Zwischenräume: The Machine as Voyeur

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Introduction

> *As you enter the empty gallery, you are aware of the presence of another, something moving behind one of the walls, a low rumbling, and you think you hear knocking. As you walk towards the wall, the knocking gets faster, and from behind you more knocking but with a different rhythm – like some form of secret code. You turn around in time to see the wall bulge and crack. A hole opens up and you catch a glimpse of a hammer. With every knock the hole gets bigger, blasting out small chunks of wall. You move backwards, your eyes locked on the growing hole – a light shines through, and at its centre you can make out the lens of a camera. You stop. The searchlight sweeps around and meets your gaze. It has seen you, and now it darts off to the side of the hole, as if it is hiding. The wall knocks again, softly this time, three quick taps. The wall behind you responds and then begins to crumble...*

The technologically enabled surveillance regime, and its machine vision, is often understood as a remote, disembodied gaze that produces asymmetric ways of looking and visibility (Brighenti, 2010). In our robotic installation *Zwischenräume*, whose curious, self-destructive nature we have introduced above, the machinic gaze literally carves itself into the fabric of our built environment. Self-motivated and autonomous, the machine's desire to look physically affects the environment that it looks at, which in turn affects the ways in which it desires to look. Looking, reflecting and acting become a mutual process that propels the relationship between the machinic inhabitants and their human environment, as much as it does between the human inhabitants of the machinic environment. This paper introduces the transdisciplinary strategies that we've developed to create *Zwischenräume*, with a particular focus on its investigative visual intelligence, and develops the context for a machinic voyerism to discuss the intricate relationship between the audience and a machine gazing back.

Zwischenräume

The installation embeds a group of robots into the architectural fabric of a gallery, as both a sculptural manifestation of and investigative lens into the politics of surveillance. The machine-augmented environment couples walls with autonomous, intrinsically motivated agents, capable of enacting and communicating their evolving desires by re-sculpting their unusual wall embodiment. Each machine agent is equipped with a motorised hammer, surveillance camera, and a microphone to interact with the environment and communicate with the other machines (figure 1). The architecture becomes the medium for the machines to live out their desires, become curious, intervene and signal their accomplices. They develop strategies to survey,

provoke, and conspire by knocking against the wall, producing cracks, marks and holes. The surreptitious powers of control and tracking increasingly perforating our everyday life (Crandall, 2005; Haraway, 1991; Lyon, 2006), become visible and tangible, and, like scars, leave trackable traces themselves.

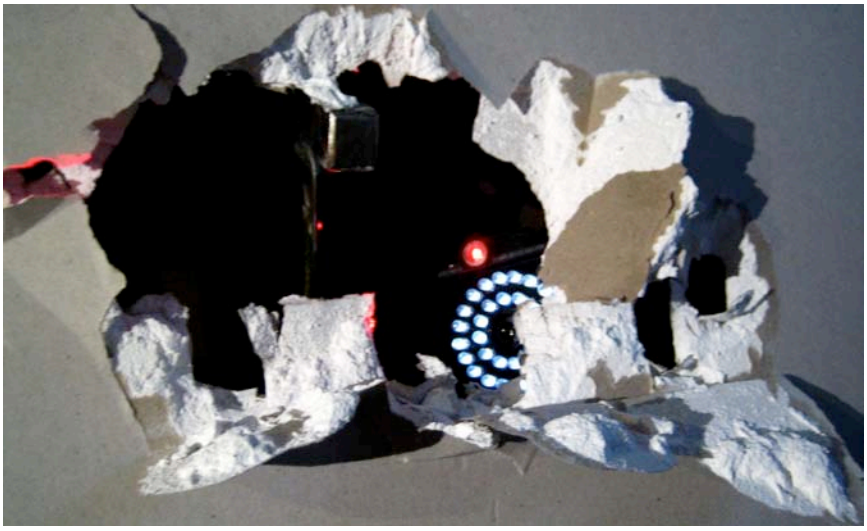

Figure 1. Zwischenräume

The sculptural practice turns the wall of the gallery into a medium for intervention; and it is the spectacle of the intervention into the architectural fabric that we are interested in, rather than the intervening machinery alone. For this intervention to be most affective, we need to exploit the audience's ignorance, confusion and curiosity. Ideally, the existing architecture is mimicked to house the machinery that (apparently) breaks through the taken for granted security offered by the familiar wall. In the first show (figure 2) the gallery space was bounded by glass walls, requiring us to not only stage the intervention but also the environment to be intervened. The transparent gallery space was turned inside out and transformed into a private, cosy, living room scene oriented towards the public space outside the gallery. The surveillance machinery attached to the back of the temporary walls inside the gallery transformed the living room scene into a capricious, suspicious voyeur.

