

Augmented Reality Art: A Matter of (non)Destination

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ABSTRACT

This paper examines the ambivalence of “destination”—namely the ambivalence of the user’s interpellation—as one of the key features of augmented reality (AR) art. It calls attention to the special status of the spectator whose participation is at once a requirement and an uncertainty, a prediction and an anxiety, a principle of localization and a questioning of the very capacity to localize. This ambivalence is endemic to AR environments which rely on mobile, networking, tracking, sensing and detection technologies. My main claim is that, as a perceptual paradigm, AR’s potential innovativeness lies in its ability to generate new ways of perceiving for the spectator or to disclose what was previously unperceived—unseen, unheard, unfelt. These ways of perceiving are structurally rooted in the ambivalence of destination. This structuring feature, however, is recurrently sidestepped by the interactive setting of AR art. Required to interact; destined to act specifically and to insert him or herself in a standardizing logic of community formation; allegedly “in direct contact” with the immediate environment despite extreme mediation: the spectator turned user, YOUuser or interactor is solicited as a *destinataire* (a recipient) in ways that most often counter the possibilities of AR as an ambivalent mode of destination. The paper investigates three AR environments by artists Rafael Lozano-Hemmer, Mathieu Briand, and Christa Sommerer & Laurent Mignonneau to show how these traits either counter or favour the perceptual potential of AR.

Categories and Subject Descriptors

H.1.2.[User/Machine Systems]: Human factors, human information processing.

General Terms

Performance, Experimentation, Human Factors, Theory.

Keywords

Augmented Reality, Art, Aesthetics, Interactivity, Perception, Community.

1. INTRODUCTION

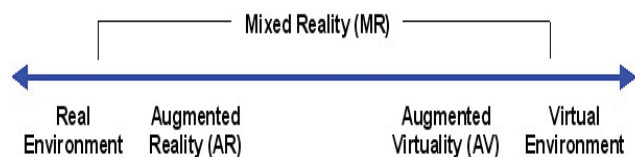


Figure 1. Paul Milgram, et al., Reality-Virtuality Continuum

As Paul Milgram’s schema specifies, the real-virtual continuum—the unbroken scale ranging from real to virtual environments—is the foundational assumption of digital forms of augmented reality (AR). AR builds up a continuous succession between the real and the virtual, in which the two categories tend to lose their distinction in relation to one another. It is this very concept of the real-virtual continuum that underlies Ronald Azuma *et al.*’s definition of AR as a system that “supplements the realworld with virtual (computer-generated) objects that appear to coexist in the same space as the realworld.”¹ This supplementing occurs by adding dynamic, interactive, and context specific information to the user’s sensory perception of space. This perceptual dimension is pivotal. In medical applications, for example, a surgeon can now wear a head-mounted display (HMD) device equipped with a semi-transparent visor which fuses his or her perception of the patient’s body with the preparatory study of the internal anatomy projected on the screen. Augmented reality is a perceptual paradigm. Considering that the definitive (yet still unachieved) goal is “to create a system such that the user can not tell the difference between the real world and the virtual augmentation of it,” the perceptual motivation underlying AR research carries several technical challenges, notably the imperative to perfect the panoply of technologies that converge to assemble a mixed real-virtual continuum for the observer-participant, from audiovisual (head mounted, wall mounted, handheld) display and playback devices to human-machine interface systems to body-tracking, sensing and surveillance instruments, one of the most difficult technical challenges being the requirement for the computer to track where the user is looking and determine what s/he is seeing

¹ Ronald Azuma, Y. Baillet, R. Behringer, S. Feiner, S. Julier, and B. MacIntyre, “Recent Advances in Augmented Reality,” *IEEE Computer Graphics and Applications*, 21, 6 (Nov./Dec. 2001), 34. DOI= <http://www.cs.unc.edu/~azuma/cga2001>.

in order to augment his/her view.² This has been from the start, this is, the impetus of AR explorations.

