot of the Demonstration Society

CLAUDE ROSENTAL

INTRODUCTION

Today we live in a demonstration society in which public demonstrations and, more specifically, public demonstrations of technology (or "demos") are widespread and play significant roles (Rosental 2021). Here, I will explore one important component of the demonstration society that relates to the very large set of high-tech conferences and fairs which are organized around the world each year. For this purpose, I will more specifically study the activities and interactions that took place during a recent high-tech summit, on the basis of ethnographical observations I carried out on site. I will show how this high-tech event led to a massive production of public demonstrations – including demos – which served various aims. I will unveil some of the material, organizational and cognitive aspects of this demonstration festival.

I use the term "public demonstration" to refer to a specific range of practices and objects that are commonly described, be it as 1. public proofs, 2. gatherings intended to protest or express an opinion on a political issue, 3. public manifestations of an inclination, an intention or an emotion, or 4. actions consisting in showing something to an audience in order to explain, interest or impress. Demos – i.e., presentations of the working of technologies – correspond to this latter meaning (Rosental 2013). While a public demonstration may refer to a street protest, a military parade showing the strength of an army, or proof of a mathematical theorem on the blackboard during a seminar, the term „demo" refers more specifically to presentations of technologies in action given for instance by Steve Jobs during the launch of new Apple products, by market pitchers at popular fairs in order to sell household appliances (Clark and Pinch 1995, Le Velly 2007, Sherry 1998), or by famous YouTubers on the internet in order to promote videogames.

Today demos have major stakes, including economic (Bloomfield and Vurdubakis 2002, Lampel 2001) and political ones (Girard and Stark 2007, Winthereik, Johannsen and Strand 2008). But they are certainly not contemporary inventions. They have a long history that includes, for instance, the demonstrations of the Atwood machine in the eighteenth century or those of the magic lantern in the nineteenth century (Hankins and Silverman 1995, Schaffer 1994).

Tech fairs have also a long history which forms part of the development of various types of large gatherings in the Western world and includes the rise of

fairs in Europe in the Middle Ages, the development of industrial exhibitions in Europe and North America since the end of the eighteenth century, and the expansion of large periodic sectoral exhibitions and universal exhibitions celebrating the virtues of human genius since the end of the nineteenth century. It also includes the spectacularizing of science museums, the rise of science centers and the development of thematic and professional exhibitions between the late nineteenth and the early twenty-first centuries (Bennett 2006, Levin et al. 2010, Rader and Cain 2014).

Social scientists have studied several aspects of tech fairs in the contemporary period. Zilber (2011), for instance, investigated the institutional roles played by two high-tech conferences held in Israel in 2002, while Gross and Zilber (2020) looked at how the narrative mechanisms of two bio-tech conferences in Israel in 2005 and 2006 allowed its organizers to exert various faces of power in organizing the events. Focusing on material aspects, Simakova (2010) studied how representatives of a company participating in a high-tech fair organized their booth and which concrete choices they had to make in this context in order to support their marketing goals. Earlier, Downey (1998) had analyzed the strategies deployed in this type of setting in order to promote sales. Looking at competition between exhibitors in a trade show, Coopmans (2011) studied how the latter managed the secrecy of their technologies.

These publications provide useful insights into the organizational, institutional and material aspects of high-tech conferences today. However, the ways in which technologies are demonstrated and the roles public demonstrations play in such contexts may be analyzed further. I will focus on these important dimensions in the case of the high-tech summit mentioned above. I will first examine the demonstrational setting and dynamics that characterized this event before analyzing in greater detail a demo that was given during one of the conference sessions.

A DEMONSTRATION FESTIVAL

The high-tech conference I observed was held at a convention center in Jerusalem in 2020. Based on the data I could gather, there were more than 23,000 registered participants from 186 countries, including 1,200 entrepreneurs, 470 venture capitalists, representatives of 600 multinational corporations, and 210 speakers. It was a one-day annual event organized by a firm which I will call Promptinvest.[1]

Promptinvest is an "investment platform" that selects startups in Israel and elsewhere. It both invests and promotes co-investment by various actors in the startups it has selected. It has also created high-tech funds in which large companies and several kinds of investors can buy shares. 33,000 entities had invested in Promptinvest financial products at the time of the event. Promptinvest also accompanies the startups it has selected in various ways. It provides mentoring and

1 For the purposes of anonymity, I use a pseudonym here.

connections to other actors such as large companies in order to contribute to their growth and increase in value.

One of the main goals of the organizers of the summit, which I will call Promptinvest 2020,[2] was to promote Promptinvest itself to a public of investors, be it venture capitalists or large companies as much as it was to promote its funds and its individual startups. These investors could become co-investors and partners of the startups belonging to Promptinvest's portfolio. Another targeted audience was composed of journalists who could report on the event in various media and thereby help promote Promptinvest and its startups in larger circles.

This context helped make Promptinvest 2020 a media event as well as a demonstration festival – a gathering at which an audience could watch public demonstrations of various kinds. The organizers used different means to demonstrate to investors and large companies that they could trust Promptinvest, that its portfolio of startups had been submitted to a rigorous selection and that this set of high-tech companies was of the highest quality.

One of these means consisted in displaying the quantity and quality of actors and especially speakers that Promptinvest was able to gather during the summit. These included major corporate leaders (e.g., CEOs and high-ranking executives of renowned firms), prominent authors and scientists (e.g., a Nobel Prize winner), and famous political representatives and government officials, in addition to a large number of entrepreneurs and investors. This served as a demonstration of the strength, "success" and credibility of Promptinvest.

This demonstration of strength was also supported by a rich program of activities. It included a long list of lectures, roundtables, and training sessions held in parallel. The diversity of topics and of the categories used to classify the latter helped show that Promptinvest had a very wide range of expertise and was a key player in the high-tech industry.

Plenary sessions focused, for instance, on Promptinvest activities, on how the company uses its networks for business development, on the "most promising" startups and investment opportunities, on current top tech trends, on the latest developments in cyber-tech, and on the future of the startup nation and its cooperation with other countries in the region. In addition to the plenary sessions, "breakout sessions" addressed several issues: how to build autonomous cars within the framework of current regulations, how US–China competition affects investment in Israel, the main trends in health tech, venture capitalists' stories, "meet the startups sessions" in different technological fields (software, semiconductors and optics, agriculture and food tech, sport, cyber and finance technologies, the medical field, energy, enterprise hardware and artificial intelligence, transportation). As for the training sessions, some were organized for investors and focused on how to invest in startups, or on the art of estimating their value. Other training sessions especially designed for high-tech entrepreneurs bore on

2 Idem.

how to do fundraising, how to recruit "amazing people," and how to sell one's company (or "exit"). This mix of topics showed that Promptinvest possessed a strong expertise on many specialized issues related to the high-tech industry, but also broad views on economic and political matters which could all inform wise investment decisions.

Other activities organized during Promptinvest 2020 put forward another strength of the investment platform: its powerful network and its ability to connect all kinds of actors, and especially possible investors and startups, in order to generate business and increase the value of firms/investments. A strong emphasis was put on "networking." Many meetings were organized in advance or favored in order to put the startups selected by Promptinvest in touch with registered participants. There were actually more than 1,000 one-to-one meetings that were scheduled by the organizing team before the summit started. These scheduled meetings were held in designated rooms, while more informal gatherings took place in various spaces of the convention center. These spaces included bars and food stands around which people could stand or sit and talk while eating food or drinking. This apparatus contributed to increase meeting opportunities, as participants did not have to exit the convention center in order to eat or drink during the event. Another important meeting device consisted in booths held by startups in the exhibition halls of the convention center. These booths were privileged spaces for representatives of the startups to meet attendees.

Many meetings took place during "networking breaks" between sessions, or during the party that ended the summit in the evening, to be continued later on at Jerusalem's open-air market. As the conference program stated, the motto was "drink, network, party": "At the end of Summit Day, the incredible networking continues into the night, as the crowd moves to Mahane Yehuda Market, the cultural center of Jerusalem. The night will be filled with delicious food, craft beer, live music, and great conversation." Additonally, although the summit lasted for one day only, some participants had an opportunity to "network" for a whole week. Some events were organized by Promptinvest for its VIP participants. They consisted, for instance, of private lectures and visits to startups. Altogether, some twenty-four events were organized during the week.

As a result, Promptinvest 2020 helped put in touch and sometimes bring together various actors while displaying the strength of this global connecting activity to the participants and to the media. Some of the meetings consisted mainly of discussions, but others were strongly mediated by demonstrations of technologies. Some interactions took place, for instance, around demonstrations of products at the conference booths. Among other things, information, contacts, and ideas were exchanged during or after demonstrations of how devices worked. Demos did not simply consist of displays of technologies, then, but were also essential conditions for exchange of all kinds of resources while helping shape the nature of interactions and relations.

Many demos were also given on stage before larger audiences. As I will illustrate later, these demonstrations consisted of large shows or even theatrical performances to some extent, depending on the meaning one gives to the notion of theater (Latour 1988, Smith 2009). Promptinvest's demonstration festival was thus largely made of public demonstrations of technology produced on site. This is actually well illustrated by the narrative that was published on Promptinvest's website several months later to explain why the firm did not want to organize an online event in 2021, when the conference couldn't take place face-to-face due to the coronavirus pandemic: "We've made the decision not to hold the Summit in 2021…. because one of the hallmarks of the Summit is the personal interaction of the global crowd – (that is: 1) hands-on tech demos, (2) direct access to entrepreneurs, and (3) shoulder-to-shoulder networking with investors, innovation executives and venture capitalists."

Thus, demonstrating was portrayed by the organizers of Promptinvest as a feature as important as meeting opportunities, if not crucial *for* meetings. But demos didn't simply serve Promptinvest's goals. They also helped entrepreneurs find investors, partners or clients and promote their companies in the media. They were tools that potential investors used to decide whether or not they should invest in, or partner with, given startups. Political representatives used them as an opportunity to associate their image with technological progress, entrepreneurial dynamism and economic prosperity. Demos also helped journalists produce attractive pictures and videos of the conference and publish enthusiastic stories about the technologies on display. Entertaining, unexpected and impressive demos were useful resources for journalists to capture the attention of their audiences and argue that "something happened," that an "event" was taking place and particularly that significant innovations, a cabinet of curiosities, and the future could be seen on site.

As a result, demos played various roles at different levels for many actors. They also helped define the meaning of "participating in the summit" for its attendees. Participating in the conference did not simply entail walking from one meeting place or lecture to another, standing, sitting, discussing, listening, eating and drinking. It also involved seeing and sometimes touching or manipulating devices.

Active participation and the large set of activities proposed by the summit contributed to a very energetic atmosphere and to the celebration of various values. One of them was technological progress, backed up by science, as a source of individual profit and pleasure. These appeared in the narratives produced during Promptinvest 2020 as fully compatible with collective prosperity and benefits for humanity. Capitalism and high-tech could work hand in hand and appeared as a form of humanism, as technologies were portrayed as solutions to all kinds of societal problems, and as economic growth contributed to better living conditions and increased pleasures. The power of individuals was also celebrated, as the lat-

ter could efficiently act in, and on, the world while finding solutions to many problems and networking with others.

In order to illustrate the ways in which such values were carried by the demonstration festival, as well as unveil how demos were run, it is now useful to focus on one detailed example.

DEMOS

Many sessions at the conference participated in portraying the world as consisting of problems that could be solved, especially with the appropriate technologies. This technological solutionism is illustrated by the summit program's summary of a session entitled "The High-Tech Horror Show: Our Worst Fears and How Startups Can Address them":

> Climate Change, the Dark Web, Gene Tinkering, Fake News, Cyber-hacking… We're putting the sum of all fears on stage in dramatic live demos, scary videos, and audience participation, then showing how Armageddon can be avoided through breakthrough technologies that will protect your privacy, treat disease, save lives, and help you sleep at night.

This summary illustrates how new technologies were portrayed not only as sources of profit and as a basis for a flourishing liberal economy during Promptinvest 2020, but also as an asset for humanity, to the extent that they could solve problems the latter faces in many domains (e.g., medicine, environment, cyberlife). "Dramatic live demos" were key to supporting both this narrative and this solutionist view of the world. This may be also illustrated by the content of another session entitled "Demo Theater: No Pitches, just Wow." Its outline set the tone: "A lineup of the coolest, most eyepopping technologies from leading edge startups. Live demonstrations by the innovators themselves, with a bit of unique audience participation mixed in. Popcorn will be served!" This abstract highlights the fact that impressive, entertaining and peppy demos played a crucial role in the festival. The event did not simply rely on verbal arguments and exchanges, but was also very much about showing technologies in action, accompanying discourses with gestures and visual support, and producing spectacular shows involving audience participation where possible.

One of the technologies presented during this session was a piece of software that provided personalized aerobic lessons. Thanks to an ordinary webcam on a laptop, this device could analyze the moves of a person doing exercise and coach him or her during the lessons. The software indicated, for instance, how to correct one's posture while performing the exercises and gave a grade at the end of each lesson. The presentation of this technology consisted of a short video on a large screen showing how the piece of software worked. Then a "friendly" com-

petition involving members of the audience was organized to demonstrate the functionalities of the device in a playful way.

Another presentation displayed a technology that transforms a Wi-Fi box into a radar in order to detect and analyze the movements of the people in its surroundings. Several applications of this device were put forward, but one main-use case was shown on stage. It consisted in detecting "unusual activity" at home, such as an elderly person falling over while walking to the bathroom. A demo was given, showing how an old man's fall could be detected and automatic calls could be sent to his family and to medical emergency services. This presentation deserves detailed analysis.

The performance was introduced by a presenter of the Demo Theater session in a very energetic way for one minute and five seconds. The company, which we will call Serenity,[3] was described as "reinventing Wi-Fi." In order to warm up the large audience in the room, the presenter asked those who did not have a Wi-Fi connection in their houses to raise their hand. He then insisted on the fact that "a stronger round of applause" be given to welcome Serenity.

The presentation lasted for 10 minutes and 50 seconds. It was composed of an introductory pitch with a PowerPoint presentation on a large screen for the first 4 minutes and 47 seconds. Then a demo lasting 3 minutes and 9 seconds was given, followed by a concluding speech of 2 minutes and 54 seconds.

The introductory pitch started on an enthusiastic note ("Hello. So much energy. I'm super excited to be here") followed by a one-sentence introduction by the speaker ("My name is Michael Clark,[4] I'm the CEO and founder of Serenity") and a brief presentation of the company's activities. On the basis of the idea that Wi-Fi is everywhere, Michael Clark argued that it "makes sense to try to make more out of your Wi-Fi, generate more value." Using a few sketches on a PowerPoint presentation displayed on a large screen, he then explained in a concise manner how the radar system worked ("it's a little bit too techy, quite scientific. So I'm going to spare you the details"). He insisted on some of the possible ways in which the technology could be used. Michael Clark mentioned that the radar could help locate a person, count how many people are in a room, tell if a being is a human or an animal, and identify the types of moves of a person thanks to "well-trained machine learning algorithms." The radar could detect if a person is, for instance, walking forward, walking backward, slipping over, sitting down, standing up, running, or moving his hands in a circular or other way.

Further to a demonstration showing how the radar system could detect an old man's fall and then call his family and an ambulance (I will analyze it later on), Michael Clark again used a PowerPoint presentation to evoke other specific uses of the technology for "elderly care," such as monitoring "the amount of steps that [an old person] was doing throughout the day. Based on that, you can get to con-

3 Idem.

4 Idem.

clusions about his health situation." He then mentioned possible applications in other domains: "Examples could be safety, home security, energy management, smart cities. We're looking at applying this technology within office buildings, within factories…. But in addition, that Wi-Fi technology can monitor and count how many people are in front of the TV at a certain point in time. Also maybe analyze their gestures, and that information can be fed back to the TV provider or the advertiser to help improve their monetization."

The presentation ended with these "examples" and was followed by a few comments from the presenter of the Demo Theater session, before the latter introduced another company: "That's beautiful. Thank you, Serenity. I mean, it's basically Wi-Fi, like you have in your house, meets radar. Redefining Wi-Fi. It's incredible."

Let us now move to the content of the demo. Michael Clark commented on the actions of an actor representing an old man called John, who went to a sofa, sat there, stood up and fell over. John's moves were represented on two large screens and said to be followed by a Wi-Fi box located in front of the sofa. After John fell on the stage, a call to his son and to emergency services was displayed on a third screen. The demo ended with Michael Clark making sure that John was OK and cancelling the ambulance as John went back to his sofa. Here is a transcript of the performance:

> And with that said, I want to do a small demo. So, I'm going to invite over a friend here. His name is John. He might look young, but he's actually 80 years old [the actor in fact looks young]! He's pretty healthy. And this is his apartment, right? Imagine that this is his living room. And this is the sofa where he loves to sit down and watch TV. So, imagine that the TV is here. Now, this is our router with our Wi-Fi radar inside. Okay, that's a prototype of our radar. And we have here two screens, right? The first screen, which is on my right or on the left, shows two things. The first one is the tracking of his movement. We'll see a red dot, which is following his movement inside the living room. And the second one, the blue screen, or the blue portion, actually is going to depict his movements or the analysis of his movements. In the middle, we're going to share you with some insights or some triggers or alerts that we're generating based on the events which are being generated as we speak. So, with that said, let's see what's going to happen when he's going to watch TV. So, as you can see, when he's walking [John is walking towards the sofa], we're supposed to see that when he's walking, there is a red dot which is following his location, right? [Michael Clark is pointing at one of the screens] And this red dot is actually indicating his whereabouts. In parallel, what we're able to do is to identify the exact dynamics of his movements. So here the system was able to identify two events, walking and sitting down. So, this is happening, right? And we're track-

> ing him and monitoring him. We're doing that without invading his privacy because this is not a camera. We're not taking his pictures. We don't know who he is. We're just analyzing certain movements and certain events. That's the beauty of using Wi-Fi. Now he's watching TV and at a certain point he needs to go to the bathroom and let's see what's going to happen. I'm going to give you a tip. Stay tuned while this is happening. There's going to be an interesting event. So please go ahead [John stands up, walks away from the sofa and falls over]. So, as you can see, we're tracking him and then unfortunately, he fell down. Now this is an important event to monitor because this is an emergency event. And what we can see here on these screens is actually two things [Michael Clark is pointing at the screens]. The first one is that we're able to detect the fact that he stood up. The second thing, we're able to detect the fall event. And based on that, the system generated an alert. The alert was sent to John's son's mobile device. And the app is showing that a fall event has been detected in the living room. And the app is calling an ambulance. Now, let me check on him [Michael Clark checks if John is fine]. Are you okay? Okay, so we can cancel the ambulance and he's going to go back to his sofa [Michael Clark is pointing at one of the screens while John goes back to the sofa and sits there]. And we can see that the red dot keeps on tracking him, and that we were able to identify the sit-down event.

This demo, like the whole presentation, clearly carried various values I previously referred to. The technology was portrayed not only as an opportunity for new profit (e.g., for TV providers or advertisers) but also, and foremost, as acting for the good of humanity. Although it was not depicted as a source of pleasures like the aerobics software presented during the same session, it was shown as a tool that could save the lives of elderly people and help improve their health as well as improving the safety and management of factories, homes, and cities. And despite the fact that the radar system could easily be seen as violating people's privacy, it was described on the contrary as helping to protect it, compared to cameras. In this way, the presentation also illustrates how technological solutionism permeated the narratives, the exchanges, and the worldviews during the conference (e.g., the world is structured by a series of problems and solutions, technology can solve societal problems while empowering individuals, high-tech and capitalism are a source of profit, pleasure, and good for humanity).[5]

The performance corresponded to common ways of practicing presentations and demos in the high-tech industry (Rosental 2007). It also matched various norms produced by specialists in the marketing of technologies inspired by Steve Jobs' communication style (Gallo 2010) or by technology evangelists such as Guy

5 For a critique of technological solutionism, see Morozov (2013).

Kawasaki (Kawasaki and Moreno 2000). The term technology evangelist is generally used to describe an individual who is able to "convert" a large number of people to a technological product, inviting them to participate in a better world and demonstrating messianic zeal, in a posture comparable to that adopted by certain Christian Evangelists (Kawasaki 2022). Sometimes it also corresponds to a professional title: Kawasaki had the title of chief evangelist when he worked at Apple. The standards and skills for high-tech demos to which I have just referred circulate by mimicry as much as through specialized books and individual coaching (Rosental 2021). Some of them may be mentioned here.

First, a strong emphasis was put on showing versus telling. The presentation didn't simply consist of a long speech, a verbal performance accompanied by gestures and images, or a PowerPoint presentation. The heart of the performance was a demonstration of technology. Admittedly, the title of the session was not accurate. It was not "no pitches, just wow." It combined a pitch, a PowerPoint presentation, and a demo. Steve Jobs also combined various sequences when he designed his shows for the launch of Apple products, but demos played a major part too.

Secondly, the presentation, and especially the demo sequence, relied on storytelling. The demonstrator told a concrete story about a situation that possible users of the technology could encounter. This story was structured by a solutionist approach to the world.

The demonstration also echoed some of the principles of Aristotelian rhetoric that commonly feed marketing techniques. It played not only on *logos*, but also on *pathos* and *ethos* (LaGrandeur 2003). In more contemporary terms, the demonstrator appealed to the audience's reason while also playing on affects and basing his credibility in particular on a benevolent attitude towards the audience. The care for others was equally evident in the presentation of life-saving or health technology. But the demonstration wasn't simply based on verbal rhetoric. It implemented what I call techno-rhetoric (Rosental 2021). The demonstration relied on the production of words, gestures, and handling of technological devices in a coordinated fashion.

As in Steve Jobs' presentations, the demonstration was marked by a noticeable quest for simplicity, straightforwardness, and concision. The demonstrator presented himself in no more than a sentence, talked very briefly about his company, and then went straight to the point. Few slides were used. The demonstrator succinctly exposed the principles of the technology and very quickly focused on its concrete features and on examples of use. As he mentioned, he made sure he was not "too" technical, and the emphasis was put on exemplifying.

Moreover the presentation did not display a large set of technical features of the device. On the contrary, it showed a drastically limited selection of the product's features. It was completed in a few minutes. The demo itself lasted only around three minutes and its scenario was utterly uncomplicated, mirroring the minimalist and purified set.

The vocabulary used by the demonstrator was also typical of exemplary high-tech demonstrations. It was largely "non-technical" and "user-oriented." It included familiar terms, superlatives and markers of enthusiasm (e.g., "I am super excited"). This vocabulary matched a casual attitude that also expressed itself in the tone and the clothes of the demonstrator, and that contributed to a will to entertain.

The use of short sentences and even slogans that were often repeated (e.g., "it's redefining Wi-Fi," "we're doing that without invading his privacy") also corresponded to canonical practice.

The search for audience participation, although very limited in the Wi-Fi case compared to the presentation of the aerobic piece of software, was not a singular practice either. It was a "trick" that was as banal as it was effective, and is not unique to high-tech demos. Thanks to the choice of the audience's members and their skillful guidance, the simplicity of use of the aerobic software could be emphasized. This method can be compared to that of a magician whose tricks tend to appear all the more spectacular as one or more members of the audience are involved (Jones 2011).[6] Many experienced demonstrators commonly use this technique so that the members of the audience can more easily identify with the ideal users of the technology displayed during the demo.

CONCLUSION

The staging of the "Demo Theater" session and more particularly of the Wi-Fi demo illustrates how demos were key to the high-tech conference. Together with other forms of public demonstrations, they contributed to making the high-tech event a demonstration festival and a demonstration of the strength, "success" and credibility of the company that organized it while serving the diverse aims of the many participants. The analysis of the demos' content also reveals how their details fitted and carried many of the stakes and values of the conference. In particular, demos helped create sociotechnical imaginaries (Jasanoff and Kim 2015) according to which technology appears a source of profit, pleasure, economic prosperity, and good for humanity. High-tech and capitalism were shown as compatible with a form of humanism and as a solution to many societal problems.

This study illustrates some of the practices and norms of production of demos in the high-tech field. These include the role of storytelling, the importance given to showing versus telling, and the implementation of techno-rhetoric. The study also brings to light the ways in which demos today help support technological promises, contribute to the marketing of technologies, and participate in economic life. It shows how demos may carry political messages in an entertaining way and contribute to a solutionist view of the world structured by solutions –

6 See also Katharina Rein's contribution to this volume of *Navigationen*, which focuses on the relationship between magic and demos.

especially technological solutions – applied to problems made public at demonstration sites. Furthermore, this case study illustrates the fact that demos cannot be reduced to proofs, persuasion tools, and theatrical performances in general. While helping put individuals in touch or bring them together through the mediation of artifacts in action, they also represent full-fledged forms of interaction and a major apparatus for anthropological and economic exchange.

Finally, this study brings to light how high-tech conferences represent privileged spaces for observing the production and uses of public demonstrations in today's world. Hopefully, such sites will be subjected to further empirical and analytical investigations by social scientists and media scholars in the years to come. Indeed, such explorations should no doubt help us better understand some of the ins and outs of demonstration society.

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HARDWARE CULTURE.

Tech Demo Modalities in PC Gaming Social Media Channels

JORDAN GOWANLOCK

Subcultures and social spaces relating to video games have been proliferating on online media platforms over the past decade. They see people playing games together, discussing games, making games, spectating e-sports, and simply watching each other play. One significant subculture focuses on the technology used to play PC (personal computer) games. Here, users and professional content creator "influencers" discuss the merits of different pieces of hardware and configurations, showing off their latest "builds" as others vicariously ogle their top-of-the-line kit. It is a world of metrics, benchmarks, technical details, marketing buzzwords, and endless debates, and it shows us how, for many people, playing games is as much about engaging with technical hardware underpinnings as with story, gameplay, or rules.