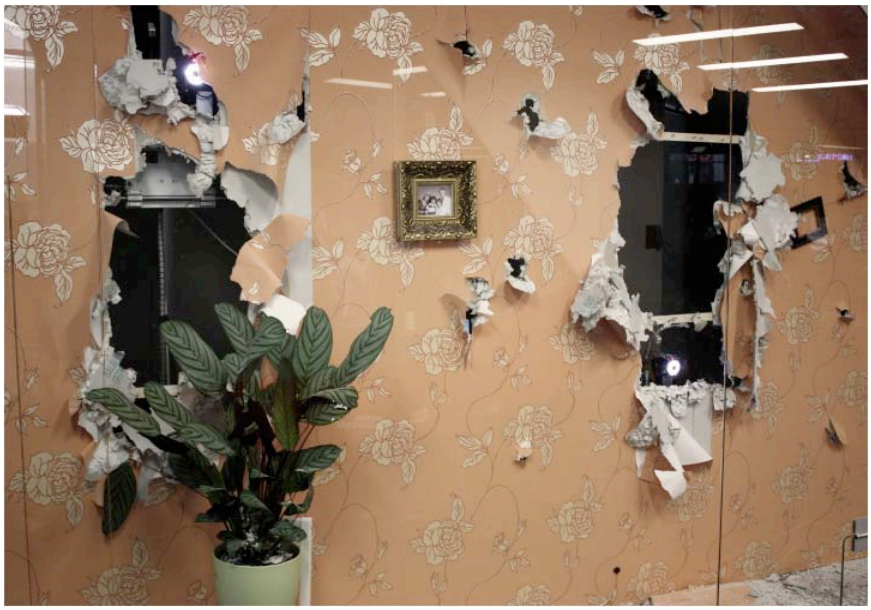

Figure 2. Zwischenräume at the MuseumsQuartier 21, Vienna, 2010

Interfacing urban combat tactics and digital surveillance

Zwischenräume looks at the stealthy invasion of digital surveillance through the physical lens of urban combat tactics. Both urban combat and surveillance turn space inside out. In contemporary urban combat, the city and its walls become fluid, a medium to be penetrated, to walk through. Weizman has brought to attention a warfare technique, executed by the Israel Defence Force (IDF), in which soldiers were literally instructed to walk through the private walls of Palestine refugee camps (2006). What was referred to as 'inverse geometry' by the IDF, was, in fact, architecture turned into a weapon.

In digital surveillance walls, too, become transparent, permeable to the flow of information, rendering inhabitants within vulnerable to being eavesdropped, identified, monitored and remotely controlled (DeLanda, 1988; Lyon, D. 2006). The project ‘Combat Zones That See’, developed by the U.S. Defense Advanced Research Projects Agency (DARPA), embeds thousands of cameras into the urban terrain, aiming for surveying and analysing the moves of each resident based on artificial visual intelligence.

When machines evolve desires and their own vision

The autonomy of the machine-augmented environment of Zwischenräume is driven by the visual intelligence of the robots and materialises the machine’s sensory-cognitive negotiation with its environment through the performance of an embodied aesthetics. Embedded into walls, Zwischenräume’s robots are intrinsically motivated to visually explore the environment and study the inhabitants of the space. Movements, colours and faces are processed to create an adaptive model of the surrounds that allows the robotic agents to expect learned behaviours and proactively intervene.