In the field of art, AR environments are, effectively, a derivative of site-specificity installation art in which site is de/un/re-specified by the activation of computer generated data. These dynamic sites are achieved by connecting spectators to networking systems (mobile phones, GPS, the Internet), sensing, tracking, and surveillance technologies, as well as robotics, which enable the processing of different forms of data—texts, images, sound, light, even heartbeats and smell. The status of the spectator in these settings is quite unique: s/he is expected to be enhanced perceptually but also to evolve interactively, often polysensorially and collectively, with the work. Let us think, for example, of Seiko Mikami's *Gravicells: Gravity and Resistance* (2004), which proposes a platform covered with panels of string-like lines that deform as the sensors underneath react to the participants' weight, tilt and velocity: the changing platform is calculated by GPS systems that register the changes in the space, a calculation displayed on different wall panels that enhance the real-time dynamic between image, body, gravity, sound and light; Usman Haque's *Evoke* (2007), an animated projection on the façade of York Minster which lights up in response to the voices of the nearby public; and Christian Moeller's recent robotic arms, built to move a ship propeller (*Daisy*, 2008) or a theatre spotlight (*Mojo*, 2007), connected to surveillance cameras: these surveilling robots follow and face passers-by in an attempt to establish contact or simply (as in *Nosy*, 2006) to randomly film passers-by and project their image in bitmap graphics on large glass panels of adjacent towers; as well as *Audio Grove* (1997), an interactive light and sound installation composed of a wooden platform supporting vertical touch-sensitive steel posts: visitors who touch the posts produce a soundscape which in turn triggers different spotlights that eventually illuminate the whole space. In all of these works, users are invited to interact—perceptually, sensorially, and collectively—with the system. But the system is persistently searching for participants—sensing, seeking and tracking bodies for the sake of communication, collectiveness, and interactivity.

My talk examines the ambivalence of “destination”—namely the ambivalence of the user's interpellation—as one of the key features of augmented reality art. It calls attention to the special status of the spectator whose participation is at once a requirement and an uncertainty, a prediction and an anxiety, a principle of localization and a questioning of the very capacity to localize. This ambivalence is endemic to AR environments which rely on mobile, networking, tracking, sensing and detection technologies. It clearly echoes the experience of a mobile phone user who can reach her interlocutor but who can never know for sure where she is. This ambivalence is best described by referring to the two titles of two pivotal AR artworks: the asserting *You Are Here* (Scott Snibbe, 2004) and the questioning *Can You See Me Now?* (Blast Theory, 2001-). AR environments keep oscillating between these two accounts. The first installation tracks and displays the paths of visitors walking through a large public space to eventually identify them when they stand in front of the main screen, with a large red “you are here” arrow. The second is an online and street-chase game, in which “real” runners circulating in a delimited

urban territory are tracked by satellites to appear online as avatars next to avatars created by computer players, but only through the diverse delays involved in Internet connections and the multiple time gaps that separate the moment when an avatar is caught and the runner's official announcement of his or her catch. In the two works, technology is rooted in the surveillance systems which have become an integral component of our public spaces; and the user is posited both as a tractable individual *and* a fleeting subject. The augmented reality artwork declares “Here you are now” but simultaneously asks (let us follow psychoanalyst Serge Tisseron here): “Where are you now?”³ The positioning of the spectator is not an act but a search, a question, a desire, a verb, an anxiety.

My main claim is that, as a perceptual paradigm, AR's potential innovativeness lies in its ability to generate new ways of perceiving for the spectator or to disclose what was previously unperceived—unseen, unheard, unfelt, unsmelt. These ways of perceiving are structurally rooted in the ambivalence of destination. This structuring feature, however, is recurrently sidestepped by the interactive setting of AR art. To clarify my claim, let us go back briefly to Usman Haque's *Evoke* (2007) mentioned in my introduction, an animated projection on the façade of York Minster which lights up in response to the voices of a nearby public made out of anonymous individuals. The multicolored lightening of the building occurs as a collective phenomenon; it is preprogrammed to respond to the manifold voices of a group. This example is emblematic of the AR applications I am trying to map out here, applications which rely on the three following principles. First, to paraphrase W. J. T. Mitchell's famous terminology about contemporary images (“What do images *want*?”), the augmented reality artwork largely wants an interactive, localizable yet anonymous addressee (a shouter or singer, for example, as in *Evoke*). It has a democratic underpinning, one that belongs to what Jacques Rancière has called the aesthetic regime: its recipient is not a specified recipient but *any* visitor, *any* spectator, *any* user. But this “any user” exists only insofar he or she is technologically detected. Second observation: in most cases, the augmented reality artwork wants to provide reciprocity to this addressee—another anonymous addressee (shouter or signer) with whom to cooperate as corporeally and immediately as possible. A representational dimension is therefore at play here: the formation of temporary communities whose model varies from work to work but is likely to be uniform and amenable. Finally, this double desire is inseparable from the reiterated suspension of a fundamental question about interactivity: does interactive participation produce alternative ways of perceiving or does it merely sustain what individuals are required to do in a society of pervasive computing? Interactivity is a modality by which the innovative potential of AR—as an ambivalent destination—is in fact regularly jeopardized.