PC hardware culture has thrived online in part because it is about consumption. On a platform like YouTube, channels on certain topics yield more sponsorship income than others (Google YouTube Help 2022). A channel on philosophy, for example, has a smaller pool of potential advertisers than one on cosmetics or sneakers, and the viewers of certain topics have higher value to advertisers than others because they tend to spend more money. Thus, there is a wealth of PC hardware content on the internet, especially on platforms like YouTube. Media that cater to consumer cultures are nothing new, of course. Print magazines like *High Fidelity* and *Modern Photography* flourished between the 1950s and 80s when home stereos and photography were popular hobbyist pursuits. One might say PC hardware culture is therefore merely the most recent iteration of a long tradition, but we should not minimize what is unique about this culture and particularly about its forms of media.

Like hi-fi or photography magazines, PC hardware culture is about the technology of media, the stuff we use to create and consume media. It is also often about emerging trends at the "cutting edge" and projections of the future. While one might assume that the enthusiasts who consume these types of media merely sit on the sidelines dutifully consuming products, this article will explain how PC hardware culture plays a vital role in shaping emerging media technologies, helping to determine what new features and technologies get adopted and molding the technological imaginary. These findings are the result of a detailed study of how these PC hardware enthusiasts demonstrate, measure, and promote PC hardware on platforms like YouTube, forums, and specialized websites.

Studying PC hardware culture offers an opportunity to reconcile two influential schools of thought in contemporary game studies that focus on social elements and hardware respectively. Researchers like Mia Consalvo and Christopher A. Paul view the social aspects of games as fundamentally constitutive, contending with earlier views that saw games as a special space separate from society (a disposition unfairly attributed to Johan Huizinga) (Consalvo and Paul 2019). In sharp contrast, Ian Bogost and Nick Montfort propose with their "platform studies" a methodology where scholars go beneath games' rules, structures, and even beneath the code itself to study the hardware substrates for which they were programmed. They argue that we need to understand the affordances and limitations of platforms like the Atari 2600, with its miniscule amount of RAM and particular user interface, in order to understand the games that were made for it (Montfort and Bogost 2009). None of these scholars would be so strident as to argue their respective methods are the only way to understand games, but there is still much left for us to understand about the way social aspects overlap and interact with hardware. While the hardware underpinnings and the social construction of games may seem like they are opposite poles, in fact they have significant overlap. Building PC hardware can be an extremely social practice, and for many the practice of playing PC games is inseparable from hardware tinkering. Studying PC hardware culture offers an excellent opportunity to examine this overlap because it consists of social spaces and media where hardware configurations take shape. These social hardware spaces further pose an opportunity to foreground and negotiate the ecological stakes of media and their hardware.

PC HARDWARE IDOLS OF PROMOTION

While PC hardware culture is full of forums and Web 2.0 platforms where amateur users make media and exchange ideas, there are a handful of professionals we might call influencers or social media personalities who garner the most views. Generally, these personalities are backed by numerous behind-the-scenes workers and work within multiple media modes. Most have their own websites, some with their own forums and even their own subscription-based video platforms, but most see the greatest amount of traffic through their YouTube channels.[1] Because they tend to focus on YouTube, I will refer to these media groups as "channels." Videos featured on these channels cover consumer advice, reviews, and DIY tinkering guides. Prime amongst these is the Linus Media Group (Canada), with a combined number of approximately 25 million subscribers and over 5 billion views on YouTube. Other notables include Hardware Canucks (Canada), Paul's Hardware (U.S.), Gamer's Nexus (U.S.), and Hardware Unboxed (Australia). English language channels attract the most traffic on YouTube, but there is

1 Linus Media Group has its own video platform called Floatplane that it uses in parallel with YouTube where users get access to additional content for a subscription fee. Several other tech YouTubers also use it as a revenue stream.

also a great diversity of regional channels that can address local issues like tariffs, taxes, and the availability of certain parts in their market. Local channels also reflect the socioeconomic status of their region, with channels based in the global south often reviewing more modest hardware. Videos featuring top-of-the-line "halo" products reliably draw the most viewers, though. A notable German language channel Der8auer (2006–), run by Roman "der8auer" Hartung, gained notoriety by setting performance records "overclocking" the highest-end PC hardware products to squeeze maximal performance from them. At times these channels function as little more than trade show tech demos; they repeat the claims given to them in their press packet, they demonstrate the function of new features, and they try to cultivate enthusiasm for a new product. But they also play the role of gatekeepers and tastemakers, judging products and sometimes withholding recommendations, like any reviewer or critic.

The influencer hosts at the center of these channels conform to what Brooke Erin Duffy and Jefferson Pooley term "idols of promotion." Duffy and Pooley observe a progression over the course of the 20th century from "idols of production" (captains of industry and the like) to "idols of consumption" (celebrities and the idle wealthy), to idols of promotion. Each belies a shift in capitalist modernity, with the most recent representing a post-Fordist age of "a flattened celebrity culture, a precarious labour market, and the heightened injunction to brand oneself online" (Duffy and Pooley 2019, 28). Through their self-promotional acumen and platform manipulation, these channels occupy a different role than a reviewer or consumer advice columnist in a newspaper or magazine, at once more promotional yet also more given to sarcasm and snark, and they seem to have a much greater degree of popularity and influence as well.

Several figures in PC hardware culture have moved back-and-forth into "product" roles in retail and manufacturing companies. Linus Sebastian, of the Linus Media Group, started as a buyer at a PC hardware retailer called NCIX, making decisions about what products to stock in their stores. JonnyGuru, the most well-respected reviewer of PC power supplies, quit writing reviews and moved into a product development and engineering role at manufacture Corsair. Der8auer has taken on several projects helping to develop products for manufacturers as a sort of endorsement deal where he lends his brand to a product. Linus Tech Tips has had similar endorsement deals as well. While these branded products might be testing the ethics of consumer advice and review, this permeability between the roles of product developer and YouTuber points to the part these figures play in shaping the hardware that will be running the games and software of the future.

JORDAN GOWANLOCK

MEDIA FOR TESTING, MEASURING, AND DEMONSTRATING

At the heart of PC hardware channels is the principle of demonstration. These are spaces to negotiate emerging technical forms and their uses. In his critique of technological determinism, Raymond Williams argues that while the technical form of media like television does have effects on society, the forms of those technologies themselves result from social factors (Williams 2010, 14). In other words, we did not just discover television fully formed in a research lab one day, but instead its form was "looked for" by society long in advance of its invention. Once established as a concept, research and development resources were allocated toward making that media form a reality. But the question remains, where do visions of media technologies like television come from? Demos are a prime place to look for clues. Although demos are rarely impartial when they envision technologies, as they typically serve marketing and strategic ends for manufacturers or institutions, they are also dense texts that, as Christoph Ernst and Jens Schröter put it, bridge the "epistemic gap" between the present and future with an "amalgamation of hopes, fears, visions, and fantasies" (Ernst and Schröter 2021, 3).

Demoing has a long history in gaming culture. Between the early 1990s and early 2000s a large proportion (perhaps the majority) of distributed media in the video game industry consisted of "demos": smaller, usually interactive versions of games used as promotional samples. These became so ubiquitous they were commonly packaged with magazines and even in breakfast cereal. PC demos had a particular function with relation to hardware, as they offered the opportunity to test if a game would work on a given configuration without buying the game. In the 1990s the gaming industry developed its own events that were part tradeshow and part fan convention such as Supergames in France (now defunct), E3 in California, and the Tokyo Game Show. In these spaces game and hardware companies demonstrate products in a more traditional fashion, conforming to Wally Smith's description of the term, where the use of a technology is modeled within a fictional "frame" of demonstration (Smith 2009). For example, when Nintendo released its Wii console with its novel motion control configuration at the 2005 Tokyo Game Show, it showed people in a living room using its unconventional controllers to play games.

While Nintendo's 2005 demo of the Wii was an unmitigated success, demoing the inner workings of PC hardware can present some particular challenges for which the traditional trade-show demonstration is ill equipped. These challenges have brought about unique forms of media. If you were to demo a piece of PC hardware like a graphics card or processor using Smith's definition, the fictionalized scenario of use would merely consist of a person sitting in front of a computer. You could show the hardware running a game, but this does not offer much information either. The difference between the way two processors run a game can be a matter of a few frames per second, imperceptible to the human eye. These differences are even harder to see on YouTube, with its video com-

pression and limited frame-rates. Thus, new forms of demo media have emerged to make the inner workings of hardware more perceptible. A popular example of this is the software benchmark. Benchmarks give a computer (PC, Linux, or Mac) a difficult computing task and record the time it takes to complete, allowing the user to measure and visualize the differences between different configurations. These tasks vary depending on the application, such as CAD work, editing, gaming, or scientific computing. For example, 3DMark uses purpose-built 3D animated sequences that the computer renders in real time, as it would a video game. Thus, the visual output is very game-like, but the program also outputs abstracted data that PC hardware channels can process into charts and tables. Many contemporary games also have built-in benchmarking tools where they run through a specific sequence to test different computing challenges. PC hardware YouTube channels use these types of software to measure and make visible the often imperceptible workings of parts like processors, graphics cards, and storage.

Certain games have become institutions within PC hardware culture specifically because they are good for testing hardware. For example, *Shadow of the Tomb Raider* is a popular game because of its ability to tax both graphics cards and processors and because it can utilize different application programming interfaces (APIs). Some games are even more popular as benchmarks than they are as games. This is the case with *Ashes of the Singularity* by Stardock Games, because it is particularly good at utilizing multi-threaded workloads. Thus, it can test processors with increasingly large numbers of parallel processing threads. *Ashes* was designed to be a good demo because it was the first game to use Stardock's new game engine *Nitrous,* which they hoped to license to other game studios. This meant it functioned both as a game and as a tech demo for what their game engine could do. *Ashes* therefore has the strange distinction of being a game few people still play, while at the same time still being frequently shown and referenced on YouTube. The game *Crysis* is the most classic example of this merger of demo and game. Like *Ashes*, the series was developed by the studio Crytek to utilize their new game engine, called Cryengine in this case. The game was so taxing even on the most expensive of hardware it became a shorthand for a graphically demanding game. When a new demanding PC game is released now, numerous articles will appear online asking if it is "the new *Crysis*." There is also a popular meme called "can it play *Crysis*?"

Examples like *Shadow of the Tomb Raider, Ashes,* and *Crysis* demonstrate how inseparable hardware consumption and gameplay are. *Crysis* had appeal because of its gameplay mechanics and rules, its narrative, and its sci-fi world building, but more than anything it was consumed because it had cutting-edge spectacular visuals, and users needed the latest hardware to enjoy those visuals. This consumer logic recalls a similar phenomenon in home theaters, where the most spectacular films drive the desire for the most expensive consumer electronics (Pierson 2002, 1-11; Acland 2010). Yet this logic goes even further. Some games are visually spectacular without being particularly demanding of PC hardware be-

cause they are well engineered, or their appeal lies more in artistic invention. Yet these games do not have the same appeal as *Crysis*. *Crysis* and games like it are appealing because they are difficult to run. The fact that games and tech demos can be almost indistinguishable demonstrates that playing a game and assembling a computer can be deeply integrated, almost indistinguishable activities. Playing a game can entail a great deal of engagement with its underlying hardware, and the pleasure may not be so much in the playing as in choosing the right components, monitoring them, and tweaking them.

The YouTube genre of game "performance reviews" offers further evidence of this overlap between gameplay and hardware consumption. These videos assess a game purely based on how it performs, completely ignoring story and gameplay. There are generally two types of videos that fall into this category. The first measures how a game performs on a variety of hardware configurations. So, for example, playing *Red Dead Redemption II* on "High" settings with an AMD Vega 56 graphics card will yield an average 71 frames per second. The other type of performance review measures the resource burden of different settings in the game. For example, turning on multisample anti-aliasing will cause a 50% reduction in performance, but through side-by-side comparison it offers a clear improvement in image quality. Again, these reviews make use of a mixture of visual display and metrics. But they also support this modality of playing games that *Crysis* suggests: In PC hardware culture, playing games is always to some extent about the hardware.

As I have observed in other work, early computer graphics tech demos exhibited at conferences like ACM SIGGRAPH gradually began to feature more theatrical and non-demonstrational elements over time. At the same time, cinematic visual effects and animation began to exhibit the reflexive technical display of tech demos in movie theaters. The line between the theatrical and the demonstrative became blurred (Gowanlock 2019). This is a phenomenon that has repeated itself over and over through media history. Michael Allen describes how films that introduced new technologies like sync sound or Cinemascope had aspects of media-reflexive demonstration (Allen 2003, 101–12). As Acland and Pierson observe, these spectacles of new movie technology often dovetailed with consumer electronics, where spectacular visual and audio content drive demand for the newest home theater technology (Acland 2010; Pierson 2002, 1-11). This is the product of industrial strategy and consumer culture to be sure, but it is also vital for understanding spectatorship and technological change. These forms of media address the audience in a certain way that is media-reflexive in nature. As *Crysis* demonstrates, this is true of games as well. Indeed, some games push reflexivity almost to the point of absurdity. In *PC Building Simulator* players choose from lists of hardware and build their own PCs in a virtual environment using 3D models of actual licensed PC hardware. To date, the game has sold over 4 million copies.

SHAPING MEDIA TECHNOLOGY

One of the aspects of PC hardware culture that differentiates it from its antecedents in spectacular feature films, home theaters, or hi-fi enthusiast magazines is its sociality. Most benchmarking software has the option to upload results to online databases, allowing fans to compare their own results to those of personalities on YouTube. There are also websites like PC Part Picker that allow users to share their own system configurations, listing hardware specs and uploading images of the finished product. This very technical activity of assembling the hardware substrate for running games is a fundamentally social activity, and these social interactions are key sites where users and consumers influence the shape of new media technologies. Of particular note is the way YouTube channels now leverage social interaction as a source of market research.

PC hardware YouTube channels often discuss hardware that is in a pre-preproduction or prototype stage. This is a chance for manufacturers to build promotional anticipation for the product, but it is also an opportunity to gather feedback. Indeed, there are examples of particular videos influencing new products. A Linus Tech Tips video titled "I Inspired This Product" (2022) discusses a new laptop with a screen resolution-setting feature the channel had called for in a past video. In addition to giving their own notes, the hosts of these channels also often ask their viewers for input. Steve Burke at Gamers Nexus (2009–) often concludes his coverage of consumer electronics trades shows saying, "let us know what you think in the comments." Hosts also talk about the feedback that they get in their own website's forums. These channels are not just spaces for promotion and consumer advice, they do market research via the social spaces in and amongst their various forms of media.

Some of these channels also use statistical sources of data for market research using affiliate links. Affiliate links are a common source of revenue for social media and websites. For example, if a YouTube video is talking about a certain type of processor, they will provide a link below the video where viewers can buy that product on Amazon, and the channel will get a small percentage of any sales Amazon gets from the link. An interesting by-product of this is that the YouTube channel then gets the information about how many customers they referred. Linus Tech Tips has been very transparent about this process. In fact, they have videos where they share their data, discussing why their viewers are buying specific products (Linus Tech Tips 2018). While they seem keen to share this information, it also has valuable market information for both the channel and their advertisers.

Through mechanisms such as elicited feedback in YouTube comments sections and Amazon affiliate links, these channels are able to use the social spaces they have created as a source of market information for manufacturers. Say, for example, a channel profiles a new computer case and through these feedback sources the channel hosts learn a certain feature is very popular. They can then in turn relay that valuable information to their advertisers who may make design de-

cisions based on it. Thus, this is not a case of computer hardware manufacturers simply telling people what they want and creating hype with their advertising dollars in a top-down, strategic fashion. Instead, it is a more transactional process. This look into PC hardware culture gives us some insight into how changes in media technologies happen over time. And this phenomenon is hardly limited to PC hardware culture. Consumer technology channels that review everything from smartphones to cars like Marques Brownlee and Unbox Therapy fulfill a similar role.

Several PC hardware technologies have taken shape in this context. High-frame-rate displays have been one of the largest changes to PC hardware in the past decade, and feedback from these enthusiast cultures has influenced the technology. Traditionally, computer displays have run at 60hz, while video games and movies tend to run at 30hz. In the 2010s PC monitors started to appear that ran at even higher numbers, like 120 or 144hz. This became a coup for the PC hardware industry because rendering all these extra frames in a video game requires more robust and therefore expensive hardware. The "top of the line" became twice as high, in other words. Gradually this technology has found its way into laptops, tablets, and even smartphones, because it offers slightly smoother motion and a higher number to advertise in marketing material. While this was certainly a success for the product developers and marketers, this was also a social process. Message boards full of debates have proliferated, discussing the merits for competitive online video games and whether, in fact, a human can even perceive the difference between different refresh rates. A variety of YouTube videos and articles from PC hardware channels discuss these debates and conduct tests, acting as arbiters between the consumers and manufacturers.

It is worth noting that the influence these channels and their viewers are having on new media technologies is a far cry from the "tactical" fan agency theorized by Henry Jenkins (Jenkins 2013, 9–49). These processes are more about market research and product development than social change. This culture does have a significant industrial influence, though. As financial markets soared to untold heights in 2021 amid a surge in "consumer investors," Nvidia, a company whose main revenue source is high-end PC hardware, became the eighth largest company in the world by market capitalization, surpassing companies with ten times their revenues (Bary 2022).

MEDIA ARCHAEOLOGY AND HIGH-TECH TRASH

The influencers and YouTube channels of PC hardware culture generally collude with the industry at large in terms of the way they promote enthusiasm for the hobby and benefit from consumer sales through sponsorship and affiliate links. They also rely on hardware companies for advertising revenue. One channel gets 41 percent of its revenue from these companies, and others likely rely on them even more (Linus Tech Tips 2020). Yet there are some notable points where the

channels push back against the logic of consumption, notably on the subject of obsolescence and repair. Laptop builders, Apple in particular, have favored construction methods that make opening and repairing their products difficult, and they restrict the availability of replacement parts. Channels will often attempt to take apart hardware to see what is inside and criticize manufacturers for being unfriendly to repair. A very common complaint is that laptops sometimes have normally-replaceable and upgradable parts like RAM soldered in place, forcing the consumer to pay for inflated upgrade costs at the initial point of purchase. Generally, these points of friction amount to minor complaints in an otherwise positive review of a product, but occasionally a YouTuber will bring the very concept of buying new products into question. Steve Burke at Gamers Nexus has on several occasions recommended against buying the newest products simply for the sake of having the most up-to-date hardware, saying "if you don't need it, don't buy," citing the role consumption plays in generating e-waste.

Although Burke's statement is the most explicit rejection of a system of constant consumption (and the e-waste that goes along with it), there are other more subtle cases where channels question the idea of newness through an encounter with old defunct media. In a Linus Tech Tips video titled "NVIDIA Thinks These GPUs Are Worthless," the host takes graphics cards that were top-of-the-line a few years ago and compares them to contemporary performance standards (Linus Tech Tips 2021). This encounter with old media hardware momentarily disrupts the enthusiasm for novelty that usually motivates these channels, instead confronting the viewer with how rapidly the new becomes obsolete. The host remarks in the video, "This was once a 700-dollar GPU but now Nvidia says, 'you know what? It's worthless. It's garbage'…"

These videos that revisit old media hardware are in effect a kind of media archaeological exercise. While they may not be uncovering the conditions of knowledge from a given period in history the way a Kittler or Foucault-inspired media archaeology would, especially given that some of the hardware is only a few years old, they do demystify some aspects of media technological change over time. Jussi Parikka and Siegfried Zielinski both describe media archaeology as way of questioning narratives of media technology advances. Zielinski (2006, 7) writes that media archaeology counters the assumption of "predictable and necessary advance from the primitive to the complex apparatus," and Parrika (2018, 13) describes how it can overcome the "strategic amnesia" of digital culture. Videos with old hardware like these remind viewers of all the over-hyped features that have been abandoned and of how quickly their new purchases will age.

Encounters with these artificially obsolete pieces of hardware are a demonstration of what Charles Acland (2007, xiii–xxvii) terms "residual media." Acland's term extends from his interest in the social processes that produce emergent, dominant, and residual media forms. An encounter with leftover, disused, abandoned, or junked media offers an opportunity to reveal the social processes that manufacture the new. Acland writes, "if there is a reigning myth of media, it is

that technological change necessarily involves the "new" and consists solely of rupture from the past. This preoccupation neglects the crucial role of continuity in historical process… it ignores the way the dynamics of culture bump along unevenly, dragging the familiar into novel contexts" (Acland 2007, XIX). Thus, while PC hardware culture relies on the logic of constant novelty, there are some limited examples where channels can disrupt or reveal this logic.

GENDER AND THE "PCMR"

While the social spaces created by PC hardware channels create opportunities for the public to influence the development of new media hardware, competing in some small way with the strategies of manufacturers, it is worth noting that not all users have an equal say, and that these spaces can be extremely exclusionary. The most salient aspect of these spaces is their extreme gender bias. The maleness of this culture is evident both in the content of the channels themselves and in the constitution of the greater culture. Although the culture does not have the open acrimony of the "gamergate" movement, there is still an abundance of off-hand sexism in PC hardware forums, and the perception of PC hardware as a male space goes largely unquestioned. While users are having an influence on the hardware that, in turn, will be shaping the games of the future, only certain users are really having a say.

As game culture in general makes gestures toward greater inclusivity,[2] PC gaming and PC hardware have become the last bastions of exclusionary game culture. Mia Consalvo and Christopher A. Paul observe in their ethnographic work that PC gaming is constructed by players as a purer, more accurate, and more real gaming experience by its advocates (Consalvo and Paul 2019, 71). The hardware aspects of PC gaming are vital to this discourse of exclusivity because this faster, higher-definition experience requires specialized hardware. This creates a hierarchy that privileges PC gaming as opposed to "casual" platforms like mobile gaming. Added to this is the elitism of technical know-how required to assemble and configure a PC. This discourse creates a category of "true" gaming that belongs to people with the material means to buy hardware and the opportunity to acquire technical knowledge, keeping it in the domain of relatively affluent males

2 In 2018 Xbox head Phil Spencer devoted his entire Academy of Interactive Arts & Sciences D.I.C.E. Summit keynote to the lack of gender equity in the industry and called for change (Spencer 2018). The organization Women in Games (founded in 2009) holds annual conferences and advocates for women in the industry. The industry's most high profile "Me Too" moment came in 2021 when Activision Blizzard head J. Allen Brack resigned amidst a high-profile lawsuit, worker walkouts, and regulatory scrutiny over "a pervasive frat boy culture" and widespread sexual harassment at the studio (Whipper 2021).

in the most affluent countries.[3] Indeed, PC hardware forum users tend to look down on those PC gamers who buy pre-built systems instead of building their own.

Game reviewer Benjamin Richard "Yahtzee" Croshaw mocked this culture of exclusivity, purity, and hierarchy by coining the satirical terms “dirty console playing peasants” and “glorious PC gaming master race” (The Escapist 2011). However, this satire has transformed into a popular way for PC hardware culture to label itself, often abbreviated to “PCMR.” The most popular subreddit on PC hardware bears this name, and so does a popular brand of input devices for PC. On social media when someone builds their own system, they will sometimes jokingly say they have “ascended,” meaning they have risen to the highest tier of gaming, the glorious PC master race. Uses of these terms are tongue-in-cheek, but they still belie an enduring elitism and an exclusionary sense of humor designed to provoke.

While there is an increasing number of gender-diverse people streaming games and making YouTube videos about gaming, there are only a handful of minor exceptions to PC hardware’s maleness. TastyPC, one of the most prominent women PC hardware YouTubers, has about 100,000 subscribers, a comparatively modest number. Even more striking is how gender is represented on the most popular channels. Within the hundreds of videos I watched, amongst the channels I studied, only two feature women on screen and do so only occasionally. One host includes his wife on occasion, who knows little about the hobby, and the other periodically features women production crewmembers (one of whom is the host’s wife), again, none of whom have knowledge about PC hardware. Indeed, a popular trope on these channels has women ineptly trying to build a computer using their limited knowledge. Four of the five women who have appeared on these channels have been in such a video.

This gendering is indicative of a bias that has been at work in computer hobbyist pursuits since the 1980s. Before 1985 it was common for women to pursue the discipline of computer science, but during this decade their enrollment began to drop, and the field gradually became one of the most male-dominated. In her study of the subject, Jane Margolis theorizes that this was in part due to the rise of computer hobbyist pursuits (Margolis and Fisher 2001, 1–5). It was becoming common for computer science students to tinker in their spare time, and boys were vastly more likely to be introduced to computers as a hobby. In this case and in PC hardware culture, people are excluded from the design of the hardware that runs our media. Indeed, we might ask ourselves how gaming hardware

3 Racialization can of course significantly overlap with wealth and educational opportunities needed to participate or work in PC gaming. In the United States, black workers in particular are underrepresented in the game industry (Toulon, 2021). At the same time, PC hardware culture has some prominent representatives from racialized groups, and in the UK BAME (Black, Asian, and minority ethnic) workers are statistically overrepresented in the game industry while women are underrepresented (Taylor 2020).

would have been different if the hobby had been coded as a girl's hobby. What different affordances and conditions might it have produced? What different types of games would be made for these platforms? How might the interfaces or the standards of progress be different in the industry? While this might seem like imposing gender upon a neutral subject – how is a processor affected by gender? – it opposes the assumption that hardware is self-evident and immune from social factors.

CONCLUSION

PC hardware culture has produced unique forms of "demo" media that allow access to the inner workings of the hardware that run PC video games. These forms of media show us the extensive overlap between the hardware underpinnings of games and the social construction of games. Indeed, for many in this culture playing games is primarily about configuring, tweaking, and testing hardware. The social spaces that have formed around these media have had a marked effect on the shape of emerging media technologies. The mechanisms these channels have developed for turning user participation and social activity into market research for hardware companies made this possible. While these YouTube channels are often actively influenced by marketing from manufacturers designed to shape their opinions, and the channels are beholden to this industry as a key source of revenue, there have been some cases where they have gone beyond being mere extensions of consumer industries. By occasioning encounters with archaeologies of past, they reveal the mechanisms that constantly manufacture newness for its own sake, and the high-tech trash that accumulates as a result.

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DEMO SKILLS IN TECHNOLOGICALLY WILD SETTINGS.

