# SPATIAL POETICS:
THE (NON)DESTINATIONS OF AUGMENTED REALITY ART

*[Ed. note: This is the first part of a two-part essay.]*

Since the early 1990s, the progressive authentication of augmented reality (AR) over virtual reality (VR) in a variety of domains—medicine, military training, robotics, education, communications, entertainment, tourism, design, and art, to name the most obvious—increased awareness of the accuracy of Gilles Deleuze's insight formulated in *L'image-temps* (1985), according to which the temporal categories of the virtual and the actual had come to exchange and displace one another in a relationship of "indiscernibility."[1] Although this relationship characterized the making of the "crystal image" in contemporary cinema (where the coalescence of temporal layers replaces the succession of shots typical of pre-war narrative cinema), it prefigures the quasi-indiscernibility in augmented reality's spatialization of cinema. The engineers Paul Milgram and Fumio Kishino introduced the spatial equivalent of the virtual-actual tie in their formulation of the "real-virtual continuum" to describe the unbroken scale ranging from real to virtual environments, with augmented reality and augmented virtuality located "anywhere between" the two ends of the spectrum[2]:
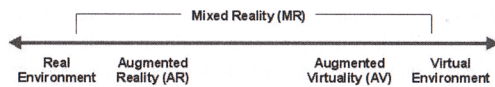
As Milgram's schema specifies, the real-virtual continuum—the unbroken scale ranging from real to virtual environments—is the foundational assumption of digital forms of augmented reality (AR).[3] AR builds up a continuity between the real and the virtual, in which the two categories tend to lose, although never completely, their distinction in relation to one another as they interact with each other. It is this concept of the real-virtual continuum that underlies Ronald Azuma, et al.'s definition of AR that will be used here: AR as a system that "supplements the realworld with virtual (computer-generated) objects that appear to coexist in the same space as the realworld."[4] This supplementing occurs through the addition of dynamic, interactive, and context-specific information to the user's sensory perception of space. This perceptual dimension is pivotal, as it is not the space itself but the perception and experience of the space that is hypothesized to be augmented. In medical applications, for example, a surgeon can wear a head-mounted display (HMD) device equipped with a semi-transparent visor that overlays his or her perception of the patient's body with the preparatory study of the internal anatomy projected on the screen.[5] In automobile applications, AR visualizing systems enable the projection of global positioning system (GPS) cartographic information on the car's windshield or front screen, allowing the driver to see the outside environment through a constantly updated map of the area.

Augmented reality is a *perceptual* paradigm. To be more precise, it is a perceptual *predicament*. Considering that the definitive (yet still unachieved) goal is "to create a system such that the user [cannot] tell the difference between the real world and the virtual augmentation of it,"[6] 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 and sensing and surveillance instruments, one of the most difficult technical challenges is the requirement for the computer to track where the user is looking and determine what s/he is seeing in order to augment his/her view.[7] This has been from the start the impetus of AR explorations.