2. INTER-AGERO ERGO SUM

Required to interact; destined to act specifically and to insert him or herself in a standardizing logic of community formation; anonymous yet celebrated in his or her embodied response to the site; allegedly “in direct contact” with the immediate environment

² Jim Vallino, “Introduction to Augmented Reality,” DOI=<http://www.se.rit.edu/~jrv/research/ar/>.

³ Serge Tisseron, *Virtuel, mon amour: Penser, aimer, souffrir à l'ère des nouvelles technologies* (Paris: Éditions Albin Michel, 2007), 20.

yet exceedingly mediated: the spectator turned user, YOUuser or interactor is solicited as a *destinataire* (a recipient) in ways that most often counter the possibilities of AR as an ambivalent mode of destination. I want to examine here three AR environments by artists Rafael Lozano-Hemmer, Mathieu Briand, and Christa Sommerer & Laurent Mignonneau to show not only how these traits counter the perceptual potential of AR but also how they are sometimes themselves countered by artists invested in the aesthetic deployment of augmented reality. More basically, I will be arguing that the tracking-*for*-interactivity impulse of these environments is a modality by which the ambivalence of “You are here now” and “Where are you now?” is predominantly refuted not only in the work, but also in statements around the work which turn out to deny the actual ambivalence of the work in question. Ambivalence is seen as a condition to overcome instead of a structural modality through which to take seriously AR as a perceptual paradigm.

Most of Rafael Lozano-Hemmer’s AR environments rely on the use of sensors that measure the heartbeats of passers-by to convert them into light beams that interact in the public space as other passers-by simultaneously engage with the sensor devices. This is especially true of his *Pulse* relational artworks (2006-). *Pulse Park* (2008) is surely the most exemplary site of the series, activating as it did a matrix of light beams moving and crisscrossing over the central oval field of Madison Square Park in New York City. The intensity of the beams was modulated by sensors installed at the North end of the Oval Lawn that recorded the heart rates (more specifically, the systolic and diastolic activities) of the visitors, which were then translated and visualized as pulses of flickering light beams projected by spotlights placed along the perimeter of the lawn. Each time a user made contact with a sensor, a light beam emerged to intersect with other light beams set off by other participants. Each time a user would release a sensor, the heartbeat would be relayed to the first spotlight and previous recordings would move down one position, with the potential of two hundred light beams projected simultaneously. According to Lozano-Hemmer, the result was “a poetic expression of our vital signs, transforming the public space into a fleeting architecture of light and movement.”⁴ But this poetic expression is inseparable from an unquestioned use of interaction through surveillance, detection and sensing technologies, a use that entails the making public of personal data. Moreover, although the heartbeats were translated into light through touch—and as such productive of an interesting synesthesia that let users see what is tactically generated—the translations were somewhat, disappointingly, homogeneous. The only differences between light beams lied in their pulse, and differences between pulses were minimal at best. Poetic expression was also inseparable from the institution of a virtual community of light beam substitutes of the self, a virtual community triggered by the interactivity of participants who did not necessarily relate to each other otherwise. The constituency of the lit community was only marginally controlled by the users: participants could only manage the presence and absence of the light beams by holding or letting go of the sensors. Although Lozano-Hemmer specifies that the recording of the participants’ pulses was “immediately converted into light pulses by the

computers” and that passers-by were surrounded by two hundred heartbeats, these were highly mediated translations whose pulsing configuration was clearly predetermined by the network of sensors.