The Demoscene

CANAN HASTIK

INTRODUCTION

The demoscene unites technology and demonstration in equal measure. However, the artifacts of the demoscene do not motivate participation or interaction, as they usually lack a narrative and are not generally politically oriented (Reunanen 2010, 48; Hastik 2022, 158). In the demoscene, creating software programs and code to generate demos aims to impress an audience, particularly the demoscene community. The scene integrates the demonstrative, not only as a "specialist art" but also as part of broader discourses on hardware, materiality, and coding practices. As Botz (2011, 387–390) notes, a demoscene production is essentially related to the hardware used and thus embedded in general discussions about the materiality of the computer. In the broadest sense, demos are a collection of hardware-specific technical functions that can be almost as diverse as the actors who conceive, design, implement, approve, rate, and share these works along a kind of 'demoscene production life cycle', a process of creating value through the design and sharing of hyper-realities[1]; these are either digital demoscene productions that distort the reality they purport to depict, or do not depict anything that actually exists, or represent the current cultural state constituting the scene's reality and the audience, in terms of a contemporary form of intangible cultural heritage" (UNESCO 2021). Finally, it remains a matter of debate whether demoscene artifacts will endure as a contemporary new media art form through the continuation of traditional historical art genres, or whether "there is no such thing as 'art', there are only artists" (Gombrich 2001, 13) and their audience. For the demoscene, their works come to life through the artists (groups) who produce them, the audience that adores these artists (groups), and the experience of a work presentation at a scene event. Therefore, the demoscene phenomenon is sometimes compared to a performance in which artists act on a defined platform within specific artistic roles and want to present and show something (Walleij 1998; Botz 2011, 331–334). The demoscene is a demonstration culture generating code on distinct platforms and communities around them. The scene is demonstrative in its expression, for a community that lives this as something natu-

1 The term hyper-realities refers to generating hyper-realistic works with their codes in which they combine surreal fantasy with science fiction, audiovisual experiments based on pure computational algorithms, but also building virtual communities connected to reality next to their real life realities (Baudrillard 1994, 6).

ral, and established as a philosophy of life and culture. In the current perception, this scene is one of the oldest and most persistent European hyper-real communities we can currently record – hyper-real, because people exist, know each other, and meet, especially at the events but mostly only via virtual channels. From their virtual meetings, the activities are transferred to the real. From their virtual meetings, the activities are transferred to the real and are finally immortalized in digital. The renowned real meetings are thus at once a meeting place, competition, and learning venue. Usually, everything starts in the virtual and ends in the real. This hyper-reality is therefore something that motivates and creates identity at the same time. Science often has a habit of interpreting cultural and social events without actively involving the actors. The demoscene is a master of a semiotic multimodal (Jewitt and Henriksen 2016) niche; according to Stöcker (2011), the production of the demoscene represents in its code, function, and presentation as a sign complex communication that can only be understood as multimodal – yet as real without the need for a million followers. Furthermore, the creative and state of the art work of the demoscene has been well documented in demoscene archives, e.g. the C-64 Scene Database (CSDB 2022), and is therefore very findable and accessible. In its original form, on a program code level, these artifacts are mostly neither interoperable nor reusable (Hastik 2022, 170), but the "sceners" continue to establish their tradition with their ideals and their own FAIR principles (GOFair 2022).

This article examines the development, creativity, and community of practice of the demoscene by focusing on the performative aspects of technology and demonstration. This leads to a summary of the settings of the demoscene subculture and its activities which aim to impress and entertain the community by creatively using hardware and producing software programs and code, thereby demonstrating skills.

THE DEMOSCENE

As a historically grown digital-cultural phenomenon, the demoscene has been recognized as "intangible cultural heritage" since 2021 (UNESCO 2021). With its rich history dating back to the late 1980s, the demoscene – sometimes written "demo scene", "DEMO scene", or for short simply "Scene" or "scene" – nevertheless seems to remain on the fringes of the scientific field. The reason for this lies in the technologically demanding and non-commercial works, which should also "receive more recognition as works of art" [2] (Deutschlandfunk 2019; transl. C. H.). The scene is far older than the internet, even if it has not registered more than 3,500 followers on the most frequented @pouetdotnet Twitter account (pouët.net 2012) and around 1,158 online users at Discord (2022) with several channels, e.g. for demomaking, demoscene media, demoparties and more. The

2 Original quotation: "als [digitale] Kunstwerke mehr Anerkennung finden" (Deutschlandfunk 2019).

scene quickly adapts technological developments ad hoc, shows exemplary archival achievements and is extremely committed to its community of attendees and participants. This community with its own infrastructures, e.g. web archives (ADA 2022), messaging systems, GitHub source archive (GitHub 2022), file server (scene.org 2022), software tools, and copyright system[3] (Pouët 2022), demonstrates a unique cultural and instrumental practice, culminating around distinct computer technology and the production, distribution, and competition of audiovisual works in real time.

The development of the demoscene culture can be better understood if it is contextualized historically. With its roots in the early 1980s – when home computing became widely available, computer games took over, and programming turned into a popular pastime – the demoscene provided fertile ground for the software piracy scene, first in the USA by the Apple II and Atari users (Levy 2010, 279), then in Europe with the Commodore 64 (C64), the ZX Spectrum and later the Amiga computer (Wasiak 2012; Reunanen 2014). The activity of removing copy protection from software products (especially computer games) – which is of course an illegal activity per se, but which was carried out by computer enthusiasts in order to be able to share, exchange and distribute software with other technically interested friends – created a split in the scene. While removing the copy protection, so-called "crackers" or "cracker groups" also used this opportunity to create a kind of splash screen in front of each cracked game as an expression of their creative achievement, consisting of pseudonyms, logos and drawings that made them identifiable as the authors. Music was also very important from the outset. It was coordinated with the artful and elaborate programming focused on visual effects and made the thunderstorm of visuals more eye-catching, memorable, and entertaining for the viewers.

This form of signing or marking later gave rise to the popular demoscene forms of artistic work such as "intros", "invitations", and "demos", which are categories still used today for competitions worldwide. Even if the demoscene was very strongly influenced by the illegal cracker scene and experienced its upswing through it, it is ideally rooted and shaped by the legally active hobby computer and hacker culture of the late 1950s – known as the Tech Model Railroad Club (Levy 2010, 6). This early hacker culture emerged as a student organization with a scientific background but today it is a less popular hobby culture. Since the demoscene is retrospectively defined by its demarcation from the illegal cracker scene in the early 1990s, its cultural significance results from its splitting. The demoscene culture is thus a product of its activities and includes further conditioning elements and values relevant to the scene. Summarized as an unwritten law, this value system is based on the obligation to explore computer systems, to overcome their limitations, and to transcend technical possibilities. Again, due to

3 Which is far more strictly regulated in terms of the music used than in terms of the generated programmed codes, aesthetics, economy, and social stratification.

the impetus and the developments of the cracker scene, a similar competitive orientation arose. Events are organized in which all active members come together to present, share, rate, and publish their works in hit lists or charts. The demoscene culture is characterized by these activities, settings, and works that convey its values, are celebrated by the community, and encourage imitation. With platforms such as the C64, Amiga, and Atari ST, demoscene works became more advanced. Graphic elements such as icons and animations emerged which were cited and evolved over time into "recognizable icons of platforms that represent an emotional approximation of technological artifacts" (Wasiak 2013, 66). This led to a symbolic aesthetic typical of the demoscene that includes elements such as the copper bars and other old-school effects (demofx 2022) which were named e.g. after hardware properties such as the Amiga's co-processor. While demoscene productions thus became increasingly advanced and enhanced with colorful designs – consisting of graphics and animations, music, and textual elements such as messages and greetings – demo coding gradually became an independent discipline. Since creative freedom is limited by the technical resources, specific coded graphic tricks serve as a benchmark for comparison. Parallel to this development and to the events and competitions (Demozoo 2022), websites, forums, and archives emerged, and newsletters, journals, and magazines were published. After it cut loose from the illegal cracker scene, the demoscene already looked back on a rich repertoire of artifacts produced for and presented on diverse hardware platforms, which not only played a major role for the scene's creative output but became its main classifier. Classic hardware platforms play a major role in the scene. Besides the C64, which was the most popular platform in the 1980s, the dominant platforms of the 1990s were Amiga, DOS, and Atari, which were largely superseded by Windows from 2000 on (Stamnes 2012). In addition to these main platforms, the demoscene always discovers, salvages, and "revives" old, extraordinary, and unique hardware, which they also (re-)engineer, explore, expand, and share. Over the years, due to expanded possibilities and more powerful computer hardware, the demoscene focused increasingly on aesthetic aspects in their productions. The range of hardware types and competition categories became almost unlimited in terms of facets and combinations (Hastik 2022, 178).

The strongest year to date of the *Revision*, the leading demoscene event worldwide, in Saarbrücken, Germany, was 2019, with over 160 submissions. In previous years, new categories had been established from time to time. However, some were neither permanent nor of particular interest to the community. Most works (Revision 2019) are submitted in the categories "pc demo", "pc 4k", "oldschool demo", "4k procedural graphics", "wild demo", and "animation". During the period of social distancing from 2020 to 2021 the scene's productivity fell.

Despite the scene's affinity for technology and the collaborative working methods during the mostly long (pre-)production phases of their works in virtual teams, the demoscene appreciates their get-togethers and special community

meetings with their competitions, be they real or virtual. For specific aspects, experts come together in different virtual teams, exchange ideas, and share and combine their developments. The productions are often finalized but rarely created at the events. Only if there are not enough submissions for a category that the community starts to produce so-called "compofillers" (Pouët 2021) which are rarely technically and aesthetically elaborate.

The demoscene thus creates both virtual-aesthetic as well as real spaces of experience with its works and events and establishes hyper-real forms of collaboration and cooperation for internationally networked teams.

PHENOMENOLOGICAL ASPECTS AND PRODUCTIONS

Although the productions and the scene are repeatedly placed in art-related contexts, the main features of the demoscene do not correspond to the current understanding of contemporary new media art, since its works usually lack a theme, plot, or message. However, there is an understanding that computer-generated digital art continues traditional historical art genres (Paul 2008), but also that art only emerges in the discourse surrounding a work, which means that it should be considered from an art-sociological and phenomenological perspective (Hartmann, 2017). The demoscene artifacts can be seen in the context of early computer-generated graphics (Hastik & Steinmetz 2012, 35) and algorithmic art (Reunanen 2010, 28). Due to its performative nature, the demoscene is also associated with other subcultural scenes such as rave culture (Maher 2012, 204), punk rock culture (Maher 2012, 181; Reunanen 2014, 4), or club culture (Wasiak 2012). The demoscene also has relations to the retro computing movement (Höltgen 2020, 21).

Due to its growing role in media history and media art, as well as its high-level enhanced community of practice and the cultural relevance of this intangible cultural heritage (UNESCO 2021), the scene and its artifacts have already been presented in several exhibitions.[4] It is reasonable to assume that the demosceners "were in front of trends just now coming to the fore in mainstream art" (Maher 2012, 204). One reason for the absence of demoscene productions in contemporary art discourse may be the lack of contextualization (Maher 2012, 204), which is related to scene language, verbal and aesthetic expression, and socio-cultural aspects (Hastik 2022, 159).

4 E.g. *Electronic Kindergarten* in the Wiener Werkstätten and in the Kulturhaus 2001 (Division 2001), *DEMOSKENE. KATASTRO.FI* at the Museum of Contemporary Art in Helsinki 2003 (Demoskene.Katastro.fi 2003), *Typography Films – Writing as an Image in Motion* at the Center for Art and Media in Karlsruhe 2013 (Scheffer et al. 2014), or *History of the demoscene* in the Museum of Technology and Industry in Warsaw (retronavigator 2014).

According to the two leading demoscene archives, pouët.net (launched 2000) and Demozoo (launched 2013)[5], the number of works registered in their databases has increased since 2016 by 26,000 to 88,258 and by 105,553 productions to 141,676 works (Hastik 2022, 249). There are also numerous smaller and more specific archives, e.g. The Hornet Archive (Mann 2022), websites by projects (farb-rausch 2004), groups and artists (viznut 2018), and file archives (Atari FTP Archive 2015). In addition to the categories defined by Borzyskowski (2000), today these are more diverse, up to 35 variations or even specializations being based on "demo", "invitation", "cracktro", "discmag", "procedural", "64k", and "4k". In particular, a categorization according to storage space and computing capacity is used for sub-classification and can be combined as desired with the conceptual categories, e.g. "artpack", "discmag", or "slideshow" (Hastik 2022, 177). With the advent of further technological platforms, categories can no longer be differentiated purely conceptually. Not only new environments provoke new concepts where resources are used extensively. But still the demoscene challenges these resources, forces efficient utilization and a reduction to the essentials. Thus, categorizing works according to storage space requirements is a useful criterion. The size and volume of the works in bytes allows them to be classified based on their "algorithmic elegance" (Gonring 2009, 111) and hardware specifications which are regarded as an essential quality criterion of the works. An algorithm is mathematically elegant if it is efficient, computes the desired results quickly, accurately, stably, and reliably, is simple, and transparently maps the shortest path to solving the problem (Deuflhard 2008). But unlike the size, conceptual aspects of the works cannot be differentiated and thus categorized so clearly. To define further work characteristics, a standard vocabulary is required with which characteristics typical of the demoscene can be distinguished. Botz characterizes the art of the demoscene not only in terms of size, but also in terms of established norms and traditional effects (Botz 2011, 387). The level of quality and complexity of the design produce its value in relation to the hardware possibilities. Hardware limitations ensure more creativity. The quality of the artwork is thus negotiated between the elegance of the code and the aesthetics. This is where the community becomes important; it drives the production of works and elicits maximum performance by its members.

THE DEMONSTRATIVE DIMENSION OF THE MATERIAL

The scene consists of a wide range of members who differ significantly in their activity and passivity. It mainly gathers graphic designers, musicians, and programmers, but others also add required skills. To develop and produce projects, they organize themselves into groups that merge and separate depending on the project idea, and their members often appear under different names, usually pseudo-

5 Both archives offer similar access to the stock in terms of content.

nyms (Borzyskowski 2000). The dynamic and productive structure of the demo groups is thus barely comprehensible and traceable for outsiders to the scene.

The graphic artists show their skills at creating images and textures, the musicians contribute with their compositional creativity, and the programmers, also called "coders", demonstrate their technical programming knowledge (Hastik and Steinmetz 2012, 36). There are only a few publications that provide rudimentary insights into demo groups by presenting individual portraits (Kringiel 2006; Scholz 2007) or by tracing some interactions of specific actors (Wasiak 2013). The exact number of groups and members can only be vaguely estimated. A look at the relevant archives provides a rough picture. Demozoo recorded 14,575 groups and 48,990 sceners in October 2016, with synonymous spellings also being counted in the number of groups. By summer 2022, the database registered as many as 25,648 groups and 97,840 sceners. The most popular scene archive, pouët.net, recorded 11,964 groups and 21,579 portal users in October 2016, 13,360 groups and 25,422 users in December 2022. On the one hand, the real actors and their multiple scene identities are unclear, and on the other hand, no further data on the user accounts are recorded; hence these numbers cannot be read as actual membership figures for the demoscene. But even if the counts are obviously very inaccurate, it is clear that the scene is alive, has an ongoing need to negotiate its status in society and prove its relevance. The community is not only the engine of the scene; with its developments and production output it also illustrates and documents its viability and collaborative practice in complex interpersonal networks. The "hands-on" approach and central motivation of the actors is: What does exist and how can a problem be solved? As already mentioned, the demoscene is a fascinating topic for research in many ways, e.g. with respect to sociological, aesthetical, art historical, and media-theoretical aspects. There are interesting treasures to be found, especially regarding social structures, group activities and dynamics, and the distribution of roles within the groups and within the scene in general, as well as regarding translocal and transnational cooperation, the localization of the groups, and their geographical distribution. Reputation in the demoscene is gained by creating artworks on historical, limited, and exceptional platforms; this fact is the baseline for the entire community structure. The demoscene events, also called demoparties, are considered the centre of the scene. Many scene artists meet here and show their works to the public, but events have long been broadcasted live online as well. The scene's language and its distinct discussion culture is special and it quickly adapts established methods of online communication. The number of participants, either online or at events, is usually around 1,000 active members. Demoscene forums serve not only to archive the productions, but also to discuss them and provide support. The comments are statements; they are a mixture of subjective opinions, such as short, positional, emotional statements with imagery, often sprinkled with irony, sarcasm, humor, and emphasis, represented in repeated letters (vowels, exclamation marks, and more) (Hastik 2022, 165). The demoscene has its scene-specific or-

thographic style, e.g. leet speak (Urban Dictionary 2022), which emphasizes the statements and represents technical insider nuances. The main language of communication is English, including neologisms and subject-specific terminology used to describe artwork features, creative production techniques and programming tricks.

The scene positions itself culturally in the nexus between real gatherings and virtual hyper-realities. It becomes clear that the demoscene follows its very own production and communication practices, which are strongly linked to hardware specific aspects and topics. Almost every kind of material can be considered a working platform and tool influencing the creative output. The resulting cultural and technological articulations provide a context that lends itself to a variety of in-depth explorations.

THE DEMOSCENE IN ITS "WILD" FORM

Regarding the terminology and history associated with the nexus of technology and demonstration, the terms "tech demo" or "mother of all demos" are not commonly used or referred to in the demoscene. The slogan "Demo or Die" nevertheless refers to a series of works by different artists, groups, and concepts in the demoscene. It remains unclear what these exaggerated work titles could refer to and what the possible motifs of interpretation are. Perhaps it is a demystification of the computer, a first attempt towards a serious error culture as a creative principle, or other aspects of material-digital aesthetics. Nine works on pouët.net are named "demo or die", even if Demozoo literally draws a slightly different picture. The series *Demo or Die! Vol. 1 to Vol. 6* by Abyss (Pouët 2005c) is a demopack release, a demo compilation video DVD from the years 2005 to 2009. The latest production *Demo or die* by Genshiken & Red Fez Studios from 2016 is a very pleasing Linux demo (Pouët 2016). Its source code has also been published on bitbucket.org (yawin123 2017).

One of the many non-classical demo types and competition categories is the "wild demo". To show and negotiate the intersections of technology, individual and society, politics, performance, and aesthetics as well as the human and technical scope of action, the 'wild' category with its community network is exemplary. The heterogeneity of this category and the examples chosen in the following are at the same time very well suited to outlining the demonstrative aspects and specifics of the scene.

For example, the works "*SHizZLE*" (Pouët 2005a), "*T42 - Tennis for Two 2011*" (Pouët 2011), and "*Code Red*" (Pouët 2013) were under discussion in the pouët forum. These three works have been released in the *wild demo* category, which is basically a hodgepodge. Anything that doesn't fit into any other category can be found here: platforms could be anything a demo runs on, without any size limit, and thus allows one to get the maximum out of the chosen hardware with a maximum showing time of 8 minutes – at least according to the competition regu-

lations of *Revision* (2022). "*SHizZLE*" is a 512-kilobyte wild demo on a Pokémon micro handheld game console with flash card by Team POKéMe & friends that has been released at *Breakpoint* 2005 in Bingen, Germany, and ranked in first place in the "Console/Real Wild" category that year (Demozoo 2021). Team POKéMe is an international group mainly organized by p0p, a German demoscener mostly responsible for graphics and together with Lupin for coding. In addition, JustBurn from Portugal developed the emulator, asterick from USA programmed another emulator development and debugger, DaveX from France provided the first working homebrew code, and Dark Fader from the Netherlands provided additional tools (Pouët 2005b). The conceptual level of the work is also described in great detail in the credits: Image Fade is realised by Lupin with coding and GBADoctor for graphics, while the SHizZLe intro part is coded by p0p and graphically enhanced by ravity. Moreover, Infinite Sprites were developed by Orion, Wormhole by Lupin, Voxel and Blobs by dox, Sine Dots and Plasma by Orion, Tunnel and Fire by Lupin, Bump Mapping code and graphics by dox, Leaf Scroller code and graphics by ph0x, Lens Effect and Rotozoom by ph0x and rack, 3D animation by Code, Booby Scrolly by Lupin and p0p, and XBOX Rumble by Lupin and ravity. As the list of credits shows, mostly common visual effects – which belong to the standard repertoire and allow comparability to other demos – are implemented. Furthermore, the distinct technological constraints require strong skills in reverse engineering, emulators, debuggers, and flash cards. Music is produced by Fridge. SHizZLe received the second-highest developing rating and was nominated for the Scene.org Awards (in 2005) for breakthrough performance. This award honored the best demoscene releases from 2002 to 2011. In the meantime, the work has slipped somewhere into the top 150 most famous demos on pouët.net. In fact, the determination of the ranking within the type and competition category is only very vague. While the website (pokeme.shizzle.it) had over 200,000 visitors within a few hours and was temporarily inaccessible due to the high volume of access, the video on YouTube has just over 21,000 clicks to date (edgartheface, 2007). During production, the active members exchanged views on IRC EfNet, channel #pmdev. Later the community moved to http://pokemon-mini.org and finally to Discord, where the topic "Pokemon Mini" is still being discussed in various channels and referenced due to exceptional hardware restrictions.

Another example is "*Code Red*", a wild demo of 4 kilobytes produced by MEGA – Museum of Electronic Games & Arts for the *Revision Easter Party* 2013 in Saarbrücken and labeled "a first ever homebrew rom for the Entex Adventure Vision […]" (Pouët 2013). Adventure Vision is a unique console from 1982, described by MEGA as "one of the rarest objects of technological history" that they aim to introduce "as a new demoscene platform" (MEGA 2013). Again, with this project strong reverse engineering, programming, and debugging skills were needed to develop a custom bios. The underlying design concept is described scene by scene in the credits (Pouët 2013). Each cut scene presents a graphical

effect usually produced by a coder and a graphic designer. Intro is coded by sy2002, Scrolly by Mr.Blinky, and Graphics of the three first scenes are made by p0p. Mad Checkers is coded by JAC!, 3D Stars by dndn1011 and Wa. MEGAzoomer is made by sy2002, p0p, dndn1011 and Wa. Checkerboard is developed by JAC!, Mr.Blinky, and p0p. Twizt is coded and designed by Mr.Blinky and p0p. 3D Objects are coded by dn1011, Mr.Blinky, and p0p. Boobie Girl is coded by Mr.Blinky, p0p & Chibicibi. Music is composed by Skyrunner.

Other projects from the context of the scene are *T42 - Tennis for Two 2011* (Pouët 2011) and currently *MEGA65* (https://mega65.org). Both projects are as contradictory as their hardware. *T42 – Tennis for Two* (MEGA) is the only existing 100% analog and fully playable reconstruction of Tennis for Two by William Higinbotham from 1958 (Brookhaven 2022). It was a project with only three members. The technology is so extraordinary and the development cannot work virtually because it is built with analogue circuits. These types of projects are rare but usually reach a respectable status, such as *Craft* by LFT from 2008 (Pouët 2008). The *T42* video also has just over 4,000 views on YouTube, while LFT's *Craft* video (Iftkryo 2008) has already garnered over 300,000 views to date.

In particular, the socio-cultural structure of the MEGA65 project is extremely complex, in accordance with the challenges. Skype, Discord, GitHub, Twitter, Facebook, LinkedIn, YouTube, Twitch and Patreon are used as communication structures. Skype is mainly used for internal community and small groups to support speech and text-based dialogue-oriented communication. Discord is open to the whole community and all developers. It is very attractive for communities because of its range of functions. As the closest format to IRC (Internet Relay Chat), it supports real-time communication, community building, and management. And if the community goes somewhere else, the project will move and go with them. GitHub provides the MEGA65 manual in Latex, as well as all programming and VHDL (Very High Speed Integrated Circuit Hardware Description Language) source codes. It is used by grassroots developers to handle issues, feature requests, and bugs. Twitter, Facebook, and LinkedIn are used for superficial and commercial activities; YouTube is used to build fan bases and by influencers who produce commercial stuff such as livestreams, update videos, or coding manuals; Twitch is used for development streams and works best for livestreams. This community has built up since 2015. Under the hashtag #mega65 on YouTube, one will find over 100 videos from 19 channels. On average, each of the videos has up to 10,000 views.

The communities, their materials, and their media are almost arbitrarily heterogeneous. The only connection between the profiles presented here is in fact one person (deft). This person always manages to advance projects that are extremely complex in terms of their requirements under a new virtual identity and then release these projects. This form of grassroots movement in which members activate others to build a community and collaborate on a product is certainly special but not unique to the demoscene. Kennedy's (2022) description of the

grassroots movement nevertheless applies to the efforts of the demoscene as well: "By rejecting the notion of indisputable 'best practice', neoliberal development embraces the needs, values and knowledge of the community to solve local problems. This is grassroots development. […] It is bottom-up and locally accountable, acknowledging that the process of development is just as important as the results."

SYNOPSIS OF THE RITUALS

This article shows that the demoscene is not about a demonstration of technology in the classical sense like the so-called "tech demos", but about a demonstration of individual, human, and social skills in a highly technological and hyper-real setting. This overview of the demoscene outlines the community of practice of the demoscene, its structures, attitudes, competitive orientation, and reward concepts, as well as its forms and channels of communication, its aesthetics, scene language, and subgroups.

People of a certain subcultural community share the same attitudes, form groups, engage in scene activities, and follow the scene's 'elite'. This elite, usually particularly active group leaders, is taking on a key role for the community. They are mediators, moderators, and trendsetters who establish, promote, and maintain interaction with the community. The content produced is thematically focused and competitive. It is presented, discussed, and reused at social gatherings. With this blueprint, the demoscene creates a transfer of cultural and technological articulation from their practice into virtual communication formats and back to real life gatherings which can be understood as a hyper-real cycle. The impression arises that the demoscene runs counter to the current development of hyper-realities especially influenced by mainstream social media, because the scene always locates itself vehemently back in reality. Therefore, the demoscene stays an interesting starting point for further investigations into the field with questions remaining: Does this technological activism that emerged from subcultural practices imply that actors have an urge to locate themselves in the real out of hyper-reality? – a question that addresses the interface between the digital, the real, and the virtual as a technical and technological demonstration. And additionally, how do the so-called demoscene demos – especially the wild demos – reflect current states of science, society, and culture – or what are the implications of these?