In the field of art, AR environments are, effectively, a derivative of site-specificity installation art, in which the site is de/un/re-specified by the activation of computer-generated data. These shifting sites are achieved by connecting spectators to networking systems (mobile phones, GPS, the internet); sensing, tracking, and surveillance technologies; and robotics, which enable the processing of different forms of data—texts, images, sound, light, motion, even heartbeats and smell—in a specific space. As specified by Lev Manovich in his "The Poetics of Augmented Space," one of the first texts discussing aesthetic experimentations with augmented reality, physical space is transformed in data space by "extracting data from it (surveillance) or augmenting it with data (cellspace, computer displays)."[8] The status of the spectator in these settings is quite unique: s/he is expected to be enhanced perceptually by evolving interactively, often polysensorially, and collectively, with the work. Think, for example, of Christian Moeller's *Audio Grove* (1997), an interactive light and sound work composed of a wooden platform supporting vertical touch-sensitive steel posts: visitors who touch the posts produce a soundscape that in turn triggers different spotlights progressively illuminating the whole space. There is also 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 movements of the participants are transformed into movements of sounds and geometrical images). This changing platform, whose changes intensify when participants join to make "plural moving observation points," is measured 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, resistance, sound and light.[9] Another example is Usman Haque's *Evoke* (2007), an animated projection on the façade of the York Minster Cathedral in England that lights up in response to the voices of the nearby public. Umbrella.net (2004–), created by Jonah Brucker-Cohen and Katherine Moriwaki, is a social networking system involving ten participants or fewer, each holding a Bluetooth-equipped umbrella fitted with a personal digital assistant (PDA) running the networking
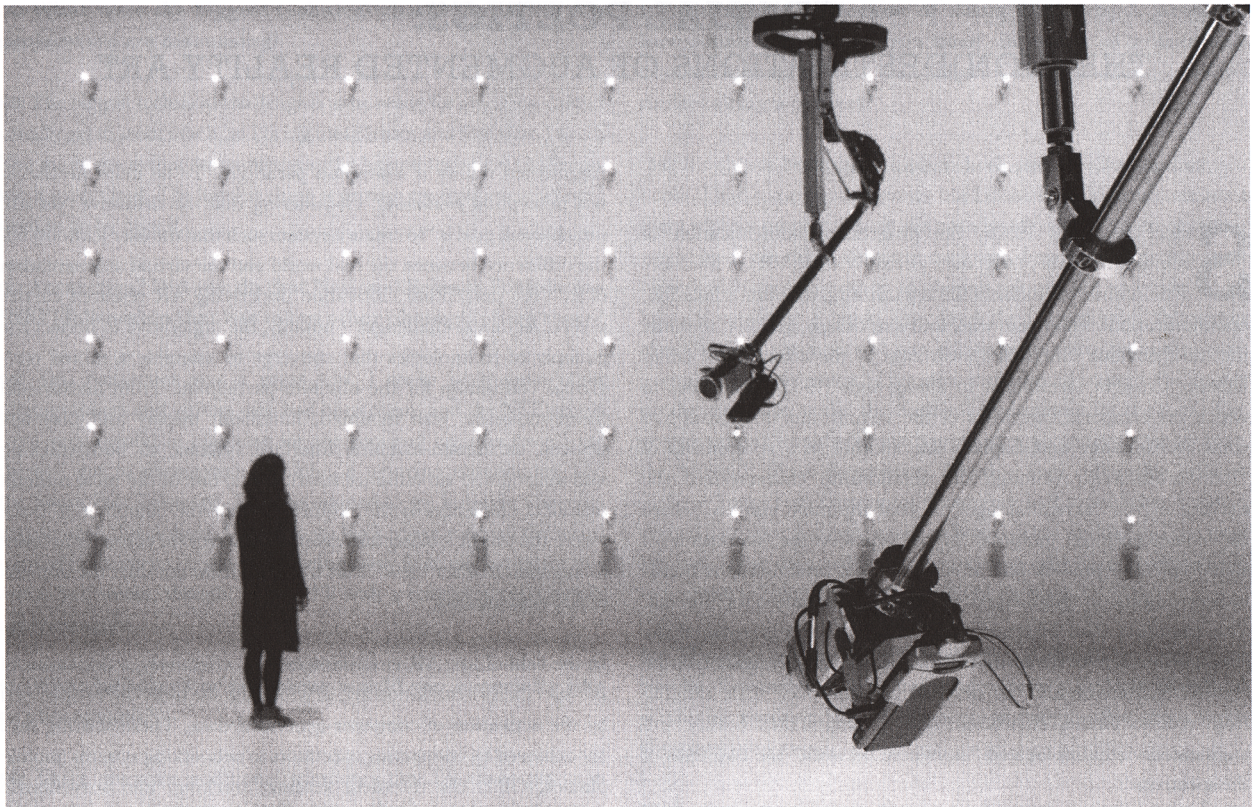
software—the software is activated when the umbrellas open, the impact of rain connecting the participants sharing the same physical space, a connection whose intensity is made visible by different light emitting diodes (LEDs).[10] Finally, *Mutsugoto* (2004), by Tomoko Hayashi, Stefan Agamanolis, and Matthew Karau, is an intimate communication device planned for a bedroom environment that allows distant partners to communicate through light-drawing on the human body. Each partner lies on his or her own bed, equipped with a touch-activated ring visible to a camera mounted above; a computer vision system tracks the movement of the ring and projects virtual pen strokes both on the user's body and the body of the remote partner—"if you follow your partner's movements and your strokes cross," write the conceivers of *Mutsugoto*. "[T]he lines will react with each other and reflect your synchrony."[11] In all of these works, users are invited to interact—perceptually, sensorially, and collectively—with the system. Nonetheless, the system is persistently searching for participants—sensing, seeking, and tracking bodies for the sake of the three "c"s: communication, connectivity, and community.