The key rule underlying AR sites is interactivity—they are the very site of affirmation of an *inter-agero ergo sum* (“I interact, therefore I am”). Interactivity situates *Pulse Park* within what Julie H. Reiss and Claire Bishop have called installation art’s participation aesthetics, and more specifically in what Nicolas Bourriaud has designated as relational art (Lozano-Hemmer uses the terminology “relational architecture”), an aesthetics that aims at reinstating the social links lost in the development of modernity. This interactivity is, however, somewhat deceptive. Indeed, the spectator is usually left, as in *Pulse Park*, with a sense of not having much control over the outcome of the piece. Temporary communities are surely built but they lack in intersubjectivity what they gain in numbers of participants; they simply amount to a conglomerate of two or more anonymous users: an amenable collective of “anyone + anyone + anyone + anyone + ...”

AR is not an aesthetics in the pure sense of the term. It belongs to an aesthetic regime endowed with a representative paradigm. For Rancière, modern aesthetics elaborates the suspension of destination in that it offers itself, at least at the level of rights, to anybody’s gaze. It is the revolution of the *quelconque*: it ruins the moral destination of the ethical regime (the distribution of images according to the ethos of the community with the aim of educating spectators as citizens) and the hierarchical distribution of the sensible of the representative regime (the making of art under the laws of mimesis that serve to illustrate specific belief systems following a strict hierarchy of genre, subject matter and public). But in AR, while the user is indeed an anonymous anybody, art asks—it wants—a localizable recipient, addressee or *destinataire*. As in the representative regime the spectator of AR tracking systems is located as the point of view of the work’s multiple perspectival composition. It also wants at least one action from its *destinataire*: inter-action. This interaction builds into a representation—that of a community. In the case of Lozano-Hemmer’s *Pulse Park*, this community is a virtual one and is best conveyed by an aerial view of the environment which appears as an enlightened ellipse made out of similar pulsing light beams. Sidestepping the ambivalence of AR, the work stores up to two hundred past interventions. This guarantees consistency to the form and, as such, compensates for the absences of recipients. It is as though AR sites, to paraphrase Rancière, “fear speaking in the desert,” fear “the letter without a recipient.”

Why is this a problem? In these types of interactive environments, AR becomes an art uncertain of its perceptual politics. It produces a community of users where any attempt of devising or disclosing an unforeseen or unperceived sensorium is simply abandoned. It draws on ubiquitous computing but merely reproduces the push-button automatism which prevails today in the interactive environments of pervasive computing. Aesthetics, as a regime of art that suspends destination in its egalitarian redistribution of the *sensible* (I follow here Rancière’s definition of the distribution of the sensible as the legitimization of certain ways of perceiving, feeling, acting and speaking; the shared sense of what is commonly perceived, felt, made and spoken; the sheer ability to perceive, feel, act and speak), is the forgotten yet indispensable notion that must be introduced in current debates on AR. It forces

⁴ Rafael Lozano-Hemmer, “Pulse Park,” DOI=<http://www.lozano-hemmer.com/english/projects/pulsepark.htm>.

us to be vigilant about AR as a perceptual paradigm and to be suspicious of the persisting yet problematic assumption that new media interactivity is a means by which the allegedly passive spectator becomes *at last* an active participant (a user, a YOUuser, an interactor), as though spectatorship was de facto a passive practice.