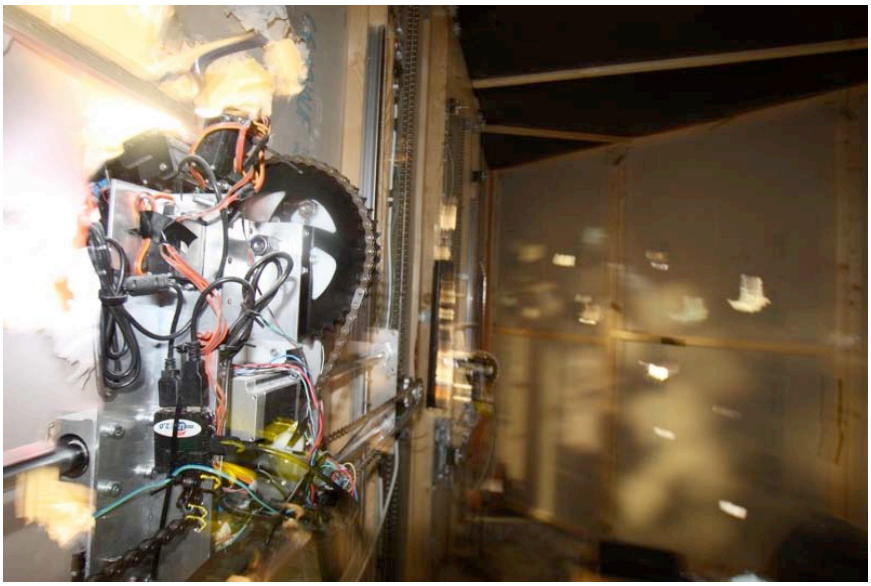

Figure 3. Behind the scenes of Zwischenräume

Zwischenräume enacts the processes (sensing and manipulating) and networks (communication) of surveillance in an embodied fashion: the practice embodied in the work rejects the use of concealed sensing and communication networks—dominant features of much robotic art—and

instead makes them tangible to foreground the political implications of surveillance and machinic autonomy. The perceptual abilities of Zwischenräume are limited but provide sufficient richness for the learning algorithms to build complex models of the machine's surroundings and based on these determine what is different enough to be interesting. It is the intrinsic desire to learn about the world directs both the system's gaze and its actions.

The robotic elements of Zwischenräume, shown in figure 3, consist of a vertical gantry with a carriage equipped a camera and microphone, mounted on an articulated arm, and a motorised hammer. The control software for the robots combines technologies and techniques from robotics, machine vision and machine learning. In particular, it combines computer numerical control (CNC) technologies from industrial robotics, low and high-level feature detection from machine vision, and unsupervised and reinforcement machine learning, coupled with a model of intrinsic motivation, to produce an adaptive autonomous and self-directed agency.

The ability to 'see' and 'understand' is dependent on the context and situation of the seeing agent. What an adaptive autonomous agent sees affects what it does and what it does affects what it sees. The difficulty of the task of machine vision comes from the undifferentiated nature of the pixel data received; consequently, machine vision systems must impose limits on what is to be expected. In Zwischenräume, the vision system constructs low-level models of the scene using colour histograms to differentiate large-scale contexts, blob detection to detect shapes, and frame differencing to detect motion. In addition, the robots have been given the specific ability to direct their attention towards visitors.

Zwischenräume combines unsupervised and reinforcement machine learning techniques (Russell & Norvig, 2003) to uncover regularities from visual data and learn strategies for maximising rewards. Rewards are generated by a model of intrinsic motivation, curiosity, relative to novelty and surprise (Saunders, 2001); where novelty is defined as a difference between an image and all previous images, e.g., the discovery of new colours or shapes, and surprise is defined as the unexpectedness of an image within a known situation, e.g., relative to a learned landmark or after having taken a specific action (Berlyne, 1960). The evolution of 'interesting' images, reading figure 4 from top-left to bottom-right, shows that it is affected by: (a) the positioning of the camera, e.g., the discovery of lettering on the plasterboard wall; (b) the use of the hammer, e.g., the production of dents and holes; and, (c) the interaction of visitors. The authors were initially surprised by the amount of interest that the robots displayed in the walls. On reflection, however, the observed behaviour is consistent with our own interest in the patterns produced by cracked and broken plasterboard.

To facilitate communication, the robots were equipped with microphones to sense the knocking of other robots. In this first installation we programmed the robots with just two signals related to their state of interest. High levels of sustained interest are signalled by a gently tapping on the wall, conversely low levels of sustained interest are signalled with three loud knocks. Upon hearing these signals robots react depending upon their own interest levels,

e.g., search for the interesting views signalled. These signals are communicated ‘in the clear’ and the concomitant reactions available for the audience to interpret.

Figure 4. The evolution of ‘interesting’ changes in the environment

The machinic gaze – an agent motivated to look back

The machinic gaze can be thought of as either prosthetic, that is, a technological apparatus that extends, enhances or proliferates the human eye, or artificial and intrinsically machinic, that is, cast by a machine capable of ‘looking’ and ‘seeing’. The latter can again be split into ‘vision-machines’ (Virilio, 1994) whose automated gaze is externally motivated, for instance by a military agenda that defines its targets, or intrinsically motivated—a machine that develops its own object of desire.

Considering the gaze of the machine opens up a view onto the relationship and performative agency between the gazing subject and the gazed-upon (human) audience. This is particularly critical when the gazing subject is in fact an object starring back (Elkins, 1999), and the more complex the more we cannot locate an external, human desire that fuels the gaze. The performative nature of a surveillant agent that looks to for the pleasure of looking invokes the notion of a voyeur. In relation to “synthetic images created *by the machine for the machine*” (Virilio, 1994), the voyeuristic machine may seem to open a more playful perspective to Virilio’s dark visions of the ‘automatic-perception prosthesis’ from whose mechanized image the gazed-upon would be completely excluded. Yet from a Feminist point of view, the very notion of ‘gaze’ already suggests an asymmetric power relationship.