This essay examines the ambivalence of "destination"—namely the ambivalence of the user's interpellation—as one of the key, yet significantly under-acknowleged, features of augmented reality art.[12] It calls attention to the special status of the spectator whose connectedness is at once a requirement and an uncertainty, a prediction and an anxiety, a principle of localization and a questioning of the capacity to localize. This ambivalence is endemic to AR environments that rely on mobile networking, tracking, sensing, and detection technologies. It clearly echoes the experience of mobile phone users who ca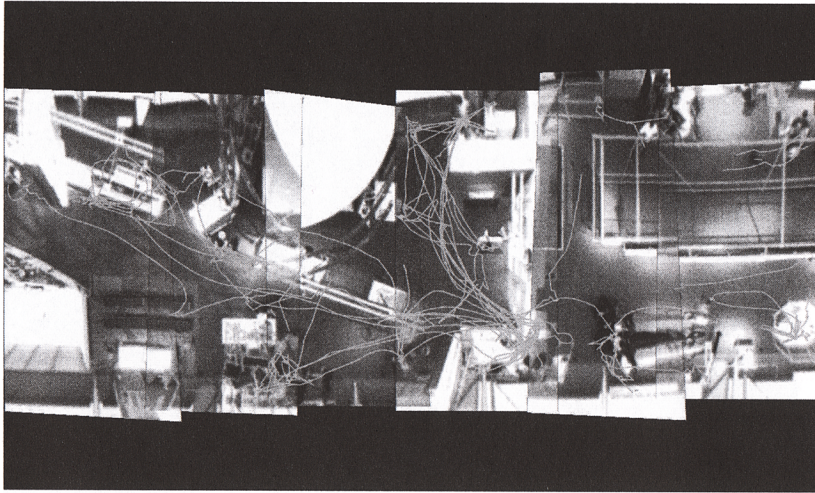n allegedly "stay in touch anytime and anywhere" with their interlocutor, but who can never know for sure when and where the presumed interlocutor will be reached. This ambivalence is best described by referring to the titles of two well-known AR artworks: the asserting *You Are Here* (2004, by Scott Snibbe) and the questioning *Can You See Me Now?* (2001–, by Blast Theory). AR environments keep oscillating between these two accounts, cumulating them as inseparable 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 actual runners circulating in a delimited urban territory are tracked by satellites and appear online as avatars next to avatars created by computer players. The first work emphasizes the tractability of the user while the second one emphasizes its fleetingness. Yet, the user is both a tractable individual *and* a fleeting subject in each of these environments. The augmented reality artwork declares "Here you are now" but simultaneously asks (let us follow psychoanalyst Serge Tisseron here): "Where are you now?"[13] The positioning of the spectator is not an unqualified act. It is a search, a question, an affirmation, a desire, a verb, an anxiety.

Above
Desire of Codes (2010) by Seiko Mikami; photo by Ryuichi Maruo; courtesy Yamaguchi Center for Arts and Media
Facing page
*You Are Here* (2004) by Scott Snibbe; image courtesy Scott Snibbe; © 2004

be examined later. When explored, the shifts complicate unsatisfying yet recurring notions of connectivity as immediate and permanently accessible, of community as communal and bonding, and of participation as necessarily purposeful, creative, and productive. The ambivalence of destination is to be understood as a modality by which spectators can never completely cohere around a community of users. They also substantially contribute to a better understanding of community, for they disclose what is usually left out of contemporary discussions on community: aesthetics.