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"LIKE A JEDI MASTER."

Gesture Control, Tech Demos, and Magic

KATHARINA REIN

INTRODUCTION

Technology is often described in terms of magic, in particular by those marketing it: Be it in company or product names such as the head-mounted virtual retinal display "Magic Leap" or in reviews comparing the use of electronics to supernatural feats, associations with magic permeate digital technology's PR language. Gesture control devices, which are the focal point of this article, are no exception: While its manufacturer's website associates the remote-control armband Myo with ninja-like abilities (MyoBlog 2016), *TIME Magazine* proclaimed that "this futuristic armband lets you control your computer like magic" (Eadicicco 2016). The competing wristband Reemo, a review promised, would "give users the power to operate their home like a Jedi master" (Bennett 2014). While I do not imply that there is a link between technology and magic because the two are associated in marketing – this would mean uncritically swallowing the blue pill handed to us by tech companies – I do argue that such a link exists in the cultural imaginary, and while the language of advertising may represent one branch of this tree, its roots lie elsewhere.

The example of the Jedi shows that another branch of the popular association of gesture control with magic grows out of science fiction. For instance, in Steven Spielberg's film adaptation of Philip K. Dick's *The Minority Report*, the protagonist John Anderton (Tom Cruise) organizes and controls a projection on a glass screen via gestures, wearing gloves with metallic fingertips (Spielberg 2002, 00:02:45–00:08:42, 00:36:07–00:39:42). The science fiction version of gesture command requires either wearable technology or the magical powers of a Jedi – technology is, once again, indistinguishable from magic. Interfaces, Jan Distelmeyer writes, "cultivate their own, effective and omnipresent field of popular cultural stagings"[1] (2017, 34; transl. K.R.). The stagings cultivated by gesture control devices, I suggest, evoke associations with magic. In doing so, they harness not only the iconography of popular culture but also that of ritual and religious magical practices and witchcraft. This centuries-old tradition of artistic representation including, for instance, paintings like Henry Fuseli's *Weird Sisters* (1783) or Georg Merkel's *The Flame* has informed the iconography of performing magicians at least since the 19th century.

1 Original quotation: "Sie bestellen ein eigenes, wirkungsmächtiges wie omnipräsentes Feld populärkultureller Inszenierungen." (Distelmeyer 2017, 34)

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This article focuses on the association of technological demonstrations with magic, specifically on wearable electronic devices for gesture control and modern performance magic. The latter term denotes the kind of illusionistic entertainment that emerged in Europe in the second half of the 19th century, defining itself as decidedly secular, i.e., laying no claim to supernatural agency (see During 2002, 1–3, 25–27). The illusion "Asrah" from the decades around 1900, considered stage magic's golden age, serves as an example of the staging of the magician's control with gestures. My second example stems from the 21st century: a demo video of the gesture control wristband "Reemo". The following sections analyze the relationship between "smart" wearables for gesture command, performance magic, and techno-scientific demonstrations in view of questions concerning control and illusionism as well as simulation and dissimulation.

While on the magic stage there is often no causal relationship between the magician's gestures and the effects presented, with regard to wearable technology we are looking at a "collective of humans and nonhumans", to use Latour's term (1999, 174–190), which at least contributes to the effect: the device cannot operate without being moved by a human, while the human's agency is modified by the device. Both magic and gesture control devices suggest that hand movements can act on the environment, while the supposed change is in fact the result of a highly complex, concealed technological infrastructure. In both cases, the chain of operations that causes the effect is (ideally) imperceptible; and it is hidden even more effectively because another "cause" is put in its place: the power of gestures. However, unlike magicians, users generally know neither precisely what kind of technology is at work nor how it operates. For this reason, I argue that these devices put their users not in the position of magicians but rather in that of spectators who marvel at the magical effects, i.e., the illusion of gesture control. My final point is that the power of this concept also influences judgements about the efficacy of gesture control devices as well as the ways in which we think and write about state-of-the-art technology. When relying on demos of prototypes as resources, media scholars setting out to examine up-to-date technology run the risk of contributing to the study of science fiction instead, thus subscribing to the fascination these devices provoke.

MAGICAL GESTURES AROUND 1900: SERVAIS LE ROY'S "ASRAH"

My example from the realm of performance magic is a stage illusion invented in the early 1890s by Belgian magician Servais Le Roy (Le Roy 1936, 275). It is commonly known by the name of "Asrah," which it received for its British premiere at the London Alhambra Theatre in 1906 (Whaley 2007, 65). Combining a levitation with vanishing (for details on both kinds of illusion, see Rein 2020), it became a staple in magic shows and spawned numerous variations over the years. A reenactment of Le Roy's historical illusion by Adam Wide for the British television

series *Illusions* gives an idea of what it might have looked like in 1906 (Shadwell, n.d.):

The (male) leading performer first establishes his control over a (female) performer by holding a crystal ball between his face and hers to "hypnotize" her. Gestures of one of his hands ensure that her gaze follows the ball, which he moves with his other hand. As she becomes entranced, he directs her by gestures to walk towards him or stop, and finally, to fall backwards, where two assistants catch her rigid body. They carry her to the back of the stage and place her on two chairs standing opposite one another – feet on one chair, head on the other – before covering her entirely with a large cloth. The magician then starts making large, dramatic passes above the cloaked body. Then, as if lifting a gigantic tray on his outstretched arms, he very slowly gestures upwards, whereupon the body begins to hover. The magician establishes a connection between his gestures and the body's upward movement in the air by repeatedly demonstrating that a change to the former entails a change to the latter. As he makes the body pause and resume its rise several times, he also leaves it levitating in mid-air while removing the chairs from underneath it. The magician then proceeds to gesture until the floating body reaches the height of his head. Now, an assistant hands him a hoop, which he passes twice around the floating body to demonstrate that it is neither suspended nor supported by anything.

Subsequently, he raises the body even higher with more dramatic gestures, then ducks to walk underneath it and to the front of the stage, holding both his palms turned outwards in front of his body, thereby signaling a break. He then turns around to face the floating body and completes a dramatic, large, circular movement with his arms – whereupon the body rises one last time – before moving his hands outwards to signal a final halt. To further consolidate his command over the floating body, the magician turns around to address the audience: "There she lies, suspended, and there she could remain, should I so desire, for all eternity." (Shadwell n.d., 04:19–04:27) Adding "and yet, behold the impossible!" (04:29–04:33), he walks back towards the floating body and slowly, with a large movement of his arms, reaches for the cloth that covers it before quickly pulling it away, whereupon the entire shape suddenly disappears. He then throws the cloth in front of a side entrance, through which the vanished woman returns to take her bows.

This performance is carried entirely by the magician's dramatic gestures, which seem to temporarily suspend the laws of nature. They are what establishes his (male) control over the (female) performer's mind and body – first, he hypnotizes her with the help of his hands and a crystal ball, then he dramatically pushes and pulls and waves her up into the air, occasionally halting to pause, as if he needed to collect his strength to make her rise higher. Finally, with another hand movement, he makes her disappear; having already suspended gravity, now his gestures have disintegrated a human being. Demonstrating that he can also re-

materialize her, another gesture – throwing the cloth – makes her return unharmed.

Magicians' gestures such as the ones displayed in this performance are firmly embedded in the popular visual code of magic – so much so that their stereotypical drama was parodied by Belgian comedian Chris Van den Durpel. Appearing in a sketch as Daniel Chesterfield – a reference to the famous magician David Copperfield – he dramatically gestures at elevators, trams and other devices that move in everyday life, thereby suggesting that he is the one causing their motions (shuk5urvivor 2009).

MAGICAL GESTURES AFTER 2000: THE REEMO WRISTBAND

Exemplary for gesture control devices for home application, I would like to look at Reemo, a wristband developed by the company Playtabase that was demonstrated as a prototype at tech start-up conferences in California in 2014 and that commands electronic devices such as lamps, radios, coffee makers, or heaters (Indiegogo 2014). A product demo video available on YouTube shows the device in action while also promoting a questionably conservative picture of a wholesome family (FreshTech 2016):

The family home presents itself to mellow piano music and a voiceover, proclaiming that the wristband makes time for the most valuable things in life. There are photographs of smiling family members on display throughout the house. Dressed in smart business attire, the young father types into his laptop, steps away from it, and puts a pastry in his mouth with one hand, while gesturing at a small device on the wall with the other, thereby turning up the heating. A boy is having breakfast, while a girl is sitting on the couch, waving at the TV to switch channels. The children then enter the bedroom, where the mother, still in bed, presumably opens the window blinds with gestures before heartily hugging the children. We then see her getting dressed and leaving the house with the children, gesturing to turn off the lights as she goes. Other applications shut down in reaction to everybody having left the house. We jump to the father who, busy at the office, directs his computer screen and turns down the radio with gestures. Meanwhile the mother is taking a yoga class, while the wristband sends her exercise data to her physician, who looks at them approvingly on his screen. In the evening, as the family reunites at home for cuddles on the couch, gesture control dims the lights. Throughout this video, almost every family member (except for the son) uses the wristband. While the father controls significantly more devices, what this video means to suggest is that this technology turns everyone from the little girl to the businessman into magicians easily commanding objects in their environment with gestures.

GESTURE CONTROL IN THE INTERNET OF THINGS

Apart from the magician, there is another professional performer who commands by grand gestures: the orchestra conductor. Like magicians, conductors either hold small batons (respectively, wands, in the magicians' case) or use their bare hands. Both performers' gestures are emphasized and fetishized, having become a firm component of the respective profession's visual representation (Kreutzer 2019, 373). Timo Kaerlein (2015, 156–159) relates the gestures of both the conductor and the magician to those of users of devices like Reemo. With regard to the Internet of Things (IoT), he notes a tradition in the tech industry of comparing the user to the magician – the more convincing analogy of the two, in his reading. This is because the IoT, Kaerlein argues, does not require a centralized director but rather relies on a decentralized, distributed agency: "The Internet of Things counts on the emergence of a capacity for self-organization rather than the top-down control of an orchestrating entity."[2] (2015, 156; transl. K. R.). I would add that the gestures we see in the demo video described above are not the gestures of a conductor to begin with. It is not the case that a conductor points at an instrument and it starts playing. Their gestures relate to the music in much more complex ways, which are sometimes even hard to recognize for outside observers. Rather, the gestures in the demo video are the indexical, dramatic gestures of a stage magician that suggest a more direct cause-and-effect relationship between gesture and change in the environment.

Florian Sprenger (2016) takes a slightly different perspective, identifying ubiquitous computing as "doing magic without a magician"[3] (transl. K. R.). Writing about how ubicomp creates an environment animated by distributed, interconnected agency, he points out that action at a distance and the functioning by proxy is what makes objects appear autonomous. The objects we see in the Reemo demo video fulfill these criteria. Moreover, promising to relieve the users of labor, these objects take on the functions of messengers and servants. Throughout the demo video, the voiceover tells us that Reemo is there "so you have more time for what's important" (FreshTech 2016, 00:59–01:01), "to help you get more out of life" (01:27–01:29) by "taking care of all the simple details" (01:27–01:29) etc.

By likening gesture control devices to magic, narratives attached to them underline their operator's omnipotence, whose signifier the gestures become (Kaerlein 2015, 158). And while "ubiquitous computing generates […] a surrounding space in which objects are no longer defined by their coordinates but rather by

2 Original quotation: "Im Internet der Dinge wird auf die Emergenz einer Kapazität zur Selbstorganisation gesetzt anstatt auf die Top-Down-Steuerung einer orchestrierenden Instanz." (Kaerlein 2015, 156)

3 Original quotation: "Zaubern ohne Zauberer." (Sprenger 2016)

their relations"[4] (Sprenger 2016, 110; transl. K. R.), the users of the wrist remote control too require, first and foremost, a wireless connection to the devices they command, whereas their geographic proximity to them becomes secondary. Sprenger also argues that machines acting on their own accord tend to mechanize the humans around them (2016, 104). The other side of the coin of control over their electrified environment is that the users themselves become integrated into the network as another element, interacting with the others.

The inherent illusionistic character of this control is also underlined by Kaerlein: if gesture control devices are associated with the performing magician rather than the conductor, then the causal relation between the gestures and their effect is merely an illusion: The illusionist's gestures, he writes, "[stand] precisely in no causal nexus to the spectacular magical effects, but can rather be characterized as deception, window dressing and distraction from the essential. Here, gesticulation becomes a sham, a pretense of agency capable of misleading superficial observers."[5] (Kaerlein 2015, 158; transl. K. R.). Because on a magician's stage the gestures and the magical effects coincide, and no alternative cause is offered to explain the latter, the two events appear to be causally related. While Kaerlein identifies the user as an illusionist whose gestures are not causing the effects they seem to produce, Sprenger sees the magician as removed from the stage entirely, replaced by an array of autonomous, interconnected technical objects acting of their own accord.

I would like to propose that, while the use and marketing of the technology suggests that it turns users into magicians who can make something happen by waving their hands, the role they in fact occupy is that of the spectator. They themselves are, perhaps, the "superficial observers" mentioned by Kaerlein – although a skilled magician is just as capable of fooling those who look closely, and spectators of performance magic are not mere passive observers. In magic, the fourth wall is broken routinely, the performances are interactive, and spectators are called onto the stage to inspect equipment and act as assistants. By choosing cards, holding coins, tying knots, having their minds read and so forth, they heavily participate in the creation of the effect. They are, however, not the ones who designed or constructed the illusion. Usually, they do not fully understand (if at all) how it works and are not in control of anything that happens on stage. Rather, they are an element in the magician's staging, precisely following their instructions on stage and perceiving only what they decide to reveal to them. Making specta-

4 Original quotation: "Ubiquitous Computing erzeugt […] einen umgebenden Raum, in dem Objekte nicht länger durch ihre Koordinaten definiert sind, sondern durch ihre Relationen im Raum." (Sprenger 2016, 110)

5 Original quotation: "gerade in keinem ursächlichen Nexus zu den spektakulären magischen Effekten stehen, sondern die eher als Blendwerk, Augenwischerei und Ablenkung vom Wesentlichen charakterisiert werden können. Hier wird das Gestikulieren zum Schwindeln, zur Vortäuschung von agency, die oberflächliche Beobachter in die Irre zu führen vermag." (Kaerlein 2015, 158)

tors feel like they are in control by suggesting transparency is part of the illusion offered by the magician. This is necessary because the participating spectators authenticate the illusion as stand-ins for all other spectators watching the show from their seats in the theater or from their homes via some electronic, audio-visual device. The participating spectators' position is the one occupied by the users of objects like the wristband described above: Gaining only as much insight into the workings of the technology as intended by its producer, they act upon instructions by its designer. This translates to users as learning how to operate the device, which is why the Reemo demo video stresses that it only requires you to perform "gestures you already know" (FreshTech 2016, 00:57). These produce a seemingly magical effect, while the labor that went into inventing and constructing the device and the complex technology and infrastructure responsible for its working is made invisible.

SIMULATION AND DISSIMULATION

This dynamic of foregrounding certain aspects – such as effects, or a medium's "content" – and concealing others – such as infrastructure, materiality, or labor – is a central characteristic shared by magic and technology. The curiosity that keeps spectators of magic shows guessing how the tricks are performed is provoked by the very fact that they are conscious of witnessing a technological effect without seeing how it is created (see also Rein 2020, 46–49, 99–108). A magic trick is only impressive when it manages to emphasize its effect and at the same time render the means causing it invisible (see Rein 2019).

This was already theorized upon by magicians in 1910, in one of the canonical publications on modern performance magic. In their seminal book *Our Magic*, Nevil Maskelyne and David Devant, two of the most influential performing magicians of their time,[6] distinguish between three methods of misdirection: The first is *distraction*, which they define as "the interpolation of non-essentials; i.e., matters which occupy the attention of the audience, to the exclusion of essential details in procedure or construction" (1946 [1910], 119). The second is *disguise*, consisting in "making one thing look like another and entirely different thing" (122). The third method they call *simulation*, defined as "the principle of giving apparent existence to things that do not exist, or presence to things that are absent" (123).

In this context, Wally Smith proposes the metaphor of the *empty box*: "a cousin of the familiar black box", it "implies that the internal workings of an apparatus are not just forgotten about or obscured but are clearly seen to be absent." (2015, 326). By opening the doors of magical boxes and cabinets or by showing the inside of their top hat before producing something from it, performance magicians present an empty box – not a black box with unknown content but one

6 Nevil Maskelyne was also a pioneer of wireless technology and held several technical patents (see Rein 2020, 341–342 for more details).

that is shown to contain nothing, and no trickery either. While Maskelyne and Devant subsume this operation performed by the empty box under their concept of disguise, Smith suggests to give it its own label: dissimulation. If simulation consists in affirming something that is not, and dissimulation in negating something that is (Kittler 1990, 200), then Maskelyne's and Devant's disguise, which includes "making 'fakey' things look as though they were free from sophistication" (1946 [1910], 120), becomes recognizable as an operation of dissimulation.

Simulation and dissimulation are not only the two principal operations necessary for performing magic; they are also operations carried out by electronic media technology. Mark Weiser's foundational, visionary text "The Computer of the 21st Century", describing ubicomp in 1991, opens with the statement: "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it." (1991, 94). Not surprisingly, this agenda clearly resonates in the promotional material of devices attempting to make ubicomp a reality. Also echoing Marshall McLuhan, the voice-over in the Reemo demo video proclaims: "We think, technology should feel more like an extension of you" (FreshTech 2016, 00:42–00:45); and the website of the company that developed the gesture control armband Myo states that it was founded "with an optimistic vision for the future in which technology becomes an invisible, helpful part of our everyday experience. Technology seamlessly blended into your world: immediately accessible when you want it, but hidden away when you don't" (ByNorth 2020).

INVISIBLE INFRASTRUCTURES IN TECH DEMOS

Smith (2015) has also shown that this dynamic of simulation and dissimulation can be identified in techno-scientific display. One way in which this happens is that demos usually present only the final result, while blanking out the long and laborious process of development, evolution, and trial and error. And they do so in a way that is accessible and impressive – essentially putting on a show to emphasize certain aspects of the technology while making others disappear. Historical examples include Louis Pasteur's anthrax demonstrations, which Bruno Latour has analyzed as exemplary of the "theater of the proof" (1993 [1984], 85), or Michael Faraday's public presentations at the Royal Institution, which David Gooding identified as the solely visible apex of the experiments' biographies, the largest part of which is concealed from the public (1989, 132). Similarly, a magic trick, while appearing effortless, spontaneous, and natural on stage, is in fact the result of long practice, exercise, writing and rehearsing patter, and sometimes involves physical discomfort during the performance. Smith even suggests that in modern stage magic "the human performer became a kind of automaton, executing an exactingly choreographed and scripted version of itself." (2015, 337) Consequently,

> [i]n resembling programmed automata, modern magicians might further be seen as having entered themselves and their audiences into a

> strange variant of the Turing test. To succeed, the magician-automaton sought to pass off its behaviour as natural and occurring in the moment and to conceal its origins in a carefully pre-programmed script. Any sense of machinic repetition was the death of the performance […]. (337–338)

The modern magician thus turns into an automaton within her stage setting of mechanized illusions, similar to Sprenger's aforementioned notion that humans become mechanized as they enter networks of electrified, "autonomous" objects.

Historical presentations of automata, and in particular pseudo-automata like the Mechanical Turk, depended on the inner workings being made invisible: Here, "unrealized by audiences," Smith writes, "an extended network of helpers and a long history of trial and error lay behind the production of […] effects for public consumption." (2015, 333). This, he observes, is a commonality not only with the aforementioned technoscientific demonstrations by Faraday and others, but also with displays of computerized life. Especially in public demonstrations of social robots, a large array of electronics, connective cables, and the human labor that has gone into creating them, are rendered invisible. Lucy Suchman has noted this in relation to the social robot Cog, which she saw at the MIT AI Lab in 2001:

> […] what struck me most powerfully about Cog was the remainder of its "body" not visible in media portrayals. The base of Cog's torso was a heavy cabinet from which came an extraordinarily thick sheaf of connecting cables, running centaurlike to a ceiling-high bank of processors that provided the computational power required to bring Cog to life. Seeing the robot "at home" in the lab, situated in this "backstage" environment, provided an opportunity to see as well the extended network of human labors and affiliated technologies that afford Cog its agency, rendered invisible in its typical media staging as Rod Brooks's singular creation and as an autonomous entity. (Suchman 2007, 246)

So, both techno-scientific demonstrations and modern performance magic generate a "combination of simulation and dissimulation: creating an effect known by all to be contrived, while simultaneously erasing signs of its contrivance in machinery and method." (Smith 2015, 336). The above examples of electronic gesture control devices take this entanglement of technology and magic to another level by additionally establishing an electronically 'ensouled' environment and promising command over it by gestures.

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THE MAGIC OF TECH DEMOS

If performance magic is to be understood as a demonstration of technology, it is one that works *ex negativo*. In modernity, it is safe to assume that magicians' audiences did not think of the performance as a display of supernatural powers. Rather, they knew it to be an illusion caused by techniques (of the body) and technology, i.e., sleight of hand and apparatus. How exactly the effects are accomplished, however, is concealed from the spectators – they are presented with a puzzle without receiving all the pieces necessary to put it together, and, ideally, they take pleasure in wondering about it (see Rein 2020, 31–33 for more details). The technology causing the illusion is thus a black spot, partially outshined by the effects exhibited excessively.

With this in mind, the following definition of public demonstrations by Claude Rosental could equally apply to performance magic, albeit in a slightly different way:

> A demo consists of exhibiting a technological device, […] in action [Rosental 2007]. The exhibition usually occurs in front of an audience, following a carefully planned script. Demonstrators may provide commentary as they run the technical device, linking its operation to general properties of a theory or method, for example. (Rosental 2013, 349)

Rosental has also pointed out the role of economic competition in demos, which creates an interplay of disseminating information and keeping secrets that he calls a "dynamics of veiling, unveiling, and dissimulation" (2013, 351). The same balance between displaying enough of the object in question and guarding the secret of its workings is also at the heart of magic performances. In turn, it would follow that the fascination created by the mystery about how the effect is accomplished pervades not only magic but also tech demos.

This fascination, I suggest, can also impact scholarly discourses about 'smart' objects. The gesture control devices described above were, in fact, ephemeral and short-lived. The descriptions, quotations, and images reproduced in the scholarly articles about them stem from websites of the start-ups that developed them, their advertising and crowdfunding campaigns, demo videos on YouTube, etc. Most of the websites referenced in Kaerlein's essay, for instance, are no longer available. Neither are the devices themselves. Playtabase ran a crowdfunding campaign for their Reemo wristband, which reached only 45 percent of its funding goal (Indiegogo 2014). Myo was produced by Thalmic Labs, a company whose weblog was last fed with content in 2016. Today, there is a note above every blog entry stating that "Myo sales ended in October 2018 and Myo software, hardware and SDKs are no longer available or supported" (see e.g., MyoBlog 2016). The company switched to developing smart glasses, was renamed North, and acquired by Google in 2020 (ByNorth 2020). While Myo was pro-

duced for several years, the Reemo wristband seems to never have made it past the prototype stage. The company (renamed Reemo Health) now provides a health monitoring platform. This seems to be the only function left from the ones presented in the original Reemo demo video (although the company no longer produces wristbands but uses a Samsung smartwatch), while the gesture control of everyday objects has been dropped.

What does this mean for media studies concerned with such devices? Perhaps that investigations of up-to-date technology that rely on demos run the risk of generating a discourse more strongly informed by science fiction than by existing technology (this also applies in part to discourses concerning AI; see Adamowsky 2020). This has to do with a collapse of the differentiation between the two aspects of ubicomp identified by Paul Dourish and Genevieve Bell: "the idea of ubicomp as a research and design project" and "the reality of ubicomp as a mundane element of everyday life" (2011, 187). While this distinction also corresponds to the operations of simulation and dissimulation discussed here, this will have to be elaborated elsewhere.

A video released by CBS news in 2015 introduces the two remote control wristbands Reemo and Myo and concludes "regardless of which technology ends up on our arms, gesture recognition could be the interface of the future" (C-Net 2015, 01:01–01:07). I suggest that gesture control seems like the technology of the future to us because we have seen its efficacy demonstrated time and time again in science fiction and magic. Apart from Jedi masters and futuristic gadgets such as the ones seen in *Minority Report*, a roughly 170-year tradition of stage magic (drawing on an older tradition of representation) has engrained the idea that gestures – powered either by magic or by technology, if the two are even distinguishable from one another – can change reality. For instance, in illusions such as Le Roy's "Asrah", variations of which are performed to this day, gestures seem to suspend gravity and (de)materialize human beings. While this tradition is evoked by "the idea of ubicomp as a research and design project" (Dourish and Bell 2011, 187), I suggest that media technology, due to its inherent magical potential, seduces us, as it were, to envision a reality in which abilities traditionally conceived of as magical (but having been de-territorialized in secular societies) become widely available in daily life. One element contributing to this is the fascination of techno-scientific demonstrations that persuade us by using the techniques of simulation and dissimulation described above: the theaters of the proof, as Latour writes, allow one "[t]o 'force' someone to 'share' one's point of view" (1993 [1984], 86). As "a mundane element of everyday life" (Dourish and Bell 2011, 187), however, gesture control has been superseded by voice command. While this too is a topic for further research, it is worth mentioning that speech not only directs our virtual assistants and smart applications but also plays a crucial role both in ritual and secular magic.

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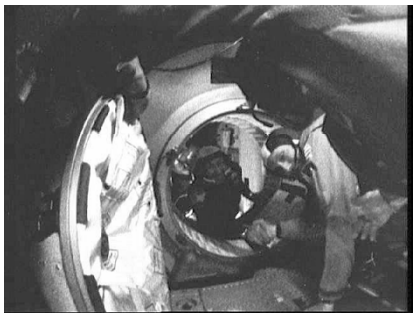
SPACE PORN.