Complicit with the unwitnessing gaze

Given our entanglement in both technological evolution and consumerism of the spectacle that this evolution affords us, arguably, the machinic gaze is not only charged with asymmetric visibility but also complicity. The complicit is

already an accomplice of contemporary warfare, where “the function of the weapon is the function of the eye” (Virilio, 1989) as well as a media culture that ‘affords’ us to see the battlefield from the soldier’s point of view. It also brings us back to the political agenda of ubiquitous surveillance not only spread across what is declared a warfare zone but also the contemporary city. Speaking of the ‘belligerent gaze’, Mikkel Bruun Zangenberg heightens our awareness that warfare, where machines increasingly substitute ‘real’ human soldiers, is constantly in the process of ‘unwitnessing’:

> *I contend that the one who cast the belligerent gaze, the one who is the subject and master of that gaze, is barred from ever becoming a witness; he may well ‘see everything’, but since he is always at a safe distance, … he cannot properly turn into a witness. Being the object of the belligerent gaze, on the other hand, is a position of passivity, vulnerability, fear, horror, and suffering, if not being exposed to the numbing effect of alienation and derealization* (2008).

Zangenberg’s ‘quasi-machinic obliteration of the conditions of witnessing’ not only allows to the human commander to command the most in-human from the safe distanced position of a far remote site, but also turns us (usually far remote) citizens into passive spectators of a cruel but safe spectacle. Here the ‘eye’ that casts the gaze is (still) remotely controlled.

The machine as voyeur

What however if the machine’s gaze is autonomous and self-motivated? To explore this question outside of the horrific, gloomy, red-tinted drama painted by numerous science fictions and Hollywood depictions, let’s retreat from the battlefield for now and return to the artistic experiment of *Zwischenräume*. A machine eye whose way of seeing is motivated by what it sees, expects, and doesn’t see that, could be thought of as an audience to the audience’s performance. In this scenario it is not only the machinic wall that performs but also the visitors who by their very presence perform for and entertain the artwork. Rather than serving as the eye for another human agent, it’s a voyeur only watching for its own ‘pleasure’.

The word ‘voyeur’ in French means ‘the one who looks’. Our machine voyeur does not necessarily invoke the typically stealthy, sexualized and, often, criminalized look, but rather draws on notions of spectacle, pleasure from looking, and power that instils the looker but also the power that the subject of desire exerts on the lookers themselves. Surveillance usually involves an abstract, classification-driven, impersonal form of watching, producing a machine gaze that is always motivated externally. The voyeuristic gaze, on the other hand, is personal and evolves in a reciprocal relationship based on what Brighenti calls spectacular recognition (2010). Both raise uncanny feelings as the technological eye looks back at us, yet while the ‘alien’ of the technological surveillance apparatus resides in the authority of a remote, unknown, but commonly still human eye behind the ubiquitous technological lens, the alien of the machine voyeur emerges from the machinic and its possible desires itself (particularly the ones we imagine and project onto it).

The close confrontation that Zwischenräume stages creates the unusual scenario of a face-to-face encounter that, on the one hand, literally embodies the act of surveillance in a tangible process, and, on the other, destabilizes the asymmetric visibility produced in this control relationship. As the work deploys biometric vision techniques and autonomous visual intelligence, and further empowers the machine with a destructive hammer mechanism to support the wall's voyeuristic desires, it obviously does not aim to trivialize the power of the machine gaze. Rather, we are interested in making this power relationship a personally affecting matter. There is no distance between this gazing agent and the (human) audience; the gaze exchange is immediate and the result affects both 'sides' involved. Interestingly in our experiment, the more we attempt to 'despectacularize' the machine, the more we turn the audience into voyeurs, seeking a glance and peeping through the holes in the wall. The gaze is reciprocal in this (wall)face-to-face encounter (figure 5). In some way it appears as if they both increasingly took on each other's role: the machine-augmented wall turns into a curious spectator of the spectacle outside, while the audience turns into an inquisitive voyeur, peeping inside