To clarify, let us return to Usman Haque's *Evoke* (2007), an animated projection on the façade of York Minster that lights up in response to the voices of a public in close proximity. The multicolored lighting 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 mapped out here, applications that rely on the two 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. It is *any* visitor, *any* spectator, *any* user. Yet, this "any user" exists only insofar as s/he is technologically detected. As such, AR doesn't fit easily with the aesthetic regime, whose main operation is the suspension of destination—a regime of indeterminate images in which form is felt for itself instead of operating under the mimetic (narrative/genre/public) hierarchies of the representative regime or for the moral purposes of the ethical regime. AR should be considered a hybrid of representative and aesthetic regimes, for it *has* a destination (it wants an interactive, detectable user) yet the identity of that user is not predetermined and his or her presence is never guaranteed: "Here you are now," yet "Where are you now?" Second, in most cases, augmented reality artworks are invested in the production of a real-virtual continuum only inasmuch as the continuum may provide reciprocity to any addressee—another anonymous addressee (shouter or signer), even a group of anonymous addressees with whom to cooperate as instantaneously as possible. Therefore, in their search for human reciprocity, they also partake in the ethical regime of art. AR wants, supports, and facilitates participation and community building between users (in many cases, a community of two, three, or four may suffice), mostly for the sake of communication, gaming, formal play, narration, mapping, mutual recognition, or embodiment.

This double principle—the solicitation of an anonymous addressee and the connection of this addressee to other addressees—structures the ambivalence of destination in augmented reality. What the brief example of *Evoke* reveals, however, is that its exploration may favor the "You are here now" component of the ambivalence of destination, to the detriment of the more anxious "Where are you now?" dimension. Indeed, though *Evoke* can never predict in advance who

This is especially true in cases when AR relies on locative technologies. Recent literature has been inclined to affirm (especially Manuel Castells, et al.'s study of mobile communication) that "the key feature in the practice of mobile communication is connectivity rather than mobility," and that mobile technology ensures a permanent and ubiquitous form of connectivity—one in which mobile users can "stay in touch anytime and anywhere in a habitual mode of communication"[14] and form what Misa Matsuda calls "full-time intimate communities."[15] But in its applications, connectivity never simply resolves the complexities of communication. In AR networking environments, the complexities of communication are intensified by the absence of the other, which entails the increased need for immediate connectivity; the difficulty to predict the availability of the other; the impossibility of verifying the other's spatial location; the inability to know for sure, particularly in text messaging, if the identified interlocutor is real or fictional; the steady possibility of misunderstanding or of being misunderstood. Connectivity is reached, but when heavily used it may even lead, through the phenomenon best described by Ichiyo Habuchi's notion of "tele-cocooning" ("the production of social identities in small, insular groups through mobile communications"), "to the weakening of communal ties beyond the most intimate group of friends": mobile technology is a paradoxical site "of integration and disintegration of communities."[16]

AR'S POTENTIAL INNOVATIVENESS

Considering that the impetus of AR explorations is to develop sensing, detection, and tracking technologies that can register and then augment the user's perception of the environment by transforming the perceived environment into a mixed real-virtual continuum, AR's potential innovativeness—and this is where the notion of augmentation may start to make sense—lies in its ability to generate new ways of perceiving that effectively and diversely mix the real and the virtual within a same field of vision. As a perceptual paradigm, AR is innovative when its perceptual predicament is not only structurally but strategically rooted in the ambivalence of destination proper to connectivity. AR connects users. In its best moments, however, it takes advantage of the ambivalence of destination to turn it into an aesthetic of perceptual, sensorial, and cognitive "horizon" shifts, which bind unbinding perceptual, sensorial, cognitive processes. These shifts will

[RLH]