Mediating the Apollo-Soyuz Test Project

SVEN GRAMPP

HANDS-ON SPACE

Philip Handler, a member of the U.S. National Academy of Sciences, undertook a trip to the Soviet Union in 1970 on behalf of NASA to explore cooperation options with the Soviet space agency. Before leaving, he coincidentally watched the science fiction movie *Marooned* (Sturges 1969). According to his own account, Handler was particularly impressed by the rescue scene: In that scene, a Soviet cosmonaut is saving an astronaut. First, the cosmonaut tries to dock with the US module but fails. Then he leaves his capsule and grabs the astronaut floating unconscious in space with his hands. This demonstrated a real practical problem of space travel, namely the inability of Soviet and US space crafts to link up. Handler subsequently described this problem to his colleagues and negotiating partners on the other side of the Iron Curtain using the example of the film *Marooned* to underline his call for cooperation (Ezell and Ezell 2010, v; Jenks 2021, 128–129). In their voluminous documentation *The Friendship,* Edward Clinton Ezell and Linda Neuman Ezell argue that this cooperation between the two 'superpowers' of the Cold War was primarily about developing a technical solution to precisely this problem (Ezell and Ezell 2010, 128–137). Consequently, technicians, designers, politicians, and space travelers spent about four years discussing, designing, manufacturing, and testing such a solution across the Iron Curtain. Haller's efforts ultimately led to the first joint venture between the US and the USSR in space, called the *Apollo-Soyuz Test Project* (ASTP). On July 15, 1975, the Soviet spacecraft *Soyuz 18* successfully coupled with a US *Apollo* module in Earth orbit, followed shortly afterwards by the handshake between cosmonaut Alexei Leonov and astronaut Thomas Stafford, televised live almost everywhere on Earth (Fig. 1). It was the first international manned space mission.



[Fig. 1: Handshake and Posing in Space across the Iron Curtain]

The handshake between Leonov and Stafford still stands today as an iconic gesture marking the end of the Space Race and, moreover, as a symbolic expression of the policy of détente between 'East' and 'West' (Krasnyak 2018). The shift from confrontation and competition to coexistence and cooperation between the 'superpowers' was no longer merely asserted, but cooperation (including compatibility) was technically accomplished and demonstrated in concrete terms – the modules from 'East' and 'West' could from now on be docked with each other – televised live in front of the whole world (Jenks 2021, 48–49, 149–153).

Yet, it was not only technical difficulties and political developments that led to this first handshake in space. Moreover, the space missions of both countries had massive legitimacy problems in the early 1970s to continue their immensely expensive space enterprises in the 'post-*Apollo* phase' (Geppert 2018; Makemson 2009, 201–204). State funding decreased massively from the end of the 1960s. Hence, both sides had an increased interest in initiating high-profile projects. Cooperation between the USA and the USSR promised to be such a new 'space first' media event. In addition, there was a simple monetary reason for such cooperation, as it cut the costs of such a space mission in half, which seemed even more crucial in a phase of massive cost-cutting and questioning of the purpose of manned missions in space. In this situation it seems unsurprising that the public relations departments and lobbyists of the space agencies on both sides of the Iron Curtain had a considerable interest in winning the largest audience possible with another spectacular 'space first' event. The technological demonstration of ASTP could be described as a kind of long-running propagandist advertising program that was broadcast for years (Ezell and Ezell 2010; Jenks 2021; Krasnyak 2018; Syromiatnikov 2005; Volf 2021; Froehlich 1976).

However, I am less interested in the symbolic gestures, the associated propaganda efforts, or whether the technical solution to the docking problem was actually the crucial point. Rather, I would like to use a few examples to trace how the demonstration of technical competence in Earth orbit was taken up. This is particularly interesting because the media coverage not only passed on the messages of the 'superpowers' from space to Earth, but they often massively transformed those messages through their mediation. Whatever the American and Soviet space agencies wanted to demonstrate, the media presentation and reporting turned it into something different, something deviating from the original intentions. In other words, on the way to Earth we can follow very concretely how the process of mediation not just makes demonstrations of events accessible on Earth, but how these demonstrations of events were also put under the specific conditions of media. What interests me the most is the shift from technological demonstrations for ideological purposes via media to the media technologies of demonstration. Against the framework of the figure of the third party according to Georg Simmel (Simmel 1992 [1908]), I would like to draw up a small typology of various media appropriations of the ideological demonstrations in the context of the ASTP.

MEDIATORS: FIGURES OF THE THIRD

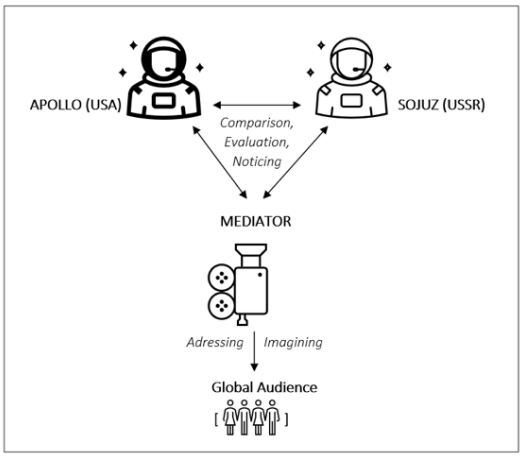
According to Simmel, the transition from a dyadic relation to a social relation in the narrow sense takes place through the introduction of a third party (Simmel 1992 [1908], 113–147). In this way, a simple, direct interaction between two elements becomes a variable and dynamic social relation. For the relationship of the other two elements, the figure of the third means a change from direct interaction to indirect and thus an increase in complexity, which in turn implies: The relationships become more flexible and more unpredictable, sometimes confusing types of connections based on their decoupling. The third party *simultaneously* separates and connects; it significantly transforms the relationship between the initial elements and thus ultimately the initial elements themselves. Accordingly, the third party can be described as a 'mediator' in the sense of Bruno Latour's Actor-Network Theory (Latour 2005, 39–40). During and through the mediation, the mediator transforms the relations between A and B while translating and stabilizing their relationship and identity in serial sequences of action. To understand the technological demonstrations of the ASTP, Simmel's concept of the third becomes particularly interesting due to at least five aspects:

(1) Since Simmel's third has a striking structural analogy to Latour's Mediator, the concept can be made productive precisely for an approach that is interested in mediality– especially beyond purely human actors. In this way, media-technological processes of transmission or media-aesthetic forms of representation can be understood as third parties or at least as aspects of a third party which decisively shape the relationship between actors as well as their understanding of themselves and others. In the context of the ASTP, this argument is relevant simply because what was happening in Earth orbit during docking could only become visible through a complicated network of media technologies that made participation indirectly possible for many on Earth in the first place.

(2) Simmel understands the figure of the third in terms of conflict (Simmel 1904, 490–501). According to Simmel, competition arises from efforts of two parties, whereby the 'battle prize' is not in the hands of the respective opponent (Hessinger 2010, 65–66), but is oriented towards a third element or is awarded by a third party, be it money, votes, prestige, legitimacy, or simply attention. Prestige, legitimacy, or attention are 'battle prizes' that were particularly relevant in the Cold War as forms of soft power. After all, in a cold war, direct violent confrontation is – by definition – avoided and indirect forms of conflict and competition take its place, especially something that can be referred to as public relations or propaganda, depending on the perspective. Despite all the cooperation between the two 'superpowers' and their joint efforts to solve technological problems of space travel, the ASTP is certainly this kind of a showcase of two ideological systems that are always competing even in their cooperation, aiming at influencing an audience in a mediated form. This constellation is perfectly visually expressed in televised live images in which the iconic handshake gesture between Stafford and Leonov that was mentioned above took place. When they shook hands, they were not looking

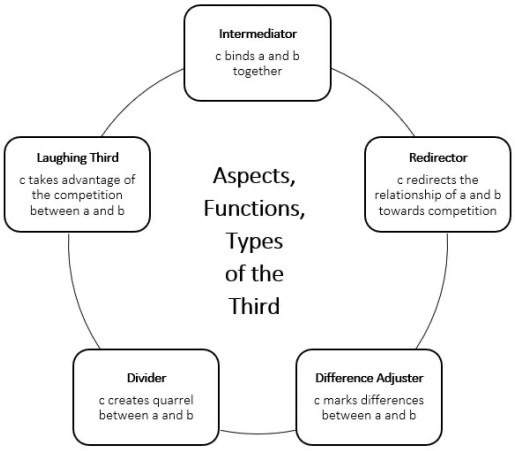
at each other, but at the camera, meaning: at the imagined audience of the television sets down on Earth. Their gaze was directed towards a third party who observed and ultimately guided their greeting.

(3) In this context, the audience can be understood with Tobias Werron to be more of an 'imagined global audience' (Werron 2014, also Volf 2021). The audience gains access to the performance and demonstrations of the competitors through the observations, evaluations, and comparisons of mediators. These mediators are in turn composed of human actors such as journalists and of non-human actors, media technologies, and forms of representation, in whose mediation processes the audience is addressed and imagined (Fig. 2).



[Fig. 2: Triangularisation of space mission coverage]

(4) The relationship of A and B to the mediators can be understood in such a way that even in advance, their performance and demonstration is significantly oriented toward the mediators' observations, evaluations, and comparisons. This is hardly surprising when performance is at stake. In what follows, however, I am more interested in what happens in the transition from the performances and demonstrations of the two competitors to the mediators' observations, evaluations, and comparisons. As will be shown, significant shifts occurred during this transition. At this point, what in the vocabulary of ANT is called 'translation' and/or 'stabilization' of chains of action becomes quite concrete. Or to formulate it using more traditional media theoretical vocabulary: Here we can observe what it means that the "medium is the message" (McLuhan 1994 [1964], 7).



[Fig. 3: Actor Types of the Third]

(5) Simmel distinguishes between different types of the third, each of which has different functions and figures, stabilizes, and/or transforms the relationship between A and B in different ways (Fig. 3). These types in one form or another, as well as in combination, are what became relevant in the reporting on the ASTP and thus contoured the relationship between the USA and the USSR in different ways. The third party appeared as an 'intermediary' (Simmel 1992 [1908], 115), for example, when the broadcast was primarily about the transmission of events in space during the coupling of the capsules according to the previously planned story line of the two competitors who now wanted to show themselves as partners. Or the third party can act as a 'readjuster' (Simmel 1992 [1908], 133) when the reporting instead actively shifts the relationship of A and B in the direction of competition between the two. If the mediator places the emphasis on the differences between A and B, we can call it a 'divergence adjuster' (Simmel 1992 [1908], 135). When the reporting is designed in such a way that not only differences are marked, but the focus is on highlighting, sharpening, or even (re)sparking the conflicts between A and B, the third party is then a 'troublemaker' or a 'divider' (Simmel 1992 [1908], 119). A special kind of troublemaker is the 'laughing third' (Simmel 1992 [1908], 141). This mediator wants to perplex both initial actors as well as the imagined audience, combined with the aim of attracting greater attention to him- or herself, for example through speculation about possible accidents, confrontations in space, or fantasies of escalation, all of which both 'superpowers' wanted to avoid as much as possible in the context of the ASTP coverage.

AS DEMONSTRATED BY THE ASTP

LIVE FROM SPACE

Not only the space cooperation between the USA and the USSR and the handshake exchange between an astronaut and cosmonaut were a novelty. It was also the type

of media coverage of their meeting in space that had many innovations to offer. Soviet and US television not only showed the handshake in space live, but the launch and landing of a *Soyuz* capsule could be seen live on television for the first time (Ezell and Ezell 2010, 303–305.; Button 1975, 5). Soviet television also showed US launches and landings for the first time ever.

Moreover, the television images were made available globally by NASA and the Soviet space agency in a common pool coverage. The fact that the telos of the ASTP was primarily aimed at demonstrating a global, live television event can be followed in the many live reports and, above all, in the effort that was made to the climax of the mission, the handshake in Earth orbit, being made globally accessible (Button 1975, 5).

For these images to actually be broadcast on television, an elaborate technical system had to be set up and coordinated (Ezell and Ezell 2010, 339). There was not only the problem that images from various cameras, different space modules, two control centers, many satellites, and receiving and transfer stations that were far away from each other had to be fed into the jointly offered 'image pool' and converted according to the particular line standards of television sets (Allen 2009, 187; Ezell and Ezell 2010, 303). In addition, there was the problem that only very limited live coverage from Earth orbit was possible (Ezell and Ezell 2010, 321). This was the case simply because, due to the Earth's rotation, signals from the stations could only be received by the coupled space vehicles in Earth orbit for 17% of the time of an Earth rotation (which corresponds to just under 15 minutes for a 90-minute Earth orbit). In the context of the ASTP, this period was extended to 55%, or about 50 minutes per rotation of the Earth, by the NASA communications satellite *ATS-6* picking up and relaying the signals from *Apollo-Soyuz* (NASA 1975) – another 'space first' in connection with the ASTP. The function of ATS-6 as a third was quite clearly its role as an intermediary. The visibility of the cooperative actions of both parties was made possible in the first place by a media-technological network and was thus accessible to the imagined global audience.

In the live coverage of the handshake, another type of third party becomes important, at least on US television. There, one could make out a difference adjuster, that is, a person who clearly contoured the differences between the two mission participants and commented on them as competitors in terms of media-technological competence, whereby the coverage shifted in the direction of the third party as a readjuster. This was particularly evident in the reporting of the CBS TV channel (CBS 2010 [1975]). Here, CBS focused less on a space cooperation and much more on a 'Picture Space Race' of its own kind as Stafford and Leonov shook hands in Earth orbit. Again and again during the coverage, attention was drawn to the fact that the audience should be seeing pictures from the Soviet space shuttle, but that the audience were not able to see them. The screen remained black. Then the broadcast switched back to the US space vehicle. A full-color image appeared showing Stafford waiting to open the hatch and greet Leonov. A comment from the ground station in Houston, meanwhile, was clearly heard: "A great picture from

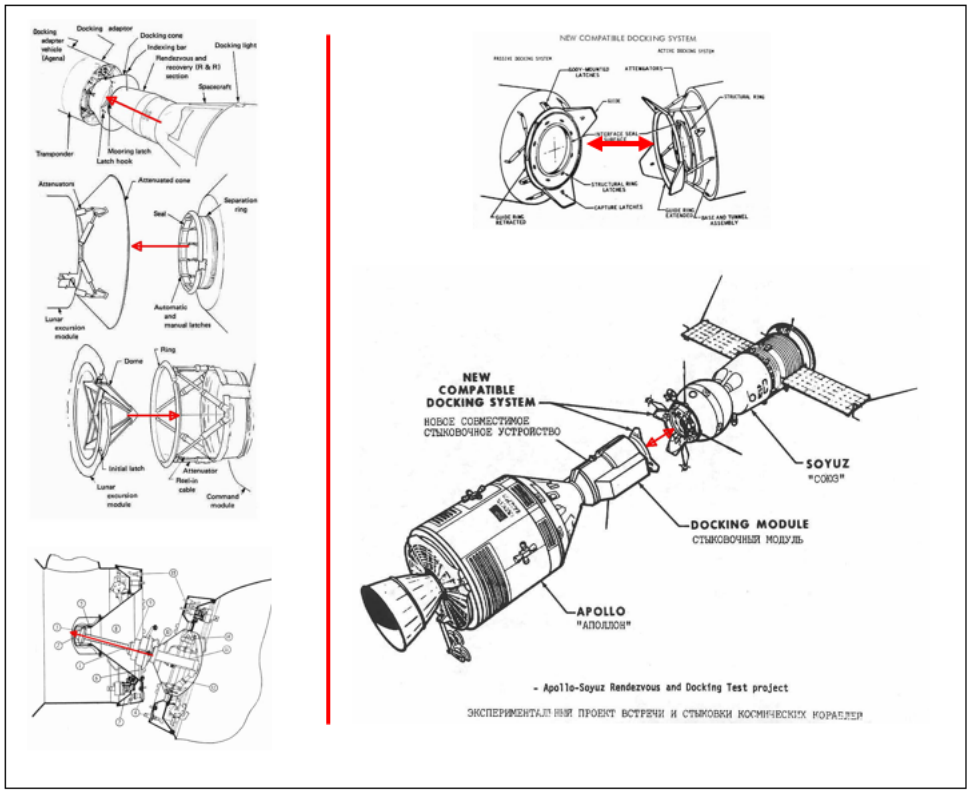
the hatch." After the two space travelers had greeted each other, they switched back to the Soviet module. The camera there was now working, but the picture sent from there was overexposed; hardly anything could be identified. The CBS moderator commented as follows: "There! The Russian picture is coming to us now" – and then continued: "A big blossom of light...strange." Ultimately, what was at stake here was the difference between image and non-image and the origins of those (non-)images. The difference was marked by the attributions '*great* picture' vs. '*strange* blossom of light,' combined with a clear evaluation afterwards that put Soviet and American media competence in competition with each other during the reporting – contrary to the intentions of the two space agencies, whose image scenography was designed for a strict symmetry of switching back and forth between the two modules during the handshake in clear color pictures.

An impressive and striking example of the translation of cooperation efforts into evaluative competition during the reporting on the ASTP can be found in the *Playboy* issue of December 1975 (Jenks 2021, 169–172). There, one can even find a description that runs entirely counter to the intentions of those responsible for the ASTP. The close metaphorical transfer of a technical docking into a sexual act is spelled out in this US-American men's and erotic magazine very explicitly.

To make clear how the *Playboy* article's description ran counter to the aim of the mission, the development of the ASTP docking system must be presented in more detail at this point. The space technology of the USA and the USSR developed strictly separately in accordance with the geopolitical logic of the Cold War. They often found very different solutions to similar problems, starting with different engine systems, designs, and multi- or mono functionality of individual components. Accordingly, it is hardly surprising that the coupling of individual components – like the coupling mechanism for modules, as explained – was not possible. In the context of the first cooperative effort in space, engineers in the 'East' and 'West' therefore discussed for a long time how compatibility between the systems could nevertheless be made possible. The idea of developing two identical spacecraft types that could enable such docking was quickly dropped. This was partly for reasons of secrecy and partly because the technical, temporal, and economic efforts were estimated to be too great. The obvious solution was accordingly: "[…] to find a universal docking mechanism that would connect peripherally to the two existing systems (Apollo and Soyuz), and thus allow both sides to meet each other in space on their own terms and in their own space systems" (Jenks 2021, 119).

'Peripherally connecting' refers in this case to adapting only the docking systems to each other, not the entire capsule. It seems interesting that although the two capsules were created based on very different technical systems, they nevertheless used structurally similar docking systems. The core of these systems is that the two docking elements were designed asymmetrically in terms of shape and activity during coupling. This means one element actively penetrated the other passively behaving element, which absorbed the former (Fig. 4, left row). The obvious solution of developing a common docking system because of this similar experience

with such a type was, surprisingly, quickly rejected. It would have been obvious to use this know-how to find a compatible solution in a comparatively cost- and time-efficient way. However, this was no longer seriously considered during the development and test phase, which lasted almost four years in total. On the contrary, a symmetrical solution was worked towards from the beginning and was given the name 'androgynous docking system' early on (Fig. 4, right row; Ezell and Ezell 2010, 113–114).



[Fig. 4: 'Male/female' and 'mama/papa' docking systems (left) vs. the androgynous docking system of the ASTP (right)]

There is at least one practical reason for this, but also a more symbolic-ideological one. Especially the second reason strikes me as requiring explanation and shows very concretely how technology and the social, technological, and social-political aspects and dynamics intertwine.

The practical reason repeatedly cited in meetings for deciding against an asymmetrical and thus in favor of a symmetrical docking system is that with the former it is not necessary for each mission, for each docking, to give extra thought and coordination to whether the modules fit together, that is, who has the active part and who has the passive part (Jenks 2021, 119–121; Ezell and Ezell 2010, 112–114). Particularly for international cooperation, where different space systems are to be expected, the decision at that time in support of symmetrical docking adapters

appears to be future-oriented and quite successful in the long term. After all, the ASTP docking system is the prototype and decisive forerunner of subsequent docking systems for international space missions. In the meantime, the *International Docking System Standard* (IDSS) has been created and is oriented precisely on this principle of strict symmetry and variability of passive and active operations (IDSS 2022).

The ideological reason is that in this cooperation between the two 'superpowers', attention was carefully paid to presenting the roles of the two participants as balanced, equal, and symmetrical down to the smallest detail. Be it that there was a common pool of images, that both missions were broadcast live during launch and landing, that during the live handshake in space it was planned to switch back and forth evenly between the two capsules, or that a strictly symmetrical docking system was developed in which the active and passive roles of the participants are variable – everywhere one finds not only cooperation but also parity and symmetry. Connotations of subordination or superiority, assignment of a dominant or inferior, an active or passive part were to be avoided to the greatest extent possible. The chosen symmetrical docking solution should be understood from a socio-political perspective as a symbolic expression of equal cooperation and a utopian idea of a world beyond the Space Race and the Cold War (Jenks 2021, 120–121).

The fact that this docking system was given the description 'androgynous' (Ezell and Ezell 2010, 113–114; Jenks 2021, 117–121), which in this context was understood by those involved as gender-neutral, makes it clear *ex negativo* that there must have been elements in previous models that were associated with metaphors of a heteronormative gender non-neutrality or with clear male and female characteristics. The active part that penetrates the other element was referred to as 'male' or 'papa' and the absorbing, passive element as 'female' or 'mama.' And indeed, the previous docking systems were referred to as 'female/male' docking technology by the American space missions and as 'mama/papa' system by the Soviet missions (Ezell and Ezell 2010, 113–114; Jenks 2021, 130–131).

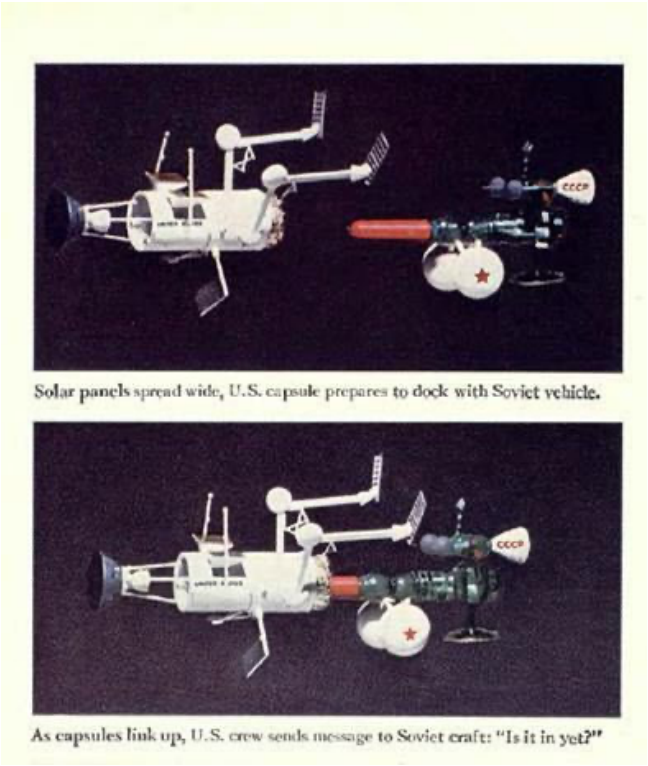
There were – at least as far as I could find – no official protocols in connection with the ASTP project that address this context and the obvious connotations associated with it, or that even state that the construction of a docking system and its designation as 'androgynous' were intended to distract from these sexual connotations. However, informal sources can be found. Vladimir Syromiatnikov, the Soviet engineer responsible for the development of the docking system at the time, writes in his memoirs:

> [...] Johnson [NASA's leading docking engineer at the time; SG] used to joke, suggesting absolutely different reasons for the unwillingness of engineers to use probe-and-cone, or male-female, configurations: none of the countries wanted to play a female role in space before the eyes of

> the world. [...] Later continuing with the joke, we started saying that with androgens, both partners are on top.[1]

However relevant the will to avoid such sexual and gender-biased role associations may have been, it is certain that all efforts were made to avoid giving the impression of superiority or inferiority: There was no competition, no showing of weakness, and any assignment of active unilateral agency against passive roles was avoided. This maxim of presentation and action applied during the docking demonstration 'before the eyes of the world' live on television.

But all these efforts were wasted. Or at least that seems to be the case if one takes an article from *Playboy* at the end of 1975 as a benchmark (Jenks 2021, 169–171). There are two models of space capsules docking (Fig. 5). Although these models bear no resemblance to either the *Soyuz* nor the *Apollo* capsule, the text and captions of the capsules state that they refer to them. A Soviet capsule introduces a phallic object into the US module, which raises its 'legs' upwards and awaits the 'arrival' of the Russian phallus. The caption accompanying the picture informs the reader about a message between the modules: "US crew sends message to Soviet craft: 'Is it in yet?'" (Playboy 1975, 209)



[Fig. 5: Apollo spreads its legs]

1 On the role and significance of women in the context of space missions, see Hilck 2019; Kohonen 2017, 115–17

This illustration not only turns the androgynous docking system of the ASTP into a definite sexual act, with clearly passive and active parts. In addition, a gesture of submission is literally demonstrated in all metaphorical clarity and connotation: The USA space module, representative of the USA, is 'taken from behind' by the *Soyuz* module, representing the USSR. This 'taken from behind' makes also clear that behind the more or less funny, erotic, or ironic picturing of the docking there are, as the historian Jenks puts it, "broader homophobic attitudes in which the act of penetration could be immediately interpreted as an all-male act in which the homosexual top would feminize the passive male bottom" (Jenks 2021, 138).

This transformation of the political intentions associated with the ASTP into and through reporting can be formulated in the vocabulary of the third party: The mediator *Playboy* acts as divider. Despite all claims of cooperation, despite all the technical solutions that were demonstrated as androgynous, the competition is staged here in precisely such a way that a subordination of the USA takes place. The USA is staged as weak, 'taken,' exploited, demasculinized and humiliated. Behind the pseudo-humorous-erotic surface, not only the difference between two parties is marked and clearly evaluated here. The aim is to satirically provoke attention and to re-establish a white phallo-centric agenda at the same time. The *Playboy* article functions as a self-empowering divider according to the maxim that Simmel assigns to this type of third party, namely "[d]ivide et impera" (Simmel 1992 [1908], 143), which means: 'make trouble and conquer!' The coverage of *Playboy* could hardly be much more divergent from the actual technical and political intentions of the two space nations.