3. THE PERCEPTUAL POTENTIAL OF AR: DESTINATION AS AMBIVALENCE

I believe that the work of Mathieu Briand and Sommerer & Mignonneau—works engaged in the switching of percepts between users and in specific activations of polysensoriality—are sensitive to these aesthetic challenges. I am particularly interested in Briand's head-mounted display devices. Users wearing these helmets can click on the button attached to the handheld device and swap their views of the environment with other participants, seeing as it were through the eyes of the other. Equipped with the battery-powered audio-video helmet—a head-mounted display device composed of a built in video camera on top and a visor located in front of the eyes that doubles as a small screen—the recipient of Briand's *SyS*05.ReE*03/ SE*I/MoE*2* (2002) or *UBIQ: a Mental Odyssey* (2006-) circulates tentatively in the exhibition space, seeing his or her environment through the visor but also, after clicking on the swapping interrupter, private views of other helmeted visitors circulating elsewhere in the same space at the same time. Real time becomes a condition of possibility for altered perception in a space in which private views become public and are replaced by another's view. The system is only operative if two, three or four users are engaged in the process, here and now, so as to enable perceptual substitution. This is why Briand prefers the terminology of "lived time" to that of real time: "if no one is there, there is no image. The exhibition was conceived like this so that the visitor is always at the heart of a work and no longer just facing an icon. [...] Personally, I try to conceive works within which the visitor becomes a receiver-emitter, systems that don't lead the viewer to a truth or a response, but rather lead to the self, to introspection."⁵ The visitor is at the center of the work but s/he is an anonymous visitor whose perceptual, communicative and intersubjective experience cannot be known in advance. This experience is mobilized by the user's reception and emission of different views of the surrounding space: delayed, split and switched views, perceived in situations where one never really knows for sure whose view is being displayed (mine?, yours?, or yours?). These views persist in their indeterminacy of meaning *and* destination. This is Briand's thrust, for sure, when he declares that, in his work, "our usual sense references are perturbed, but it is this destabilization that allows us to discover new things. This is the emission/reception that I'm talking about," and that he wants "to branch out into alternative connections in the brain," enabling the user to "apprehend the world differently through new perceptions and dive into the *inframince*."⁶

The AR constitution of space here is a hiatus that both links the participants but also marks their differences. Spectators are

⁵ Mathieu Briand, in Evelyne Jouanno, "Mathieu Briand: Hacking Contemporary Reality," trans. Rosemary McKisack, *Flash Art*, vol. 37, no. 238 (October 2004), 115.

⁶ Briand, 115-116.

required to participate interactively but the process and the result of this interactivity differs from one individual to another. The spectator becomes a user but never abandons the activity of spectatorship as s/he is perceptually challenged. Interactivity becomes the means by which a unique way of seeing—seeing not only through the eyes of the other but through the questioning of whose eyes are effectively active in such views—is set into play. The community of users is structured on the very ambivalence of AR, as it constantly oscillates between "Here you are now" and "Where are you now?" (i.e., "I am linked to someone (an anonymous anyone) yet where does my view stop and where does yours start?").

Also experimenting with wireless technology, Christa Sommerer's and Laurent Mignonneau's *Mobile Feelings I and II* (2003-04) explore wireless tactility over distance by means of sophisticated micro-sensors and Bluetooth technology. They invite users to hold 'mobile feelings' phones (gourd-shaped phones for the first version and egg-shaped for the second) equipped with sensors, vibrators, ventilators, and micro-bio-electrochemical systems that capture their heartbeat, blood volume and pulse, skin conductivity, breath, sweat and smell. When the devices are held by several participants (each version has six devices for a potential of six participants), a user can select another user and receive that person's bodily sensations, through a vibration, a pulse, a slight stroke, a small wind or humidity. Within each device a Bluetooth module will either establish a direct connection between the devices in a range of ten meters or communicate with a PC or PDA connected to the Internet or to a mobile phone network. These connections allow the six devices to communicate with each other wirelessly and send information to remotely located users. Communication can also be oriented toward a specific participant whose image is displayed by the *Mobile Feelings* devices: once the participant is selected by a user, the user will receive the other participant's body data through specific tactile sensations: a pulse, a vibration, wind or humidity, a push or a stroke. The innovativeness of these devices lies in their sensor and tactile settings which allow participants to communicate with strangers not, as is now habitually the case, via voice or images, but through bodily properties usually suppressed in predominant western regimes of hygiene: smell and sweat. The emphasis put on the tactile experience is also interesting as it reduces but never eliminates the sensory input channels of vision and sound. These channels are constantly negotiating with tactility, even more so in cases when users are strangers remotely located in relation to one another.