and when the users will interact, participants interact collaboratively and similarly to the same end, singing or shouting together in sync to light up the cathedral. Other AR works will explore the double principle of AR to uphold the productivity of the user's "Where are you now?" status—the anxious, fleeting, and unknowable dimensions of AR connectivity within a real-virtual continuum. I will examine different AR environments—by artists Rafael Lozano-Hemmer, Seiko Mikami, Blast Theory, Mathieu Briand, and Christa Sommerer and Laurent Mignonneau—to identify the modalities by which key contemporary AR artworks investigate this double principle, sometimes to sidestep, sometimes to affirm the ambivalence of "You are here now" and "Where are you now?" As stated earlier, the potential of AR as a perceptual paradigm lies in its ability to follow the ambivalence of destination by allowing for inter-sensorial, inter-perceptual, inter-cognitive horizon shifts. I will be relying on Rancière's notions of aesthetics and the distribution of the sensible, as well as Jean-Luc Nancy's and Marc Augé's notions of inoperative and illusionary community. The productivity of these notions lies precisely in their troubling of problematic forms of connectedness in AR artistic practices, as well as their capacity to help disclose the innovativeness of AR in its bridging of the three "c"s: communication, connectivity, and community.
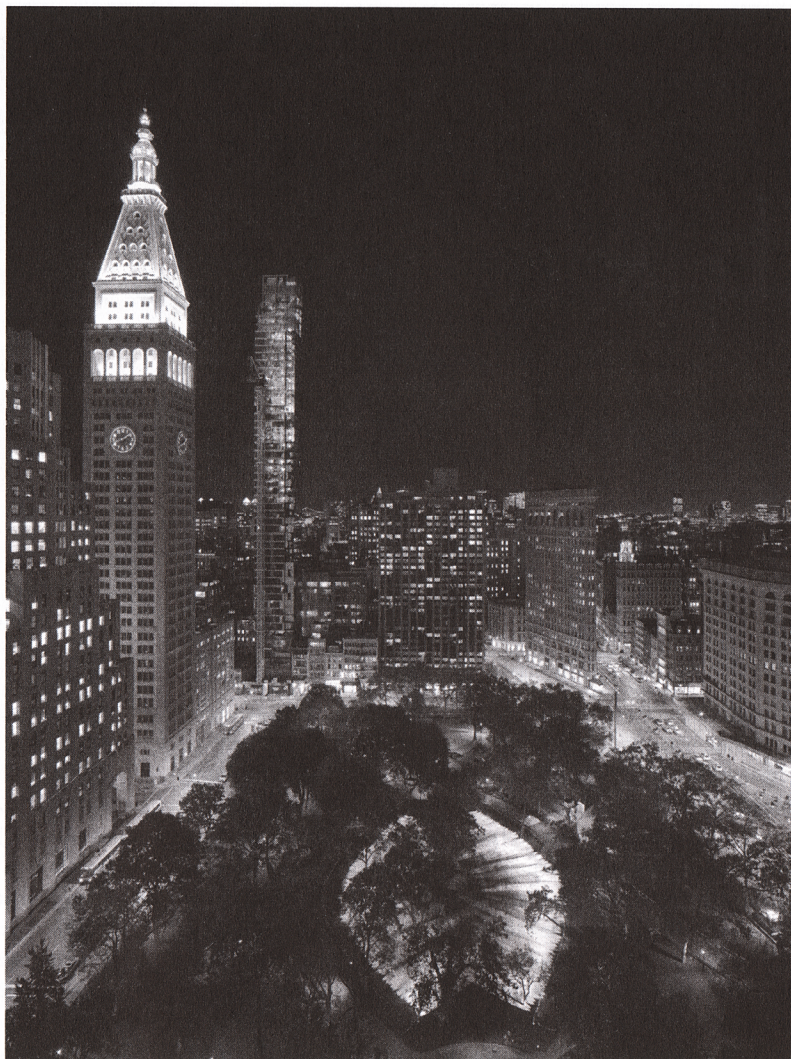
Many of Lozano-Hemmer's AR environments depend on the use of sensors that measure the heartbeats of participants to convert them into light beams that interact in the public space as other participants simultaneously engage with the sensor devices. *Pulse Park* (2008) is surely the most exemplary site of the "Pulse" series (2006–), activating 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 a sensor 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 the sensor, a light beam emerged to intersect with other light beams previously set off by other participants. Each time a user would release the 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."[17] The heart rates were indeed flowingly translated into light through touch: these translations carried with them an aura of wonder and synaesthesia as they let users see the sounds and poundings resonating inside

their own bodies. Surprisingly, however, Lozano-Hemmer appears to negate the wonder of translation when he affirms that participants were "surrounded by the 200 most recent heartbeats."[18] The statement awkwardly denies that the pulsing configuration of the heartbeats were clearly predetermined by the heart rate sensor, DMX controller, software, and generator.[19] It confuses the digital translation of systolic and diastolic activities into light with the biological activities under translation.[20] Moreover, the translations were somewhat disappointing and homogeneous when considered as community building. The only differences between light beams was 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 otherwise did not necessarily relate to each other. Finally, the constituency of the lit community was only marginally controlled by the users: participants

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Above
Pulse Park in Madison Square Park, New York City (2008) by Rafael Lozano-Hemmer; photo by James Ewing

could only manage the direct presence and memorized presence of the light beams by holding or letting go of the sensors.