LIFE IN SPACE

At the same time the ASTP-Mission was in Earth orbit, the *Salyut 4* space station was also circulating in Earth orbit. During the live coverage of the ASTP, the audience on the television sets were repeatedly taken to the *Salyut 4* space station. From there, the cosmonauts reported on their everyday life on board. What is interesting about this, is what the cosmonaut Pyotr Klimuk, who was residing there at the time, told the audience about the station. Often it was about plant experiments on the *Salyut 4* that were shown to the TV viewers, among others experiments in space. In these reports a specific story of the expansion of the organic living world into space was repeatedly told, which on the one hand had to do with a *centralized homogenization* of outer space and the earthly realm of life, and on the other hand with a *domestication* of space.

I will illustrate both aspects with some examples. To begin with the first aspect: 'Centralist homogenization' means that terrestrial and extra-terrestrial areas are staged as one homogeneous space. In Soviet reporting on the ASTP, this homogenization took place primarily on a visual level and also had a clear center from which this homogenization spread out in two directions: The starting point for all actions

was the Soviet Union as the center of power. Conversely, all achievements must ultimately lead back there.

To give some examples of this centralization: The Soviet leadership insisted from the very beginning of the negotiations that the *Soyuz* rocket had to be the first to be sent into space from the Baikonur Cosmodrome (Ezell and Ezell 2010, 186–188, 317–320). Thus, the joint mission of the USSR and the USA was given its starting point on Soviet territory.

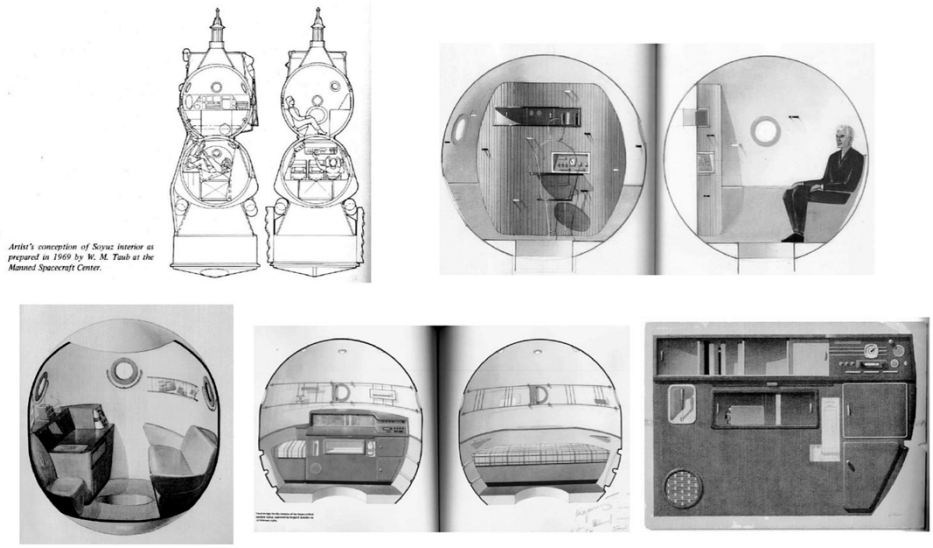
A second example is the introduction and conclusion of the coverage reports on the ASTP that were designed in exactly this way on Soviet television (DRA 1975): First, a shot of Red Square was broadcast (with the reference that this is an *Intervision* program, which means a program that is broadcast transnationally). After that, a picture came into view that showed a star-filled universe. A rotating Earth was then graphically inserted into this, and was finally wrapped with the logo of the ASTP mission. At the end of each ASTP special broadcast, the image constellation was reversed. In other words: At the end, the viewers found themselves back at the starting point of the program on Red Square in Moscow.

This spatial constellation followed a Soviet ideology insofar as it was part of a tradition that was frequently used for propaganda purposes under Stalin. Since then, Moscow was presented as the center of power from where all crucial movements originated and returned (Kohonen 2017, 31–34). Moscow can be understood here as a magnetic pole, or more precisely: as a reversibly adjustable magnetic pole. On the one hand, all movement emanates centrifugally from this magnetic pole and, on the other, all movement returns centripetally to it. This became clear on a visual level during the reporting on the ASTP, as shown in every special program at the beginning and end. Thus, Moscow's sphere of influence, which was supposed to reach into the infinite expanse of the universe, became real in the eyes of the viewers. US broadcasters, on the other hand, usually left it at the common mission emblem. The reporting on Soviet television therefore mediated the events in space different. Everything came out of Moscow and went back to Moscow. Houston simply did not appear here.

Such a practice of centralization and return is interesting above all because it relates to a certain form of space representation: The terrestrial and extra-terrestrial spheres were homogenized and made similar to each other in a very peculiar way – and in this way the extra-terrestrial sphere was ultimately domesticated. First, this was done on a motif level: As already mentioned, plants in Earth orbit were held up to the camera while reporting on the ASTP. In addition, plants were also handed over to the returning cosmonauts by young pioneers live in front of television cameras (DRA 1975). The ‘fruit’ of the (Soviet) earth was therefore literally found everywhere. Or to put it another way: The Soviet Earth was extended into Earth orbit and thus the previously ‘other’ space was made ‘one’s own.’ This was not a frontier situation at all: Outer space was not the 'other' space or the 'wilderness' that must be conquered, but rather a space that was made similar to home, a place like home. This was very different to the reporting on US space

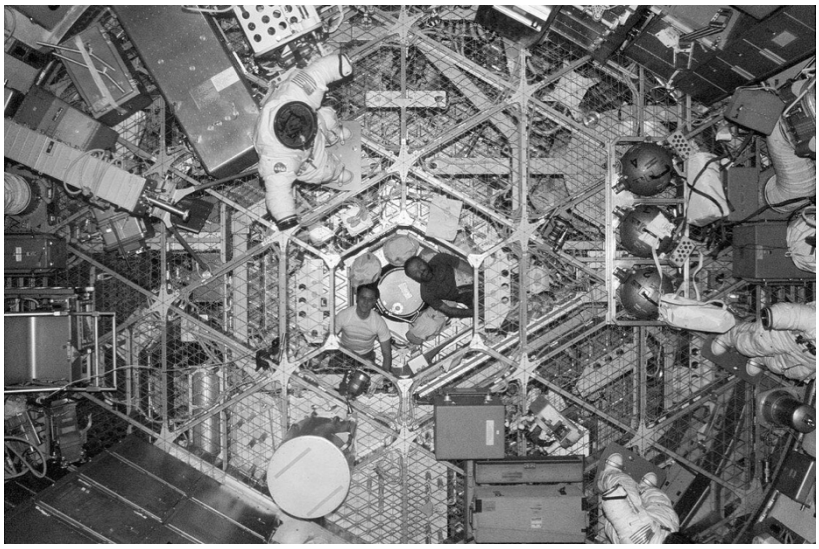
missions. There, space was a 'new frontier' (Kennedy). Representations of outer space showed viewers inhospitable places or 'other spaces' in the sense of Michel Foucault (1986 [1967]). This was the authoritative form of representation in the US at least till the end of the *Apollo* era in the 1970s (McCurdy 1997, 48, 140–145).

A specific design was given to this domesticating transformation of outer space during the development of suitable space modules for the *Soyuz* missions (Fig. 6). The interior design of the rockets was developed such that was reminiscent of the so-called 'Star City' near Moscow in which cosmonauts had been living since the mid-1960s (Gruntman 2011, 45; Asse 2013) with a radio, designer furniture and a well-stocked library (Peldszus 2018, 240f.; Meuser 2015). Bookshelves, technical communication, and entertainment equipment, including comfortable seating, could thus not only be found in Star City near Moscow, but also – according to the suggestion of these design concepts – in Earth orbit. Being and living in Earth orbit was the domesticating extension of Star City on Earth.



[Fig. 6: How to make space a place with Sojuz]

This spatial design and imagination were diametrically opposed to that of the USA, where the focus was on demonstrating the technical equipment of the highly artificial infrastructure required to live in space. For example, the first space station of the USA, *Skylab*, was usually staged in such a way that the alien and/or technical nature of this space vehicle was highlighted (see Fig. 7). There was no trace of homeliness in these images (Evans 2012, 131).



[Fig. 7: Celebrating the technically sublime with Skylab*]*

The Soviet side provided a large contrast: There, the complexity of the technology is not the center of attention. In fact, it is shadowed and covered, transferred into the direction of an ordinary life on Earth. The cosmonauts had long since settled into space, while the astronauts were much more like Western frontiersmen who must explore and conquer new, dangerous, inhospitable regions and environments on the border between the civilization and the wilderness, which was marked precisely by strict visual differentiation between settlements on Earth and technologically advanced survival in space.

A very 'homely' module for the gathering of astronauts and cosmonauts in the *Soyuz* module was designed especially for the ASTP (Meuser 2015, 39–41). There, the space travelers were not only to meet for the first time in space and hold joint press conferences, but also spend leisure time and above all eat together. Even if space history likes to be told in such a way that the Space Race between the USA and the USSR was transformed into a space cooperation or even ended with the ASTP (Jenks 2021), on the level of the representation of space as a homely place, the Soviet Union at least won this particular sub-competition after the end of the main Space Race. In the following decades, the space of manned missions was mediated based on the Soviet space representation matrix. Here, the reporting serves as a mediator in the mode of a difference adjuster: The difference between the American mission and the Soviet mission was clearly demonstrated retrospectively by the dissimilar traditions of presenting life in space. While the *Apollo* missions focused on technology and on space as an alien world, the *Soyuz* missions obscured technology and presented outer space as a comfortable extension of the home zone.

In media representation, this specific form of representation of space after the ASTP became the central form of representation and appearance in space even after the end of the Soviet Union. Let me briefly give just one example: Canadian

astronaut Chris Hadfield became famous primarily through a video he posted on his *Twitter* account on 12 May 2013, which has since been viewed millions of times on platforms such as *YouTube* (Rare Earth 2013). In this video, Hadfield can be seen with an acoustic guitar performing his version of David Bowie's famous songs *Space Oddity*. The special thing about it: The astronaut sings this song on the ISS, wearing comfortable shorts and a shirt (Fig. 8).

[Fig. 8: "And the papers want to know whose shirts you wear" (Rare Earth 2013)]

Here, the astronaut was doing something that has long been established as a pattern of self-promotion in social media: A well-known song is adapted in front of a camera. The unusual thing, of course, was that Hadfield did it in Earth orbit, i.e., in weightlessness. Despite this difference, it was nevertheless also about homogenization in a certain sense: The same things can and are done on Earth and in space. And again, Earth's orbit is being domesticated. This impression is supported by the many reports from the ISS which tell of everyday life on board, hardly differing from what is done on Earth (working, playing guitar, eating together, showering, checking emails, using *Skype,* or even what Hadfield, among others, did extensively: tweeting). Marking normality in the abnormal seems much more important than emphasizing the otherness of weightlessness, the dissolution of above and below, the speed of locomotion, the narrowness and the highly artificial nature of the technical apparatus. Outer space is particularly performed in a down-to-earth way on the ISS. The difference to the depictions of life on a space station in the feature film *Marooned* or the images of *Skylab* could hardly be greater.

The view into space is oriented to this day by this specific mediation of the ASTP, beyond the intentions of the people involved or the propagandistic strategies of the Soviet Union during the Cold War. A central aesthetic representational form of manned space missions has become stabilized, detached from its former human actors and propagandistic demonstration strategies. From this perspective, this kind of mediating power towards demonstrations can be described as a type of

laughing third party in the sense of Simmel. After all, it has taken advantage of the competition between the USA and the USSR in space – at first only at the cost of the USA, but then also that of the Soviet Union, as this form of mediation has outlived the Soviet Union and nevertheless continues to significantly frame the view of space as a place that has always been homelike.

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IMAGE INDEX

Fig. 1: Taken form "45 Years Ago: Historic Handshake in Space." *NASA History*, July 17, 2020. https://www.nasa.gov/feature/45-years-ago-historic-handshake-in-space/.

Fig. 2: Illustration by the author, SG.

Fig. 3: Illustration by the author, SG.

Fig. 4: Taken from NASA (1975) and Ezell and Ezell (2010, 120).

Fig. 5: Taken from Playboy (1975, 290).

Fig. 6: Taken from Meuser (2015, 26–28).

Fig. 7: Taken from "Skylab." *NASA*, September 11, 1995. https://heasarc.gsfc.nasa.gov/Images/skylab/skylab4_inside.gif.

Fig. 8: Taken from "Colonel Chris Hadfield Sings 'Space Oddity' On BBC News." *Speakers' Spotlight*, December 17, 2013. https://www.speakers.ca/2013/12/colonel-chris-hadfield-sings-space-oddity-on-bbc-news/.

IMAGINARIES OF MACHINE VISION.

A Short History

JENS SCHRÖTER

1. INTRODUCTION

Stanley Kubrick's movie *2001: A Space Odyssey* came out in 1968. This famous film has been the subject of a great deal of discussion. An important aspect of the plot is the spaceship crew's fight with the hyperintelligent computer "HAL"; several times we see HAL's point of view. This is mostly achieved by first showing one of HAL's "red eyes" (one of his cameras) and then cutting to the subjective shot, which is marked as the machine's subjective point of view (or "POV") by a fish-eye, circular distortion. The film thereby shows us *machine vision*.[1] In *2001*, the machine vision shots connote the consciousness of the supercomputer and its active role in the plot. As is well known, HAL becomes paranoid and attempts to kill the crew of the spaceship. How can we analyze this fictional machine vision? What is the role of such a fiction? How was it possible, as early as 1968, to think of such a kind of machine vision? In the second part of this paper, I will discuss some selected positions from the theory of technological imaginaries that might prove helpful for understanding such imaginary technologies. In part three, I will discuss *2001: A Space Odyssey*. In part four, I will analyze *Westworld* (USA 1973, Michael Crichton) before examining, in part five, *The Terminator* (USA 1984, John Cameron). I will also explain the reasons for these choices. In the conclusion, I will provide a brief analysis of Kazuo Ishiguro's novel *Klara and the Sun* (2021).

2. TECHNOLOGY AND IMAGINARIES: THEORIES.

The concept of the 'imaginary' has a certain role in political philosophy (cf. Taylor 2002).[2] As the political scientist Benedict Anderson in particular has demonstrated, the "nation" is an "imagined political community – it is imagined as both inherently limited and sovereign" (Anderson 1983, 6). A similar imaginary component can also be observed in the history of technology. The history of a given technology is also a history of its imaginaries, which means the history of the promises and fears, anticipated futures and expected uses connected to it. Since there has already been

1 See Branigan (1984) on a general theory of subjective shots and especially p. 105 on the "metaphorical POVs" in *2001* and *Westworld*; see Schröter (2004a) for a philosophical discussion on the fact that films can present subjective experience of others, an access to subjectivity that cannot be experienced in real life.

2 The following is elaborated in much more detail in Ernst/Schröter (2021a). I express my gratitude to Christoph Ernst for writing large parts of that book.

a lot of research on this topic, I will limit my discussion to only a few relevant positions.

The media studies scholars Simone Natale and Gabriele Balbi differentiate between (1) imaginaries that project future media before they emerge, (2) imaginaries which develop when a medium is real and new, and (3) imaginaries that nostalgically refer to "old" media (cf. Natale/Balbi 2014). The first case is especially relevant to this paper. *2001* imagines a perceiving super computer, a technology that did not exist at the time. In that sense, it represents a form of a "media prophecy" (ibid., 205–207).

Media prophecies have existed at least since the nineteenth century, especially in science fiction. Science fiction is a discourse that – as Arthur C. Clarke (1962) noted – reaches out imaginatively into the impossible in order to determine what is possible. One example of this is the relationship between the history of computing and science fiction. For the computer scientists David L. Ferro and the historian Eric G. Swedin (2011), science fiction functions as a link between the public and the development community. Indeed, in *2001*, some members of the community developing artificial intelligence were scientific consultants (cf. Kirby 2003).

On the one hand, science fiction helps us imagine computing's possible consequences for society; on the other hand, it makes explicit the "needs," that is, the wishes and desires, that drive development in society (cf. Ferro/Swedin 2001). In particular, the concept of imaginaries contains an understanding of the instrumentalization of science fiction as part of the "strategic" planning of possible futures. Today, science fiction is very consciously employed in technology development and product design through "science fiction prototyping" (Johnson 2011). It is therefore interesting to observe science fiction as one site of imaginaries of machine vision, although it is an open question at this point if HAL in *2001* can be called a case of science fiction prototyping.

The goal of science and technology studies (STS) is to study the process of the social production of science and technology (cf. Sismondo 2010). The role of imaginaries has been a matter of intense discussion in this research tradition in recent years (Sneath, Holbraad, and Pedersen 2009; McNeil et al. 2017). The term "sociotechnical imaginaries" developed by the historians of science Sheila Jasanoff and Sang-Hyun Kim (2015) is a case in point. Jasanoff (2015) regards sociotechnical imaginaries as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology."

The concept of sociotechnical imaginaries illuminates historical changes in ideas about the interplay of sociality and technology. If one compares this very broadly conceived concept to the concept of the *Leitbild* (guiding image), which is common in the German-speaking sociology of technology, the similarities are striking. Katharina Giesel writes: "*Leitbilder* bring together socially separated

(mental or verbalized) ideas of a desired or desirable and in principle achievable future that becomes reality though corresponding action" (Giesel 2007, 245, my translation). In both cases, it is a matter of analyzing the collective imagination about a desirable future for science and technology. The concept of "sociotechnical imaginaries" emphasizes the aspects of institutional safeguarding and of public performance (mise-en-scène, staging, presentation). Both concepts focus on the *mediating function* of imaginaries for coordinating in the development of new media and the social acceptance of these technologies. Therefore, one question I wish to address in my analyses below is: To which socio-technical imaginaries or *Leitbilder* are fictional representations of machine vision connected?[3]

Since there is an emphasis on the public performance of socio-technical imaginaries or *Leitbilder* (literally: guiding images) in STS, this research specifically includes approaches to analyzing the media required for presenting imaginaries, such as theatre-like practices, e. g. stages, and other forms of "negotiation arenas" (Schulz-Schaeffer and Meister 2009) in which, for example, prototypes are choreographed and displayed (cf. Ernst and Schröter 2021b). The STS scholar Wally Smith has presented an approach to analyzing such presentations under the title "theatre of use" (Smith 2009, 449). In the IT industry, demonstrations serve to show hardware and software in action. In front of a heterogeneous circle of addressees, developers present the evidence that the technology works and is useful. The historical model for this is public demonstrations of scientific experiments (cf. ibid., 451–457). One can observe, according to Smith, a difference between the way significance is attributed to an experiment in the everyday practice of science and the significance an experiment takes on when it is publicly demonstrated. Using Erving Goffman's (1974) frame analysis, now well established in sociology, Smith understands this as a "reframing." Whereas a laboratory experiment is about representing nature, public demonstrations are about representing the possibilities of the technical apparatus and of the experiment itself (cf. Smith 2009, 456). The focus is not on what could be found out about nature in the future but on the *future possibilities of technological feasibility* (cf. ibid., 453). One example is the gesture control of the interface in Steven Spielberg's science fiction thriller *Minority Report* (Spielberg 2002). The interface designer John Underkoffler had already developed experimental prototypes of this technology in reality. In Spielberg's film, however, the interface is presented as a completely functional technology with idealized scenarios of possible use.

STS scholar David Kirby refers to such phenomena as "diegetic prototypes." (Kirby 2011, 193–218). Diegetic prototypes are objects that are fully functional *in*

3 At the University of Bergen in Norway, there is an EU research project entitled "Machine Vision in Everyday Life: Playful Interactions with Visual Technologies in Digital Art, Games, Narratives and Social Media", https://www.uib.no/en/machinevision, accessed June 3, 2022. They have built up an interesting database: https://machine-vision.no, accessed June 3, 2022. Their research interests and publications (that can be found on the website) do not overlap with this paper.

the diegetic world constructed by the narration. In the context of imaginaries, they mobilize "public support for potential or emerging technologies by establishing the need, benevolence, and viability of these technologies" (ibid., 18). We can summarize Kirby's arguments regarding the representation of imaginary technologies in a film in the following four points:

1. *Performative artifacts*: The objects demonstrate the possibilities of an emerging technology;
2. *Social contextualization*: The objects are situated by the narrative in a social context; for instance, they are associated with a community of users;
3. *Normalized approach*: The objects are presented as completely normal objects and their use as completely 'natural;'
4. *Real need*: The technology is framed in such a way that the film may trigger a real need for these objects.

The popular science fiction film is a widespread and influential example of such presentations. Science fiction films are conveyors of technology and media for reflecting on the technological change that is taking place. What "theatres of use" and "diegetic prototypes" can we find in representations of machine vision?

In the following sections I will to return the fictional representation of machine vision in *2001*, but will also consider other examples of an imaginary machine vision in science fiction and analyze them in their respective contexts. How is machine vision represented? Which socio-technical imaginaries are connected to it? Can we find Kirby's different aspects in the filmic representations?

3. 1968: 2001: A SPACE ODYSSEY

[Fig. 1: HAL's gaze]

In 1960, one of the earliest papers on machine vision was published: "Pattern Recognition by Machine" by Oliver G. Selfridge and Ulric Neisser. It appeared in *Scientific American* – in a journal, then, that popularized current scientific knowledge. The paper opens with the following passage:

> Can a machine think? The answer to this old chestnut is certainly yes: Computers have been made to play chess and checkers, to prove theorems, to solve intricate problems of strategy. Yet the intelligence implied by such activities has an elusive, unnatural quality. It is not based on any orderly development of cognitive skills. In particular, the machines are not well equipped to select from their environment the things, or the relations, they are going to think about (Selfridge and Neisser 1960, 60).

In other words, the machine needs a capability for perception or, as the authors put it, pattern recognition. Although the text focuses on the recognition of printed and handwritten characters, this is clearly a case of machine vision. Interestingly, they start with the question of "thinking machines", which had been a somewhat fashionable topic in computer science since the Dartmouth Conference of 1956. Through popularizations such as Selfridge and Neisser's text, "artificial intelligence" had become a well-known theme (an "old chestnut") by the end of the 1960s. Indeed, one of the protagonists of the Dartmouth Conference, the computer scientist Marvin Minsky, was a scientific consultant to *2001*. He is especially known for advocating a modular concept of mind in which different specialized "modules" interact to produce "intelligence" (cf. Minsky 1988).[4] One such module is perception. The staging of the supercomputer HAL as possessing the ability to understand and produce spoken language, to play games, to plan, and to see shows his intelligence to be of such a modular kind.[5]

We can state that machine vision appears in *2001* in the context of a movie that tries to be scientifically accurate about (a certain modular conception of) AI.[6] HAL's POV is staged as a 'normal' view (it looks like the POVs of the human actors, as compared to other more technologized POVs I will discuss below), except for the fact that it has a circular form that mimics the circular form of his red "eyes", which are dispersed all over the spaceship (Fig. 1). At the time, there were certainly not any digital tricks available for staging his POV (as compared to the machinic POV in *Westworld* 1973, see below), but it would of course have been possible to

4 This book was published twenty years after *2001*.

5 See Mateas (2006, 107): "Marvin Minsky, one of the founders of AI, served as a technical consultant for the film: doubtless his contribution helped to establish the strong resonance between the depiction of HAL and subfields within AI, including language, commonsense reasoning, computer vision [!], game playing and planning, and problem solving." See also Stork (1997).

6 See Rosenfeld (1997) for a detailed analysis of the representation of machine vision in *2001* from the standpoint of a – leading – practitioner in the field.

defamiliarize HAL's view in some other ways. Staging it as very similar to the point-of-view shots of the human protagonists would have been a very plausible means to show HAL's intelligence as comparable to that of humans – and it also implies self-awareness on the part of the super computer.

I now wish to systematically apply Kirby's methodological steps for analyzing diegetic prototypes:

(1) *Performative artifacts*: *2001* demonstrates the possibilities of an emerging technology, AI. But as Kirby underlines, to work as a diegetic prototype, a technology has to be shown to work flawlessly– and that is of course what the film does not do. As is well known, HAL becomes paranoid and kills the crew (with the exception of Dave, who, in the end, shuts HAL down). This is first and foremost for dramaturgical reasons, of course, because an antagonist is needed (as in *Westworld*, see below). However, to stay with Kirby's reasoning, it demonstrates that the film does not intend to arouse interest in and acceptance of AI. AI is simply presupposed to be a real technology in a distant (or not so distant: 2001) future and to have ambiguous implications. Machine vision in this context can be read as a potentially dangerous technology of surveillance – think of the scene in which HAL reads the astronauts' lips to thwart their plans.

(2) *Social contextualization*: In *2001*, the mission has a scientific character, but it seems also to have a hidden military background, since the astronauts were not fully informed about its real purpose. This points to real developments: as Yarden Katz points out, there was a memo at the "MIT Artificial Intelligence Lab, one of the first academic AI laboratories (cofounded by Minsky), written in July 1966. The memo, authored by Seymour Papert, describes plans to build – in the scope of one summer – an artificial vision system that could recognize objects." Furthermore, he adds: "Practitioners had some reason for optimism: the term 'Artificial Intelligence' charmed the Pentagon's elites, and they poured money into the field" (Katz 2020, 24). Finally, Katz notes that "AI's subfields were from the start organized around a militaristic frame: vision research to detect 'enemy' ships and spot resources of interest from satellite images […]" (ibid., 35). These real developments informed the film, which hints at a special community of users in high science and the military, and locates machine vision in this context – and HAL (be he paranoid or not) indeed tries to kill the astronauts in a ruthless, military manner to secure the mission.