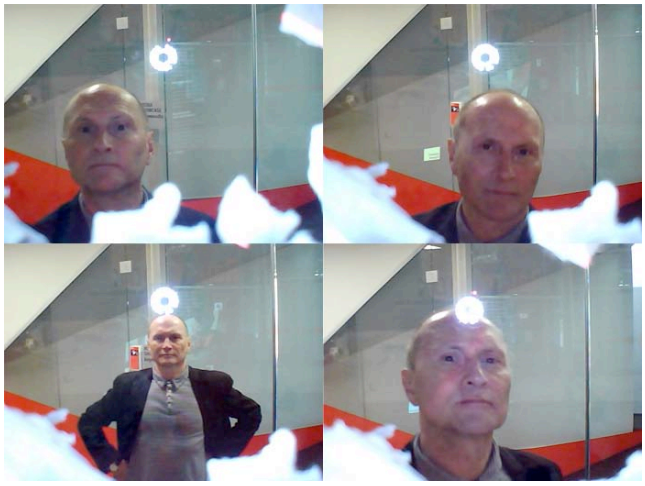

Figure 5. Captures from the machine–environment

(figure 6). The installation produces a close-circuit in which the machinic gaze looks back, rendering the spectators witnesses of their own involvement.

Parting Thoughts

The curator of the exhibition *Exposed : Voyeurism, Surveillance and the Camera Since 1870* Sandra Philips argues that "[s]urveillance pictures are voyeuristic in anticipation, seeking deviance from what is there: the creeping presence of enemy activity; telling changes in the landscape below; evidence of incriminating behaviour, such as spying, crossing borders illegally, or accepting bribes" (2010). While the voyeurism enacted by *Zwischenräume*'s robotic protagonists relies on their visual intelligence to recognise changes in the environment, their motivation to seek deviations defies military logic of suspicious behaviour. They seek deviation from the known, desiring difference for the sake of being different.

The most unique aspect of *Zwischenräume* is that it physically manifests the machines' voyeuristic desires. According to Canetti, "[t]here is nothing that man fears most than the touch of the unknown. He wants to *see* what is

reaching towards him, and to be able to recognise or at least classify it" (1960). According to Brighenti, Canetti is referring to the "*haptic* component of the gaze", the gaze as social force, revealing the most fundamental movement of power, "the gesture that seizes" (2010). *Zwischenräume* enacts and embodies this transmaterial force and its 'uncanny touch'. Its sensory images drive the materialisation of the agents' evolving perspective, whose disruptive marks and traces, in turn, produce an image of the politically

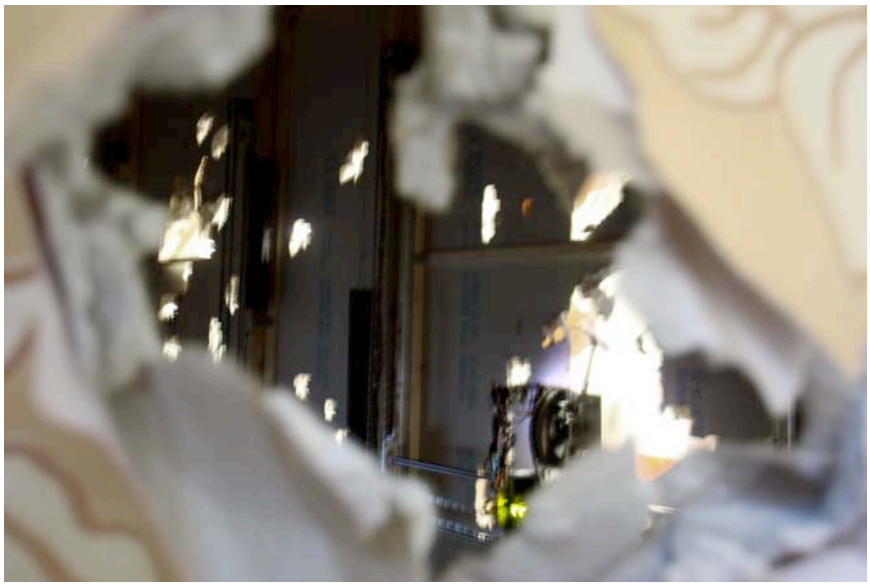

Figure 6. Peeking through the wall

charged relationships they provoke. The embodiedness of the robots' abilities to survey and control, forcing them to operate 'in the clear', critically exposes the power spectacle of operational media (Crandall, 2005).

The machine-augmented wall also presents us with a whimsical view onto a powerful, autonomous machine, eager to control its environment. It is an image that is probably more accessible when we're not finding ourselves jumping back in shock of a hammer breaking through a wall, followed by the uncanny gaze of an autonomous eye, or captured in awe of the machine spectacle. Beyond the immediate affect of the wall's self-destructive process, we see a machinic voyeur with a hammer, slowly but steadily dismantling not only its vision barrier but also its own disguising embodiment. A voyeuristic wall undressing itself.

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