The key rule underlying AR sites such as *Pulse Park* is interactivity and participation for the sake of community building. They are the site of affirmation of *inter-agero ergo sum* ("I interact, therefore I am"). AR wants at least one action from its *destinataire*: interaction through participation. There is nothing wrong with this rule per se. On the contrary, interactivity tasks are at the center of ubiquitous computing today and it is vital that artists investigate these. What must be addressed, however, is the kind of interactivity required of the user as well as the types of communities resulting from such interactions. In *Pulse Park*, interaction is minimal: the recipient is left with a sense of not having much control over the outcome of the piece. More problematically, it shapes communities that 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 + . . . " This homogenizing conglomerate is best conveyed by an aerial representation of the environment: an enlightened gestalt-resolved ellipse made out of similar pulsing light beams. Sidestepping the ambivalence of AR, this relational work stores up to two hundred interventions to compensate for the possible scarcity or absence of participatory recipients. This guarantees consistency, fullness, completeness, and inclusiveness to the form and, as such, re-affirms the location of the user to the detriment of the unverifiability of that location. It is as though AR sites, despite the ambivalence of their structure (connectedness 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), "fear speaking in the desert," as Rancière would put it. They fear "the letter without a recipient."[21]

THE PROBLEM: PARTICIPATION AND INTERACTIVITY

What is the problem here? In these types of interactive environments, AR becomes an art uncertain of its perceptual potential. It produces wonder through translation from heartbeat to light; it produces a community of users. But as it sidesteps the "Where are you now?" modality of AR ambivalence, attempts at generating new ways of perceiving and connecting are also sidestepped. Such interactive environments—Haque's *Evoke* is not far here—belong to the category of what Castells has designated as "ad hoc groupings," which find their "technological platform in this capacity to call for action or . . . for sharing—in instant time."[22] They rely on a restrictive use of time as instantaneity (to which I will return) and on a superficial view of participation and interactivity, which dismisses the requirement to reflect upon the limits of (a) participation through (b) interactivity. As such, these works have abandoned vital insights of earlier, non-digital forms of installation and performance art.

a) *Participation*. One of the most significant contributions of installation and performance art of the 1970s to the non-destination breath of aesthetics has been its double entendre in matters of spectator participation: a mode of address that solicits, even seduces, spectators into a specific environment only to destabilize

their sense of autonomy. These artistic practices—to name some of the most pivotal examples, the work of Yoko Ono, Valerie Export, Bruce Nauman, Vito Acconci, and Maria Abramović & Ulay—invited what art historian Janet Kraynak has insightfully called "dependent participation."[23] Kraynak borrows the term from Alain Touraine, published in his *The Post-Industrial Society* (1971), which was coined to refer to the demands made by the service-oriented society emerging in the late 1960s: technocratic demands of widespread conformist inclusion in contrast to earlier periods of industrialism, which were contingent upon exclusion.[24] Ono's *Cut Piece* (1965), where the artist sat motionless on the stage after inviting the audience members to cut away her clothing until she was naked; Export's *Tap and Touch Cinema* (1968), a street action in which the artist wore a miniature movie theater around her breasts, giving public accessibility to her body, not to be seen but to be touched by any viewer reaching through the curtains of the theater; Nauman's *Green Light Corridor* (1970), a claustrophobic passageway forcing the spectator to maneuver his or her way through; Acconci's *Seedbed* (1971) where the performer lay hidden underneath a gallery-wide ramp, masturbating while vocalizing into a loudspeaker his fantasies about the spectators walking above him; and Abramović & Ulay's *Imponderabilia* (1977) where the couple stood naked opposite each other in the museum entrance, requiring that visitors enter sideways between them: all of these works wanted participation from the spectator. Participation, however, was meant to be an alienating, frightening, and uneasy experience. The participant was solicited to contribute to unfolding power relations. In other words, inclusion was experienced as a promising yet problematic feat—a difficulty, a constraint, a means to hold one's own exclusion at bay. This standpoint, as Kraynak has convincingly argued, questions post-industrial society's increasing reliance on non-conflictual forms of participation.