(3) *Normalized approach*: For the astronauts it is quite normal to communicate with HAL and to accept that he has a kind of vision. In one scene, HAL asks astronaut Dave Bowman to show him a drawing he has done. Dave complies and HAL comments on the drawing.[7] Machine vision is normalized – at least for special users like astronauts. Nonetheless, this technology is not safe: The gaze of the AI turns out to be a terrorizing instrument of control. The AI indeed ends up killing most of the crew, an outcome that foreshadows contemporary

7 The scene can be seen here: https://www.youtube.com/watch?v=_jeJk63XYPg, accessed June 3, 2022.

discussions about the danger of autonomous weapon systems that have capabilities of perception and select targets to destroy them. In not only normalizing but subsequently showing the dangers of AI, the film ultimately departs from Kirby's typology, since, for Kirby, "movies can show audiences how a technology works, why it is safe and why they need it" (Kirby 2010, 45).

(4) *Real need:* Since HAL and its capabilities are located in a special, high science, space travel, and at least implicitly military context, it does not correspond or coincide with real-life needs, such as those of the audience, for instance. Machine vision is presented/interpreted as removed from ordinary life.

As Michael Mateas notes, the figuration of HAL turned out to be a quite powerful socio-technical imaginary: "As a representation, HAL, and the role he plays within *2001*, both captures preexisting intellectual currents that were already operating with the field of AI and serves as an influential touchstone, which has had a profound impact on individual AI practitioners and on the aspirations of the field" (Mateas 2006, 105). The idea of machine vision was connected, at an early juncture, with the ambiguous idea – unrealized to this day – of a general artificial intelligence.

4. 1973: *WESTWORLD*

[Fig. 2: Subjective of the Gunslinger robot]

In 1973 *Westworld* was released, a science fiction movie directed by Michael Crichton. It presents a different scenario than *2001*. The "Westworld" is a kind of high-tech amusement park in which guests can play, often transgressively, with lifelike androids in different historical settings. Then a malfunction happens: The security measures fail and the androids become a serious threat to the guests. The antagonist, an artificial gunslinger played by Yul Brynner, kills one guest, chases another, but can be defeated at the end. The historical background informing the film is similar to that of *2001*: "Artificial intelligence" was a widespread – albeit controversial – topic in 1973. The idea of self-acting robots was not completely

alien. But *Westworld* adds some new twists to the picture. To illustrate this, I turn, again, to Kirby's scheme:

(1) *Performative artifacts*: In *Westworld*, machine vision is connected not to an all-seeing AI but to an always situated robot that is, on the one hand, very limited compared to HAL. This robot is only a gunslinger and completely reduced to that task – in that sense he is an imaginary representation of a "narrow AI" compared to HAL, which is an imaginary representation of a "general AI" (cf. Dyer-Witheford, Kjøsen and Steinford 2019, 10–15). On the other hand, the machine is able to move and, therefore, to chase the protagonist, showing working robotics at play. In this context we see the POV of the robot, its machine vision, several times (Fig. 2).[8] While HAL is an image of a symbolic AI, the gunslinger in *Westworld* is an embodied AI. Machine vision is constructed here as robots' means of orienting themselves in space. Interestingly, *Westworld* is now considered to be the first film in which digitally processed images were used to present the robot's POV. Computer graphics pioneer John Whitney Jr. writes:

> When I met Brent Sellstrom, the post-production supervisor of *Westworld*, he had a problem: to find a technique to represent, on film, the point of view of a machine. The script called for the audience to see the world as a robot gunfighter, played by Yul Brynner, saw it. This 'Robot POV' was supposed to consist of a series of animated colored rectangles. It could not be done by any known special-effects technique. Something new was required (Whitney Jr. 2020).[9]

Yet, he adds:

> It occurred to me that the scanning digitizing methods employed by NASA's Jet Propulsion Laboratory on their Mariner Mars flybys could be used here. Basically, in this system, an image is broken down into a series of points, and the gray-scale value for each point determined. A numerical value can then be assigned to each point, and a new image reconstituted electronically. Similar techniques have been devised in computer science to enable computers to 'read' handwriting, X-rays, seismic data, and so on. It is the kind of technology that allows a computer to tell the difference between a 'P' and an 'R' (ibid.).[10]

8 See https://www.youtube.com/watch?v=nILKFlpOZi0, accessed June 3, 2022 for a compilation of machine vision scenes from Westworld.

9 Whitney Jr. (together with Saul Bass) also created the very famous graphic title sequence of *Vertigo* (Alfred Hitchcock, USA 1958), the first ever computer graphic sequence in cinema (cf. McCormack 2013).

10 The details of the cumbersome process are provided in detail in that article. See also ASC Staff (2020).

Ultimately, Whitney had to use another approach than that deployed by NASA, for simple reasons of cost. Yet the images representing the machine vision in *Westworld* refer to the history of the digitization of images, which would turn out to be very important not only for science, space travel etc. (cf. Schröter 2004b) but also, as he explicitly states, for the history of pattern recognition, that is: machine vision itself. The POV shots of the robot not only represent the vision of a machine but are actually made with technologies that finally led to machine vision.

(2) *Social contextualization*: Contrary to *2001*, the plot of *Westworld* shows the advanced technology of machine vision not in space travel and in a scientific and/or military context, but in a future form of entertainment. In that sense, it connects machine vision with the not unusual transfer of technologies from the military to the civil realm. Indeed, Whitney Jr. was known for "creating animation with military-surplus analog electronics and motor assemblies" (Price 2013).[11] On the level of content, as on that of material production (at least concerning Whitney's earlier work, before he did special effects), the film presents the transfer of military technological inventions to civil entertainment.

(3) *Normalized approach: Westworld* describes a future in which it will be normal (at least if you have enough money) to interact with robots that can see. The gunslinger is a slave-like robot designed for a very specific task that then breaks out of his assigned role, not in an act of conscious rebellion, however, but as a result of technical failure. Again, advanced technology is imagined as a potential threat.

(4) *Real need:* In *Westworld*, the socio-technical imaginary of future entertainment is modeled after Disneyworld: going to a special place, a theme park, and para-socially interacting with fictional, but tangible and in that sense virtual characters in fictional scenarios. The real need for an ever-expanding entertainment industry foreshadows its own future. Such robot parks are still far from becoming real, even if a contemporary television series directly based on *Westworld* refreshes this imaginary.[12] Perhaps this will never become a real practice, yet narrow AIs – like the robot in *Westworld* – are in fact already widespread today. While robots have mostly non-anthropomorphic forms and are used in industry, simple AI systems possessing the ability to recognize visual and aural patterns are to be found in Alexa or Siri or in the face recognition systems of modern iPhones.

Westworld introduced digitally processed images and their digital look to audiences and links this electronic POV to a robotlike, narrow AI. The rhetoric of such technological-looking images is well established today. Machine vision appeared/emerged in *Westworld* in a context of entertainment, mirroring the then slowly nascent transfer of computer technologies, originally developed by high science and the military, into entertainment and, finally, everyday life.

11 See also McCormack (2013).

12 *Westworld* (Nolan and Joy 2016).

5. 1984: THE TERMINATOR

[Fig. 3: Subjective of the Terminator]

This dissemination of computing began in the late 1970s with the creation/foundation of companies such as Microsoft and Apple. One popular computer was the Apple II, released in April 1977. In 1984, *The Terminator* (directed by James Cameron) opened in the US cinemas. It told the story of a robot, the "terminator", who is sent from the future to kill the mother (Sarah Connor, played by Linda Hamilton) of the future leader of the resistance against the tyranny of artificial intelligence in that same future. A human fighter, played by Michael Biehn, is sent back too and tries to protect the mother. He then falls in love with her, they have sex – and become the parents of the coming leader.

What is the connection to the diffusion of early home and personal computing?[13] The subjective POV of the robot from the future is, different from the POVs in *2001* and *Westworld*, overlayed with diagrams and snippets of computer code to make it look more robot-like (Fig. 3). The code snippets are from 6502 assembler code, which was the exact code used in the Apple II.[14] The snippets were taken from the home and personal computer hobbyist journal *Nibbles*.[15] The 6502 processor and its close relative, the 6510, were also used in

13 On the history of early home and personal computing, see Haddon (1988, especially pp. 23–24 for the Apple II).

14 See a compilation of POV scenes from all the Terminator films: https://www.youtube.com/watch?v=CZlEiD6Nmnc, accessed June 3, 2022.

15 E. g. Manly (1984, 52); Peterson (1984, 40); Efflandt (1984, 89). Since the last two examples are from the September issue of the journal *Nibble* and since *The Terminator* was released in the US on October 26, 1984, it seems that the POV shots with the snippets of the code were filmed very late and shortly before release.

other popular computers of the time, such as the Commodore VIC 20 and the Commodore C64 (cf. Bagnall 2011). We again use Kirby's scheme:

(1) *Performative artifacts*: As in *Westworld*, we are shown a robot which has astounding capabilities but is more limited than HAL. He has only one purpose: killing Sarah Connor. What is more important is that the machine vision of the terminator shows the visual field overlayed with information. This prefigures the now widespread idea of "augmented reality" (AR) (cf. Schröter 2011). Viewed from a contemporary perspective, the robot's POV displays the enhanced and augmented POV of today's computer users *avant la lettre*. It shows the successful performance of an AR system. Moreover, since the Apple II had been available since 1977, and insofar as many users would have known the 6502 code (although most of them presumably programmed in easier higher programming languages), the POV also references another, well-performing, technology: home and personal computers of the time.

(2) *Social contextualization*: Machine vision is shown in a warlike and therefore military context. The robot from the future means the threat of hyperintelligent AI exterminating mankind. In that context, machine vision is, somewhat similar to *Westworld*, but on a much larger scale, conceptualized as a predatory and even genocidal gaze – a dystopian scenario that is still influential today, for instance when world-famous physicist Stephen Hawking warns against AI (cf. Cellan-Jones 2014).[16]

(3) *Normalized approach:* The scenario is obviously different from *2001* and *Westworld*. The technology is not normal, but comes as a deadly threat from a distant future. However, the film does make it seem to be normal for advanced AI to use killer robots.

(4) *Real need:* Although it may reasonably seem like there is no meaningful need for dangerous killer robots, there is actually a lot of research on autonomous weapon systems conducted by the military. *Terminator*, in that sense, can be seen as metaphorically representing the automatization of warfare and the role of machine vision as a technology for identifying targets (cf. Virilio 1994; Queisner 2017). Furthermore, the imaginary technology presented in *Terminator* is removed from Kirby's notion of the "diegetic prototype":

> Diegetic prototypes differ substantially from what I term 'speculative scenarios' in movies […]. Speculative scenarios represent highly implausible and impractical situations and technologies that film-makers and science consultants imbue with a sheen of plausibility, so that they look possible within a film's narrative. They make these technologies look plausible, knowing that they are impossible to achieve in real life. (Kirby 2010, 46)

16 On other dystopian AI scenarios, see Dyer-Witheford, Kjøsen and Steinford (2019, ch. 3).

Although *Terminator* surely has no direct influence on the socio-technical imaginaries or *Leitbilder* of technological development (compared to HAL from *2001*), it was influential in an aesthetic way. With its representation of the machine POV as images overlayed with diagrams and code, *Terminator*, just like *Westworld*'s pixilated and 'technical look,' has shaped the aesthetic of imaginary machine vision to this day. The sequels to *Terminator* contain machine POVs that further modify and extend the aesthetics developed in the initial movie. Interestingly, the idea of integrating information snippets in the machine vision was already present in the production of *Westworld*:

> Crichton was concerned from the outset with how to give a distinct look to the gunslinger's point of view when the audience saw events through its eyes. Five years earlier, Stanley Kubrick had used a wide-angle lens to show the perceptions of [HAL] 9000, the troubled computer of '2001: A Space Odyssey.' Crichton, however, wanted his villain's perspective to look like that of an electronic machine. His script described it as a bizarre, 'computerized image of the world' with 'flashed-up calculated figures' (Price 2013).

6. A CONCLUSION WITH KAZUO ISHIGURO'S *KLARA AND THE SUN*

What the three films analyzed have in common is that they have shaped the imaginary of machine vision. All subsequent representations in films and television basically resemble their aesthetic and thematic construction of the POV of machines. Through numerous films and television series, the idea of a machine POV (and the associated idea of machine consciousness) has become well established in popular culture and part of our socio-technical imaginaries and media prophecies.

The idea of a machine POV and the associated idea of machine consciousness is so well known that today it can even be found in highbrow literature, normally far removed from science fiction. A remarkable example is the novel *Klara and the Sun* (2021) by Nobel Prize (2017) winner Kazuo Ishiguro. The story is narrated from the point of view of a so-called "artificial friend" (AF), a highly developed robotic, female-connotated AI system named Klara. She is a kind of robot puppet that can be bought as a companion for children. The machine is thus associated with "female" values such as care – in contrast to the "male-connotated" computer systems discussed above.[17] Klara tries to understand the world in her own way. The details of the wonderful and deeply moving plot need not be discussed here. Suffice it to emphasize, first, that AI is represented not according to today's stereotyped representations as either a slave or a threat (except for the fact that many people in the story world are "post-employed" due to technical progress[18]),

17 This embeds Klara in a history of female-connotated robots in film, e.g. Her (USA 2013, Spike Jonze).

18 On AI and labor, see Dyer-Witheford, Kjøsen and Steinford (2019, ch. 1 and 2).

but as a loving friend and companion. Second, since the book is centered around Klara's subjective experience, it is also centered around her visual (and aural) perception. At the very beginning, where she is presented in a store window and object of the customers' gaze, we read: "I should confess here that for me, there'd always been another reason for wanting to be in the window […] Unlike most AFs […] I'd always longed to see more of the outside – and to see it in all its detail" (Ishiguro 2021, 6).[19] Many passages in the narration emphasize the way she visually perceives the world and it becomes obvious that Klara's field of vision is technologically pixilated in a way that resembles the POVs in *Westworld*: "The mother leaned closer over the tabletop and her eyes narrowed till her face filled eight boxes, leaving only the peripheral boxes for the waterfall, and for a moment it felt to me her expression varied between one box and the next" (ibid., 104). Her field of vision is somehow structured in "boxes." Later on, Klara has some problems with her eyesight:

> I'd thought that once I was no longer observing them through glass, the theater people would become more distinct. But now I was in their midst, their figures became more simplified, as if constructed out of cones and cylinders made from smooth card. Their clothes, for instance, were devoid of the usual creases and folds, and even their faces under the streetlight appeared to have been created by cleverly placing flat surfaces into complex arrangements to create a sense of contouring (ibid., 235).

If the idea that machines can see, like the recent iPhones that can recognize our faces, has become a well-established topic, it is because more than fifty years of socio-technical imaginaries of machine vision have accustomed us to the idea that vision is no longer the privilege of higher biological life forms alone.

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19 See also Ishiguro (2021), where one character says to Klara: "You're an intelligent AF. Maybe you can see things the rest of us can't" (108).

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IMAGE INDEX

Fig. 1: Taken from the Film *2001: A Space Odyssey* (Kubrick 1968).

Fig. 2: Taken from the Film *Westworld* (Crichton 1973).

Fig. 3: Taken from the Film *The Terminator* (Cameron 1984).

THE TECHNOLOGIZATION OF STREET DEMONSTRATIONS AND THE AGENCY OF THE MOBILE PHONE.

A Short Story of the Future of Digital Witness Evidence

MAREIKE MEIS

1. INTRODUCTION

For the last two decades, a steady and increasingly growing technologization of street demonstrations has taken place. The global advance of the internet and wireless digital communication technology introduced new ways of mobilization and coordination for social movements and protests (Castells 2009, 299-303). The emerging strategic, self-structured, and cooperative communication and social organization resulting from the use of web-enabled mobile devices led Howard Rheingold (2002) to coin the term *smart mobs*, i.e., groups of people who form "ad-hoc mobile social networks" (169) and "act in concert even if they don't know each other"(xii). He identified the anti-globalization protests in Seattle (USA) (also known as the *Battle of Seattle*) in 1999 and the People Power II Revolution in Manila (The Philippines) in 2001 as the first "netwars" (161) in which "the power of the mobile many" (157) brought forth a different mode of political conflict.

Then, the Arab Spring (2010–2011) introduced another level of interconnectedness of street demonstrations and media technology. Social Media like Facebook, YouTube, and Twitter became central to the diffusion of demands for political freedom and human rights (Castells 2012). When camera-equipped mobile phones became prime documentation devices in opposition street demonstrations, Kari Andén-Papadopoulos (2013) saw the rise of the "*citizen camera-witness*" (754; italics in original) who engages in the life-threatening endeavor of photo- and videographing to generate a visual public testimony to disproportionate violence and human rights violations. In the street protests of the early days of the ongoing Syrian Civil War, this practice culminated in the phenomenon of mobile phones triggering deadly encounters between snipers and protesters and documenting the actual death of protesters while they were filming violent crackdowns on anti-government street demonstrators (Meis 2021, 91–104). This phenomenon attributes a paradoxically new meaning to the former MIT media lab slogan *demo or die*, a modification of the academic saying *publish or perish* (Roth 2016), when the act of demonstrating not only entails possibly dying accidently but deliberately accepting the possibility of falling victim to the violent suppression of human rights during the documenting act. As a potential post-mortem documentation and reporting device, here the mobile phone became a constituting

part of witnessing to human rights violations in civil protests when it outlived, or *survived*, the deadly encounter while the filming person eventually died (Meis 2021, 117–120).

This gives rise to the question of the agency of the mobile phone as an ever-present and ever-ready recording and dissemination device in the act of witnessing and giving testimony in contemporary technologized street demonstrations. Linked to the pursuit of legal accountability and justice to the perpetrators and victims of human rights violations with the help of digital media technology in the context of the Syrian Civil War, the agency of the mobile phone in these past acts of witnessing directs towards a future of media witnessing that can be used in courts[1] (78–79, 120–121). Today, human rights organizations like *TRIAL International, WITNESS,* and *eyeWitness to Atrocities* as well as international legal investigative teams like UNITAD (United Nations Investigative Team to Promote Accountability for Crimes Committed by Da'esh/ISIL) pursue the common goal of introducing digital witness evidence to human rights violations into criminal legal investigations (Gabriele, Matheson, and Llorente 2021; UNITAD 2021). In different digital witness evidence projects, they appear to establish a sociotechnical future of the legal admittance of media as a witness in international criminal proceedings. This future admittance was already evoked with the practices of media witnessing in the opposition street demonstrations of the Arab Spring.

Looking back at the large corpus of videos available on social media from the street protests of the Syrian Civil War, I focus in this paper on these past acts of media witnessing as being portents to a future inclusion of media witnessing in general and of digital witness evidence in particular in court. I discuss the nature of the agency of the mobile phone as a prime documenting and reporting device in contemporary technologized street demonstrations in its retrospective historicity with reference to the scenographical approach of testimony by Aurélia Kalisky (2017) and the politico-philosophical reflections of Judith Butler (2011). Applying a diffractive research perspective towards the study of media phenomena grounded on the writings of feminist scholar Donna J. Haraway (1997, 2004 [1992]), I bring together different media material and theoretical approaches in a narrative history of the technologization of street demonstrations on the one hand and of the future of digital witness evidence as corroborating, and eventually direct, legal evidence on the other.

In the next section, I first introduce this diffractive research perspective that integrates a narrative analysis as a contribution to the literature on media witnessing. Second, I look at past acts of media witnessing in the street protests of the Syrian Civil War and the changes brought to it with the employment of mobile phone recordings by a resistant civil opposition. In the third section, I turn to the

1 Frosh and Pinchevski (2008) define media witnessing as "witnessing performed *in*, *by* and *through* the media." (1) For this paper, the second and third mode of media witnessing are of particular interest, i.e., "media themselves bearing witness" and "the positioning of media audiences as witnesses to depicted events" (1).

agency of the mobile phone evoked by these past acts of media witnessing. Here, I refer to the employment of new media technologies by human rights NGOs and international legal investigations that work towards the admissibility of digital witness evidence in criminal proceedings and in writing a history of past crimes to allow for their future judgement. In the conclusion, I summarize the central findings and the benefits of a diffractive perspective for doing research on technologized street demonstrations.

2. DIFFRACTION AND NARRATIVE ANALYSIS: BRINGING TOGETHER THE PAST, PRESENT AND FUTURE IN THE STUDY OF MEDIA WITNESSING

Haraway (1997) introduces *diffraction* as a methodologically applied metaphor for doing and thinking research differently. She adopts diffraction from the study of physics, where it describes the movement of waves when they hit an obstacle and deflect. In the process of diffraction, the waves deviate from their initial course and advance into areas that were previously out of their reach. If waves meet, they interfere with each other constructively or destructively: They superimpose and either amplify to greater waves or cancel each other out and level off. In other words, interfering waves affect each other by becoming different and producing difference. Diffraction refers to the moment when distinct events interact with each other in a way that produces an (empirically) observable difference; or in physical terms: a diffractive pattern. It is an interaction marked by openness and relational becoming in which the process of relating is never complete, i.e., the resulting diffractive pattern is subject to constant change (Bath et al. 2013, 7; Deuber-Mankowsky 2007, 343–345; Meis 2021, 40–46).

Haraway's (1997, 16) motivation for following diffraction as a way of thinking about other phenomena is to produce different insights and realities instead of reproducing only various versions of the same knowledge in the scientific analysis. She situates herself in a feminist tradition that pursues a self-critical perspective of difference and connectivity (Haraway 2004 [1992], 48). As Schneider (2002) puts it, she proposes a scientific practice "for doing […] knowledge differently" (466). On the methodical level, she applies a narrative approach and introduces *storytelling* as knowledge practice. As another key analytical concept, she applies (with reference to the mimetic teachings of Eric Auerbach) *figurations* as performative, verbal, and visual images in which the material-semiotic practices of the production of meaning and knowledge consolidate (Haraway 1997, 16). Embedded in a diffractive way of thinking, the concepts of storytelling and figuration allow researchers to refrain from (re)producing a homogenous historicity, instead embracing the production of heterogeneous (hi)stories that do not follow a logic of "mirroring and straight lines of sight" (Schneider 2002, 472) but of diffraction and displacement that make relations and effects of difference visible. Haraway's (1997, 273) intent is to pave the way for (hi)stories that allow for critical perspectives in relation to others. Embedded in a narrative approach, the diffraction met-

aphor refers to the process of producing meaning in and by the figurative displacement and interference of events within narrations. Meanings appear as generative differences that concentrate in diffractive patterns that can be read and written and are neither true nor false. However, they can be significant or insignificant in that they have strong or weak effects of difference in evoking certain perceptions and realities (Meis 2021, 43).

Above all, as Deuber-Mankowsky (2007, 345) explains, diffraction refers to the retrospection of and ongoing engagement with events that are always in the past and took place elsewhere, but those effects bear a present and future meaning. With a diffractive way of thinking, the focus of research shifts from the phenomena to the consequential effects of diffractions and superimpositions of events that become visible in a diffractive pattern of stories, figurations, and meanings. In line with feminist standpoint theory, phenomena are not understood as distinct appearances with an independent existence that are to be discovered by modest scientific observation. Instead, phenomena emerge from the research process as a kind of retrospectively applied logic that is relevant to the present, effective for the future, and results from the epistemological as well as the socio-cultural, -political, and -economic standpoint of the researcher (Haraway 1997, 37-39, 235-237).[2]

With the applied metaphor of diffraction it is not only possible to research the effects of differences of events that occurred but only become visible in retrospection – a factor that makes a diffractive perspective in particular suitable for researching social media phenomena that are characterized by an inherent volatility and instability (Eickelmann and Meis 2023/forthcoming). It also allows researchers to focus on the *potential* effects of events, i.e., the not (yet) realized but possible, if not inevitable, future of an event's effects. This future may be described with Ernst and Schröter (2021, 80) as part of the *sociotechnical imaginaries* that ground in the political, legal, or ethical valuations and regulations of technologies. In this regard, a diffractive perspective allows us to read stories regarding their future, i.e., their imagined but realizable, ramifications that are latent in the constant changing and unfurling diffraction patterns of dispersed yet concurring events. This factor is of relevance for doing research on today's technologized street demonstrations of the third wave of *new social movements*[3] that are characterized by decentralized grassroot organization and a high degree of dispersion and heterogeneity of their followers. Despite the followers' loose and informal connectivity, they yield collective actions and effects (Kern 2008: 15;

2 Haraway (1997, 16, 37) introduces for this epistemological understanding the concept of situated knowledge with reference to feminist strong objectivity.

3 Literature on social movements usually refers to three waves: First, the civil-emancipatory movements during the Age of Enlightenment; second, the labor movement during the Age of Industrialization; and, third, the new social movements after World War II that resulted in new forms of the feminist, peace, and environmental movements (Kern 2008: 13).

Rheingold 2002: xii) – not least because they resort to digital technological tools, most notably social and mobile media, for communication and coordination (Rogerson 2010: 2-3). Grasping the moment of concurrence and interaction of these dispersed and heterogenous forces, i.e., a moment which produces significant social effects and phenomena in the context of technologized street demonstrations, is an example of the particular benefit of using a diffractive research perspective. By following the propagating waves of interfering events and mapping the evolving effects of difference in their emanating diffractive patterns, it becomes possible to focus on the entanglement of forces that yield strong effects in the concerted actions of a collective of street protesters. In these diffractive patterns, figurations appear as bearers and enablers of certain meanings and serve as central points of reference in the narrative analysis.

A diffractive research perspective is thereby flexible in integrating other analytical concepts and methods that help to read and understand the diffractive patterns of stories, figurations, and meanings. For acts of media witnessing and their future legal use in general and of digital witness evidence in particular, the scenographical approach to witnessing by Aurélia Kalisky (2017, 43) is useful for analyzing the testimonial agency of media technology. She describes witnessing as a performative act that constitutes a primal scene in which the witness, the recipient of the testimony, and the testimony are integral parts. Witnessing is borne by the convincing dialogue between the primary witness and one or more recipients on the one hand, and the contextual and material appearance of the testimony on the other. In the first place, the testimony is a bodily experience that inscribes itself in the witness' body. As creator or author, the witness then provides it by any means and in any media form to others. Witnesses communicate their witness knowledge to the recipients, who then need to acknowledge the witness and the testimony and need to be convinced by the testimony in the light of their own convictions. In this process, not only the content of the testimony, but also its context, place, and time of appearance as well as its media materiality are crucial for its social, political, and/or legal acceptance and recognition. This primary scene of witnessing may be extended if the recipients become witnesses themselves by disseminating the testimony by their own conviction and acting as secondary witnesses (Kalisky 2017, 43; Däumer, Kalisky, and Schlie 2017, 15-17).