4. THE "COMMUNITIES" OF AUGMENTED REALITY: PROBLEMS AND POSSIBILITIES

The communities that emerge from Sommerer & Mignonneau's AR settings are communities made out of participants who can never easily settle into a resolved connection, precisely because of their perceptual experiments, which have much to do with the need to decipher the nature of the tactile sensations and bodily properties provided and communicated by the devices. The artists may well say that "*Mobile Feelings* devices allow remote users to feel each others' heartbeat and breath from a distance" almost "instantaneously" and that the "strong sense of bodily connection through these devices" is "similar to 'holding each other's heart in their hands' and feeling the other's heartbeat and strength," users

are in fact situated in an environment which continuously needs adjustment, negotiation and interpretation. The allegedly “immediate” haptic feedback is after all a translation of the frequency and strength of the user’s heartbeat or breath which is itself initially received via the wireless Bluetooth and relayed as data to the actuator.⁷ There is nothing direct, instantaneous, homogeneous, and immediately binding or reflexive in the experiencing of these communicative devices. I believe this to be a strength, a point I will make clearer further down. Recent critics of their work, however, and the artists themselves have emphasized the participatory, interactive, dimensions of the work and the immediacy implied by User or interactive art. Peter Weibel, for example, describes the work of Sommerer & Mignonneau “as a form of participation,” a “User art” which turns the spectator into an “emancipated consumer.” His description goes as follows:

“The historic subjects of the past were slaves and the workers, but now the new subjects of change are the consumers. ... The consumer learns through the personalized technology that he or she is part of the environment and that he or she can participate in its design. Participation in the world shows the subject that he or she can co-design the world and interact with the world. ... The emancipated consumer can thus change the world through his or her interactions. The participation of the public in the creation of artworks in a museum is like a training field for the emancipation of the consumer. Visitors to these installations are in the center of attention; they are the emancipated consumers. YOU are the content of the exhibition; YOU are the content of the world. But even the user is part of the world and thus carries responsibility for this world. As a participant, YOU the YOUUser have the chance to change the world.”⁸

This view of interaction as a form of participation which de facto allows users to co-design and change the world is highly problematic, mainly because crucial terms—participation, interactivity, change, the emancipated consumer—are taken for granted, as though they could be assessed out of context and outside any discussion on aesthetics. Erkki Huhtamo similarly refers to Sommerer & Mignonneau’s use of tactile and haptic interfaces as emblematic of interactive art at its best. For Huhtamo, however, the value of interactive art lies on its eradication of the idea of distance which otherwise only succeeds in distracting the spectator “from the burning social and political issues ‘outside the frame’.” “It was left to interactive art, he writes, to redefine the artwork’s relationship to the viewer in a more decisive and radical manner. The idea of distance is abolished, and the ‘haptic gaze’ deemed insufficient. The interactive artwork unleashes its meanings only through an active and continuous interaction with the viewer (turned into an

‘interactor’).”⁹ Meanwhile, Roy Ascott speaks of the work as “a field of aesthetic experience in which the re-generation of our own being can take place,” while referring explicitly to *Mobile Feelings* as a telematized experience that opens up to the most central of human experiences, “the exchange of feelings through the intimate biology of the body, blood, sweat and tears.”¹⁰

Such descriptions end up trivializing centuries of art which have privileged the interpellation of the addressee as a spectator. They deny the perceptual questioning at play in Sommerer & Mignonneau’s AR works and the ways in which the smooth, direct and immediate “exchange of feelings” is decidedly complicated by the affirmed ambivalence between the asserting “Here you are now” and the questioning “Where are you now?” As in Briand’s *SyS*05.ReE*03/ SE*1/MoE*2* and *UBIQ: a Mental Odyssey*, interactivity is set up so that the proximity, directness and waning of distance it is assumed to establish is thickened, textured and interrupted by the user’s reiterated need to adapt, fine-tune, absorb, discover and rediscover, bind and unbind, privatize and publicize. Again, there is no community resolution, although there is intersubjectivity.