Following a diffractive approach, different types of witnessing, or, to put it in legal terms, witness evidence (e.g., direct, hearsay, or expert witness evidence), may be described and analyzed as figurations brought forth by the material-semiotic practices in the legal production and establishment of a certain truth or reality.[4] Reading figurations of witnessing and following their diffractive patterns provides insights into the interplay of the aesthetics and discourses at work in this process (Meis 2021, 115-120). Media technologies, in their documenting capacity,

4 For a further discussion of the process of legal truth finding and production of reality in court, see Bens 2019.

may not only play a crucial role for how convincing testimony is. As acts of media witnessing in the Syrian street protests described in the next section show, they may also enter, and significantly change, the primary dialogue of witnessing and the related figurations of witnessing. They have the potential to achieve a testimonial agency in the act of witnessing that is directed towards their use in the future prosecution of human rights violations.

3. SYRIAN STREET PROTESTS AND THE FIGURATIVE DISPLACEMENT OF THE SCENE OF WITNESSING

According to the established, reconstructed narration of events, the street demonstrations in Syria started off as peaceful and isolated civil protests in the wake of the Arab Spring revolutions in January 2011. But after March 15, their frequency and scope as well as their character changed. On that day, people were killed and hundreds injured in the Syrian city of Deraa during a demonstration against the arrest of school children. This event initiated a series of street protests against police arbitrariness, the ongoing emergency legislation in Syria, corruption, and nepotism. The regime answered these protests with military force, mass arrests, and torture. In response, the intensity, reach, and demands of the protesters changed, putting a spiral of violence and radicalization in motion that led the country into a complex civil war (Asseburg 2013, 11-12). At the same time, the Syrian regime launched a large-scale campaign of disinformation and suppression of press freedom. It not only tightened the already restrictive control and censoring measures in place since mid-2000. It also put bans on journalists, made them subject to expulsions, imprisonment, torture, and killings, and reframed the street protests as minor events which were driven by terrorists, foreign agents, or Islamic extremists without any considerable civilian causalities.

Lacking any other means in this restrictive environment, the Syrian civil protesters resorted to social and mobile media to put their view of events on public display. They started to record low-quality videos of violent protest incidents with mobile phones or handheld cameras, provided these to news agencies all over the world, disseminated the footage via social media platforms like Facebook and YouTube, and established media offices and archives (Khamis, Gold and Vaughn 2012, 9-10; Reporter ohne Grenzen 2013, 5, 9, 22–27). This gave rise to what media scholars termed "citizen camera-witnessing" (Andén-Papadopoulos 2014, 753) or "civil-resistance videography" (Meis 2022, 1). At first, these recordings were driven mostly by an urge to document and commemorate the extraordinary events of civil uprisings in the public space of the street, to express moral outrage, and to generate a counter-narrative that challenged the story told by the Syrian regime. But with the growing violence inside Syria and the aggravation of the conflict, Syrians increasingly engaged in the dangerous act of recording incidents of human rights violations out of the desire to provide evidence for bringing justice to perpetrators and victims (Wessels 2019, 242–243; Meis 2020, 81).

Today, after more than 10 years, the Syrian Civil War appears to be a scattered and forgotten conflict – even more so since the Russo-Ukrainian-War has captured the world's attention (The Guardian 2022). Still, the echo of past atrocities and human rights violations in Syria resounds in the records available in social media and digital archives, waiting for a reverberatory room that makes their full extent recognizable.[5] Mobile phones as ever-present and ever-ready recording and dissemination devices may not only play an important role in documenting human rights violations and making them accessible to international criminal investigation. As the latest endeavors of human rights NGOs and international legal investigative teams like UNITAD show, they may also assume a primary role in the act of witnessing and the process of providing witness evidence in the legal prosecution of past crimes with the help of witnessing apps (Gabriele, Matheson, and Vazquez Llorente 2021; Hamilton 2018, 46-47; UNITAD 2021).

This potential role of the mobile phone as a digital-witnessing device traces back to the actions of civil-resistance videographers and their vision of a future accountability and prosecution of crimes inside Syria driving their recording and documenting efforts (Meis 2021, 120). The extraordinary testimonial capacity of mobile phone records becomes apparent with the application of the figuration of the survivor testimony, which takes a particular mode of appearance in the Syrian street protests (Meis 2022; 2021, 115-120). In general, the survivor testimony refers to the immediate experience, living through and passing on of events of extreme political violence. As such, it requires survivors as bearers of subjective victims' knowledge. The survivor testimony makes the wrongful action which the survivors and their collective suffered public and accessible to reflection. It thus signifies a collective experience of extreme political violence and its potential international justiciability (Kalisky 2017, 30). Yet, it is constantly exposed to the risk of annihilation by a regulating political power or of being devalued because its recipients may refuse to recognize it (Däumer, Kalisky and Schlie 2017, 7, 12).

This risk was realized in the Syrian conflict when videographers themselves fell victim to the violence they were documenting with their mobile phone cameras. Even more, it materialized in the *surviving* record[6] as a communicable testament to this annihilating power when it was retrieved from their devices, up-

5 One example in which digital records of past crimes in the Syrian civil war available on social media led to a criminal trial is the case of Mohamed Abdullah, a low-level Syrian soldier seeking refuge in Sweden in 2014 who was convicted in 2017 based on a Facebook post of a photograph showing him abusing dead bodies (Barnard 2017).

6 In their analytical reflections of political videos in social media, Eder, Hartmann, and Tedjasukmana (2020, 15, 17-18) introduce the category of the witness video (German: Zeugenvideo) produced by activists who try to protect the record and their lives against the violent actions of a regime. However, this categorization misses the role of the recording as a trigger of violence, the tension between survival and non-survival, and the presence of death – as a potential or actual reality – that is key in the practice of civil-resistance videography described here. For a further elaboration on this, see also Meis 2022.

loaded to social media, and re-produced in different accounts of the Syrian Civil War beyond their deaths. At the height of street protests in Syria, the phenomenon of civil videographers getting shot while filming military actions during demonstrations in auto-record mode, which continues even if the filming person falls dead,[7] is an example of the paradox of an annihilating power that brings the testimony into being the moment it tries to prevent its creation by killing the potential witness. This evokes a particularly far-reaching testimony, in which the record and the recipients of the testimony act as witnesses. The moment the filming person is shot while holding the mobile camera, the record takes the place of the dying primary witness in the testimonial scene. Uploaded to social media, the collective of platform users takes the place of secondary witnesses once they disseminate the recording and comment on it in an accrediting or discrediting way. The convincing testimonial dialogue described by Kalisky is thus figuratively displaced: It no longer takes place between the primary witness and one or more recipients; it takes place between the record and a collective of receiving social media users (Meis 2021, 118).

4. THE FUTURE OF TESTIMONIAL AGENCY OF THE MOBILE PHONE

In this testimonial scene, the act of witnessing merges into the auto-record mode of the mobile phone camera. Here, the recording becomes a key link in a media-induced chain of witnessing, those propagating diffractive pattern links to the past and to the future. It links to the past when Syrian videographers engage in the life-threatening endeavor of recording human rights violations with their mobile phones and tell their account on events in the news and social media despite and because of the knowledge of others who have been targeted by military force and have been killed (Meis 2021, 94). In this concatenation of past and present events, the testimonial act achieves a commemorative value as it points to a series of undocumented deaths that allegedly happened under the same circumstances. It links to the future when the same videographers martyrize themselves to fight the annihilating power of the Syrian regime that tries to place them and their collective beyond rights and beyond the political space by putting their deeds on public display for trials yet to come. Here lies the extraordinary testimonial capacity of the mobile phone that becomes apparent with Butler's (2011) argument on the protesting body that claims and performs its legitimate presence and its *right to have rights* by making a public appearance on the streets and in the media despite and in resistance to the violence directed at it. To perform this bodily persistence, she writes, it "requires the mobilization of space, and that cannot happen without a set of material supports mobilized and mobilizing" (Butler 2011). In the Syrian street protests, the mobile phone becomes this material bearer of a persisting power of the witness' body when the bodily experience of witnessing inscribes it-

7 An example of such a video is available on YouTube under the title "Man films his own death in Syria protest" (netspanner 2011).

self in the record and proceeds with the auto-record mode of a digital technology after the attempt to kill the human witness. By *surviving*, the mobile phone record vehemently resists the annihilating power of the Syrian regime and preserves the testimony for a future judgement of its atrocities in a figuration I have introduced elsewhere as the *non-survivor testimony* (Meis 2021, 116).

The mobile phone, the record and the collective of social media users constitute here a joint authorship of the testimony to human rights violations in Syria in an almost unstoppable chain of witnessing (117). However, it is not a matter of course that the mobile phone record will enter the dialogue between primary witnesses and recipients in the legal process of truth building.[8] In criminal proceedings, witness evidence presented before court plays a key role, but dead witnesses cannot testify before a judge nor can records speak for themselves – despite the repeatedly uttered tenacious belief in the opposite. This was already proven in the early days of video witness evidence in the Rodney King case in 1992 when an eyewitness was asked following his report on events to tell the court what the video shot by casual observer George Holliday[9] tells and what it does not tell (Ronell 2000, 269). This was again proven when digital video and photo evidence was admitted to court in the Affaire Castro et Kizito in the Democratic Republic of Congo in 2018 only as corroborating evidence for proving the severity of suffering inflicted on victims of crimes of humanity (Gabriele, Matheson, and Vasquez Llorente 2021, 126). As these examples show, contextualization and corroboration are required for visual evidence to contribute in court, while the ultimate interpretation of the evidence remains uncertain: The Holliday video did not support, and might have even hindered the arguments for racial police brutality, and legal scholars today caution that digital user-generated evidence might also benefit the other side of the reasoning (Meis 2021, 119; Hamilton 2018, 50-51).

But the role of video evidence before court is not limited to the re-narration of the circumstances of a crime. It includes the provision of auto-generated meta data too. Recently developed witnessing apps like the one by *eyeWitnesss to Atrocities* bring digital and automated verification tools and secured evidence archives into this equation. From this perspective, a whole apparatus of digital evidence collection stands before court when digital video witness evidence is admitted in a criminal proceeding: It is not just one video, but also the people watching it and testifying to what they just witnessed with the video, the recording device and its applications providing the meta data of the recording, and a hybrid net-

8 Usually, the legal discourse rather refers to truth *finding* (Bens 2019), but considering the feminist epistemology applied in this paper, these processes are more appropriately described as truth *building*.

9 Rodney King became subject to police brutality during his arrest in a residential area in Los Angeles (USA) after a car chase on March 3, 1991. Resident George Holliday recorded a nine-minute video of the physical abuse by the police officers against Rodney. Back then, the video was disseminated via the news media very shortly after the event (Zelizer 2017).

work of humans and technology feeding the evidence into an archiving, dissemination, and investigative system (Hamilton 2018, 6, 17–18; Meis 2021, 119-120). This human-technology collective of witnessing constitutes a testimonial figuration in which the function of the mobile phone extends from a hosting device for applications to those of a facilitator that puts a complex apparatus of evidence into motion in the pursuit of legal recognition.

The vision engraved in this testimonial figuration by the developers of mobile phone witnessing apps is that the app itself will be considered a witness before court one day (Hamilton 2018, 46–47). When this is the case, the mobile phone as an ever-present and ever-ready documenting device will achieve an unprecedented witnessing agency that was already present in the past acts of civil-resistance videography in Syria. These past acts are thus an attempt in the present to write the future of whether and how these crimes can be prosecuted. Civil-resistance videographers in Syria and other street demonstrations have laid the groundwork to make it succeed in their persistence to record and document human rights violations with their mobile phone cameras and to push legal criminal investigations and proceedings for a future admittance of digital recordings as (primary) witness evidence.

Yet, this potential new agency does not come without risks. These became apparent in the wake of the Syrian conflict, too: Fake videos and re-enactments were published that claimed their own agency in the truth-building processes by creating their own narrative of events, which add up to the overarching stories told of past crimes and ongoing wars and conflicts wittingly and unwittingly. There is a case of a re-enactment of snipers shooting at children from high buildings as the children tried to cross the street between two occupied areas of warring groups in Syrian cities that unintentionally threatened the revolutionary cause of the Syrian opposition. This video led to the Syrian regime making a general accusation that most or all videos were faked, universally calling the sincerity and genuineness of the videos' accounts into question (Meis 2021, 192–193). There is also the example of a European-based, right-wing populist movement that re-enacts the infamous beheading videos of the Islamic State and thereby reframes them as a war on European soil and a threat to European identity to reenforce its extremist claims (Meis 2021, 227–232). While these are past examples for the challenges of what can be described with Karen Barad (2001, 235) as emerging *agential realities*[10] of testimony, recent incidents in the Russo-Ukrainian-War are a foretaste of what might come: Supposed deep fakes by a state-sponsored Russian comedy collective, pranking international politicians with a fake video call by Kyiv mayor Vitali Klitschko (Behrendt and Schneider 2022) point to the challenges that

10 Barad (2001, 235) introduces *agential realities* as realities made up of material-discursive phenomena constantly changing with the intra-actions between humans and nonhumans that *we* – the watchers, users, observers, witnesses, and investigators – are a constituting part of and that open up the epistemological space for material-discursive agencies, which include the nonhuman and the hybrid or cyborgian.

these emerging agential realities might pose in the processes of legal truth-building and the work ahead for investigative teams and app developers to verify and authenticate video material. Still, as the Syrian context and latest international criminal cases and investigations from the Democratic Republic of Congo and Iraq show, these agential realities also bring hope for a new understanding of and dealing with digital witness evidence in the pursuit of international prosecution of human rights violations. In these investigative projects, international teams consisting of legal professionals, human rights defenders and media experts have worked and continue to work together in creating case dossiers, video presentations, and digital evidence presentation platforms which are partly based on evidence collected with the help of mobile phone witnessing apps (Gabriele, Matheson, and Vasquez Llorente 2021; UNITAD 2021; UNITAD Iraq 2021). Their work is not only an effort to write a history of past crimes to allow for their future judgement but also to tell the future of digital witness evidence.

5. CONCLUSION

Demo or die – publish or perish – record or vanish into the oblivion intended by an annihilating power: These slogans appear to be the old and new catchphrases for the agential realities constituted by the employment of digital technologies of street protesters in their fight against the repressive measures of the people in power. This is also a fight against the constraining witness evidence practices of the current international legal system that is not yet fit to deal with the massive wave of a material-discursive call for legal accountability and participation of large-scale human rights violations by a collective of affected people. As legal and human rights NGO practitioners point out, shortcomings not only include the procedural and regulatory set-up of the international legal system. They also include the question of how to deal in the investigative process with the sheer number of digital videos produced in current conflicts and how to sensitize judges for the value of digital witness evidence (Freeman and Vasquez Llorente 2018, 166; Gabriele, Matheson, and Vasquez Llorente 2021, 108, 129-130). Research on the employability of digital witness evidence thus needs to focus both on the material and discursive challenges it means for the legal system but also for the socio-political system. A diffractive research perspective as presented here can address this two-fold challenge, as it allows for a comprehensive picture of the heterogenous forces at work in the processes that the – more or less – accidental recordings of foreseen and unforeseen human rights violations during street demonstrations undergo until they are hopefully admitted as digital witness evidence in international criminal trials. In addition, it also makes it possible to approach the dispersity of today's technologized street demonstrations with a methodology that is flexible and agile in the face of unpredictable effects of interfering events and to focus on the opportunities of digital witness evidence today and tomorrow.

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TECH | DEMO

Abstracts

JORDAN GOWANLOCK

HARDWARE CULTURE.
TECH DEMO MODALITIES IN PC GAMING SOCIAL MEDIA CHANNELS

This article concerns the particular forms of tech demos at work in PC hardware culture, a video game subculture where people review and debate the consumer products needed to run video games. As an intensely social online space where emerging forms of hardware are represented, negotiated, and debated, this subculture and its unique forms of media are a contact zone between the hardware underpinnings of video games discussed in video game "platform studies" and the social construction of video games. This article takes a wholistic approach to this culture, noting its persistent gender bias and embeddedness in consumer culture, while also noting points of resistance that bring a media archaeology skepticism to discourses of technological advance and obsolescence.

SVEN GRAMPP

SPACE PORN. MEDIATING THE APOLLO-SOYUZ TEST PROJECT

The article uses several examples to show how, during and through the media coverage of the *Apollo-Soyuz Test Project*, the political efforts to demonstrate technical and political cooperation between the USA and the USSR were not only transported to earth, but meanwhile also underwent a massive transformation. Based on the theoretical figure of the third according to Georg Simmel and their interpretation as mediators for a global audience, two examples will be spelled out in more detail. The first is about the reporting in the *Playboy* magazine, in which the *Apollo-Soyuz Test Project* is reinterpreted and demonstrated as a very special sexual act. The second is a closer look at how space is conceptualised as domesticated space in the Soviet design of the space capsules. Since then, even after the collapse of the Eastern Bloc until today, space has often been staged as a place down on earth.

ABSTRACTS

CANAN HASTIK

DEMO SKILLS IN TECHNOLOGICALLY WILD SETTINGS. THE DEMOSCENE

The article examines the practices of the demoscene, looking at performative aspects at the intersection of technology and individual skills. The scene is one of the oldest and most enduring, primarily European, hyperreal communities whose creative and cutting-edge works are well documented, findable, and accessible. However, at the level of program code, these artifacts are generally neither interoperable nor reusable. In addition, the demoscene bases its tradition on its own ideals and principles and has developed an individual demonstration culture that aims to impress and entertain the community by creatively using hardware, producing software programs and code, and demonstrating their capabilities.

MAREIKE MEIS

THE TECHNOLOGIZATION OF STREET DEMONSTRATIONS AND THE AGENCY OF THE MOBILE PHONE. A SHORT STORY OF THE FUTURE OF DIGITAL WITNESS EVIDENCE

Looking back at the big corpus of videos available on Social Media from the early street protests of the Syrian Civil War, this paper focuses on past acts of media witnessing as inheriting a future justiciability of digital witness evidence. It discusses the agency of the mobile phone as prime documenting and reporting device in contemporary technologized street demonstrations with reference to Judith Butler (2011) and Aurélia Kalisky (2017). Applying a diffractive research perspective towards the study of media witnessing based on Donna J. Haraway's (1997; 2004 [1992]) writings, the paper brings together different media material and theoretical approaches in a narrative history of the technologization of street demonstrations and of an inherited future of digital witness evidence as corroborative, and eventually prime, legal evidence.

KATHARINA REIN

"LIKE A JEDI MASTER." GESTURE CONTROL, TECH DEMOS, AND MAGIC

Analysing tech demos in conjunction with magic, this article interconnects three elements: the gestures of modern performing magicians, wearable gesture control devices for home application, and technoscientific demonstrations. The role of gestures in the first two cases is analysed through two examples: the historical stage illusion "Asrah" by Servais Le Roy, and the wristband remote control device

"Reemo". These serve to examine the relationship between tech demos, gesture command, and magic through analogies and points of intersection. In all three cases, this article argues, the respective effects are emphasized in the demonstration, while the underlying, complex infrastructure and the human labour involved in the production of these are made invisible. This interplay of simulation and dissimulation is at the centre not only of performance magic but also of the devices examined, and of technoscientific demonstrations in general.

CLAUDE ROSENTAL

DEMONSTRATION DYNAMICS AT A HIGH-TECH EVENT.
EXPLORING A HIGH-STAKES SPOT OF THE DEMONSTRATION SOCIETY

This paper analyzes the activities and interactions that took place during a high-tech summit held in Jerusalem in 2020, based on ethnographical observations carried out on site. It shows how this high-tech event led to a massive production of public demonstrations – including public demonstrations of technology or "demos" – which served various aims. It unveils some of the material, organizational and cognitive aspects of this demonstrative festival. This study illustrates the ways in which demos and a techno-rhetoric may help support technological promises, contribute to the marketing of technologies, and contribute to economic life. It shows how demos can offer a solutionist view of the world – especially technological solutions – brought to problems made public on demonstrative sites. Thereby, it explores one important component of the demonstration society, related to the very large set of high-tech conferences and fairs organized around the world every year.

JENS SCHRÖTER

IMAGINARIES OF MACHINE VISION. A SHORT HISTORY

The historical development of the technologies that ultimately led to the field of 'machine vision' began in the 1960s. As is always the case with emerging technologies, imaginaries of potential future usages (and dangers) of the potential new technologies emerged too. This article analyzes the intertwined histories of machine vision technologies and their corresponding imaginaries by focusing on some exemplary configurations. These analyses reveal how machine vision was imagined, to which uses it was thought it should be put and what dangers were considered to be lurking within it. The paper focuses, firstly, on methodological considerations, on how to reconstruct the intertwining genealogies of technologies and their imaginary representations. Secondly, it examines three examples.

The first is the famous point-of-view shot of HAL9000 in Stanley Kubricks' *2001: A Space Odyssey* (1968). The second example is the point of view (POV) of the antagonist in *Westworld* (1973), played by Yul Brynner. These shots have a 'pixilated' look that stages machine vision in a way that connects it to the slowly emerging digital image aesthetics. The final example is the machine POV in *The Terminator* (1984). The paper ends with a conclusion and a short analysis of Kazuo Ishiguro's novel *Klara and the Sun* (2021).

TECH | DEMO

Bios

JULIA ECKEL

Julia Eckel is Junior Professor for Film Studies at the Department of Media Studies at Paderborn University, Germany. Currently, she is working on a book on the nexus of animation, documentation, and demonstration. Other research interests are: audiovisual anthropomorphism, animation and AI, synthespians, screencasting, and selfies. Recent publications include *Das Audioviduum. Eine Theoriegeschichte des Menschenmotivs in audiovisuellen Medien* (2021) and the three co-edited volumes *Exploring the Selfie – Historical, Theoretical, and Analytical Approaches to Digital Self-Photography* (2018), *Ästhetik des Gemachten. Interdisziplinäre Beiträge zur Animations- und Comicforschung* (2018), and *Im Wandel … Metamorphosen der Animation* (2017). Furthermore, she guest-edited the February 2022 theme of the *animationstudies 2.0* blog on Animation and AI (together with Nea Ehrlich). Further information: www.juliaeckel.de.

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KATHARINA REIN

Katharina Rein received a doctoral degree in Cultural History and Theory from the Humboldt-University of Berlin for her award-winning dissertation on stage magic in the late nineteenth century. She currently works as a lecturer at the Arts and Media Department of the University of Potsdam, and in winter semester 2022/23 she held a guest professorship for the Theory and Aesthetics of Digital Media at the University of Vienna. Previously, she worked as a researcher at the International Research Institute for Cultural Techniques and Media Philosophy (IKKM) of the Bauhaus-University Weimar and was a member of the international research project "Les Arts Trompeurs. Machines, Magie, Médias". Rein is the author of *Gothic Cinema* (2021), *Techniken der Täuschung* (2020; forthcoming in English) and *Gestörter Film. Wes Cravens "A Nightmare on Elm Street"* (2012), and the editor of *Illusions in Cultural Practice: Productive Deceptions* (2021) and *Magic. A Companion* (2022). Her academic essays have appeared in four different languages.

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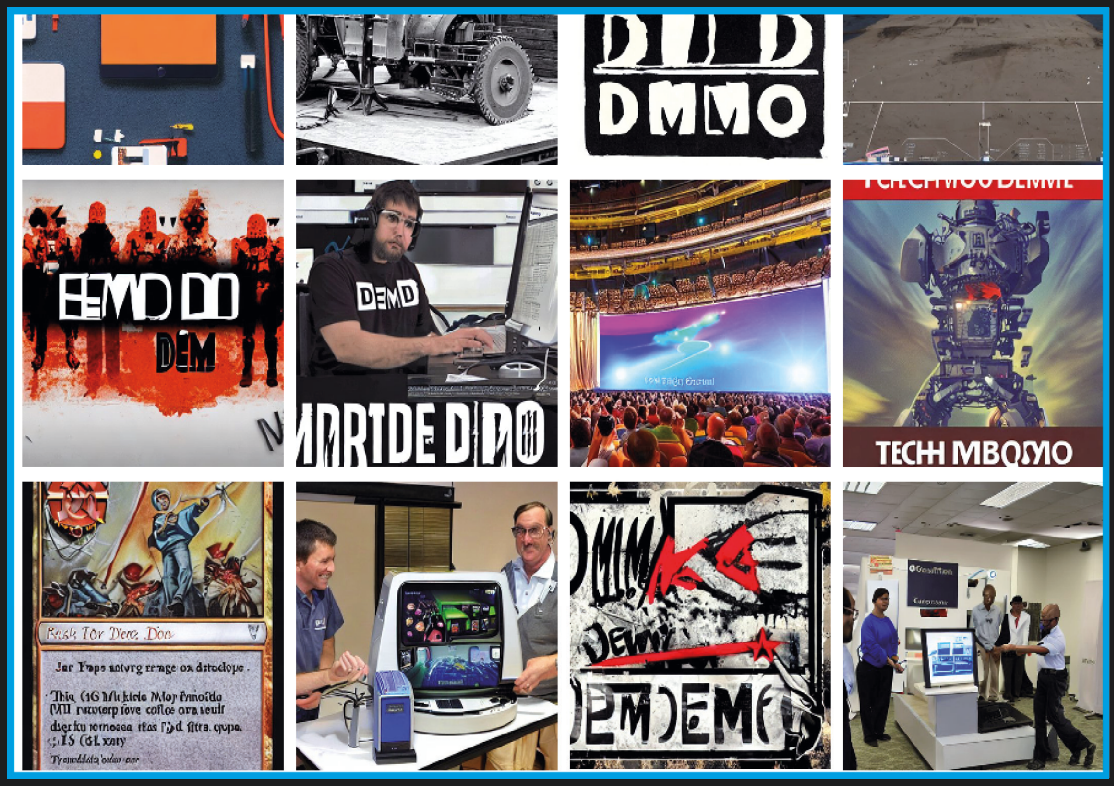

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