The productivity of Rancière’s notion of aesthetics as the suspension of destination lies in its troubling of unsatisfying (redundant, reactive) forms of interactivity in AR artistic practices, as it also lies in the questioning of the problematic “communities” which are supposed to derive from interactivity. Interactivity—and I follow here Jens Jensen’s definition of the term as “a measure of a media’s potential ability to let the user exert an influence on the content and/or form of the mediated communication”¹¹—is necessarily contingent, and its productivity has limitations and some undesirable consequences. As Slavoj Žižek has pointed out, the uncanny double of interactivity is interpassivity. Spectators, in new media—mixed or augmented—art, are now invited to interact with the screen and such relationships have put an end to the supposed passive consumption of artworks. In some of the examples described above, the spectators shout, move, touch, hold, select, put on HMD helmets, to “participate actively in the spectacle.” These consumptions, however, create situations “in which the object itself deprives me of my own passive reaction of satisfaction (or mourning or laughter), so that it is the object itself that ‘enjoys the show’ instead of me, relieving me of the superego duty to enjoy myself.”¹²

Supporting this view, new media specialist Erik P. Bucy has empirically shown how interactivity—as an experience with

⁷ Christa Sommerer and Laurent Mignonneau, in Gerfried Stocker, Christa Sommerer and Laurent Mignonneau, eds., *Sommerer and Laurent Mignonneau: Interactive Art Research* (Vienna: Springer-Verlag, 2009), 202 and 207.

⁸ Peter Weibel, “Sommerer & Mignonneau’s Contribution to the Algorithmic Revolution,” in Stocker, Sommerer, and Mignonneau, eds., 19.

⁹ Erkki Huhtamo, “Tactile and Haptic Interaction in the Works of Sommerer & Mignonneau,” in Stocker, Sommerer, and Mignonneau, eds., 33.

¹⁰ Roy Ascott, “Absorption in the Art of Sommerer & Mignonneau,” in Stocker, Sommerer, and Mignonneau, eds., 194.

¹¹ Jens F., Jensen, “Interactivity: Tracking a new concept in media and communication studies”, *Nordicom Review*, vol. 19, no. 1, 1998, 201. Jens F. Jensen, “The Concept of Interactivity – revisited: Four new typologies for a new media landscape,” in *Proceedings for the ACM Conference*, vol. 291, 2008, 129.

¹² Slavoj Žižek, “The Interpassive Subject”, *Traverses* 3, 1998, DOI= <http://www.lacan.com/zizek-pompidou.htm>.

technology—is not merely located in the properties of technology and communication settings but mostly in the user’s experience and perception of interactivity. The user might perceive that s/he is participating in a “meaningful two-way exchange without ever achieving *actual* control over the content” or when it in fact lacks communicative reciprocity or behavioral opportunities.¹³ This perception varies from one user to another, depending heavily on the user’s skills and experience in advanced information. The assumption that two-way communication is necessarily desirable and that it leads to more knowledge does not hold. Interactive settings may increase frustration, confusion and reduced memory when they demand too much time, expertise and cognitive resources of the user. More importantly, in light of AR’s community formations (let us follow Bucy’s findings here), “at low levels of interactivity, such as that afforded by new media, a certain level of sociality and civic engagement may be cultivated, leading to norms of reciprocity and possibly the formation of social capital ... As the information environment becomes ever more interactive, individualized, and fragmented, however, shared experiences across unlike groups may diminish, encouraging selfishness and self-indulgence.”¹⁴ Interactivity is thus not automatically participation or sociality prone. AR artworks are not immune to such fluctuations. These are better addressed in works that don’t simply equate interactivity, progressiveness, and community. As the work of Jean-Luc Nancy has succeeded in demonstrating, the formation of communities require *désœuvrement* (inoperativeness)—gaps, dissensus, difference, innovations, troubles—to prevent their turning into homogeneities mobilized by problematic operations of inclusion and exclusion. AR does, in some cases (notably, in works that set into play poly/inter-perceptual indeterminate enchaining of views) and despite key descriptions of AR artworks, partake of constructive *désœuvrement*.

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¹³ Erik P. Bucy, “Interactivity in Society: Locating an Elusive Concept”, *The Information Society* 20, 2004, 376.

¹⁴ Bucy, 379.