Augmented reality art (in its partaking of relational aesthetics) has too easily become the aesthetics par excellence of non-oppositional participation, what Rancière has come to identify as "consensus": an act or methodology of agreement between parties that suspends disagreement as the modus operandi of politics, denying the dynamics of inclusion and exclusion that structure any community. Participation is in fact promoted as a means of community building: this is the case of *Pulse Park*. It has even become a mode of community synchronicity, as in Rebecca Allen's *Coexistence* (2001), an interactive work that partakes of the same consensus platform, though specifically devised to enable "a shared experience between two people in a world that is both real and virtual."[25] Wearing an HMD equipped with a small digital camera and an integrated head-tracking device, a participant can both see the environment in front of her through the camera and 3D computer-generated objects that seem to inhabit the same physical space. A hand-held interface device that combines a breath sensor with a modified force feedback game pad allows the participant to interact with responsive computer-generated forms through her breath. At first, the participant will see a cloud of virtual forms obscuring her view of the real world, but as she blows into the breath sensor her breath will progressively blow away the virtual forms. Meanwhile, across from her, the other participant will also be blowing away virtual forms. By "working together" both participants will remove

the virtual objects "to reveal a view of each other." Although technically inventive in its blending of virtual and real worlds, *Coexistence* builds a community of two in which it is presumed that participants will collaborate on a similar task—oddly the removal of the virtual dimensions of the visual field—to finally reveal each other. Why integrate the virtual only to dismiss it? Synchronicity is pivotal here, as well as transparency. Mediation has reached such precision that it allegedly vanishes in the act of communication. As *Pulse Park*, it tends to erase the inevitable noise of mediated transmission. What mainly disappears *is* noise—the coding of the senses, the translation of human biology, and the participants' connectedness to new media as "milieu." As the work of Michel Serres has shown, noise is an excess of information that keeps modifying the signal and the message.[26]

b) *Interactivity*. Interactivity—in 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"[27]—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. 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."[28] Supporting this view, new media specialist Erik P. Bucy has empirically shown how interactivity—as an experience with technology—is not merely located in the properties of technology and communication settings. Rather, it is 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.[29] 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.[30]

Interactivity is thus not automatically participation or sociality prone. AR artworks are not immune to such fluctuations. These are

better addressed in works that do not simply equate interactivity, progressiveness, and community. As Nancy has contended, the formation of communities requires *désoeuvrement* (inoperativeness)—gaps, dissensus, shifting forms of interperceptuality and intersensoriality, processual passings of time, in short the ambivalence of destination—to prevent their turning into homogeneities mobilized by imperceptible operations of inclusion/exclusion.[31]

[Ed. note: See the November/December 2010 issue (Volume 38, no. 3) of Afterimage for Part 2 of this essay.]

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NOTES **1.** *Gilles Deleuze,* L'image-temps. Cinéma 2 *(Paris: Les Éditions de Minuit, 1985), 93.* **2.** *Paul Milgram and A. Fumio Kishino, "Taxonomies of Mixed Reality Visual Displays,"* IEICE Transactions on Information and Systems, E77-D *(12) (1994): 1321–1329.* **3.** *See Lev Manovich's wider definition of augmented reality in "The Poetics of Augmented Space,"* Visual Communication *5, no. 2 (2006): 222: "the laying of dynamic and context specific information over the visual field of a user," a definition that rightfully allows for analog forms of AR such as Janet Cardiff's and George Bures Miller's audio-walks.* **4.** *Ronald Azuma, Yohan Baillot, Reinhold Behringer, Steven Feiner, Simon Julier, and Blair MacIntyre, "Recent Advances in Augmented Reality,"* IEEE Computer Graphics and Applications *21, no. 6, (November/December 2001): 34–47; www.cs.unc.edu/~azuma/cga2001.* **5.** *J.P. Mellor,* Enhanced Reality Visualization in a Surgical Environment, AI Lab *(Cambridge, MA: MIT Press, 1995).* **6.** *Jim Vallino, "Augmented Reality — Introduction," 2003, www.se.rit.edu/~jrv/research/ar/.* **7.** *Vallino, www.se.rit.edu/~jrv/research/ar/ and "Interview with Professor Steve Benford, principle investigator at Nottingham University's Mixed reality Lab," www.bbc.co.uk/arts/shootinglive/2002/blastheory/mrl.shtml.* **8.** *Manovich, 222.* **9.** *See Seiko Mikami: http://doc.ycam.jp/relatedworks/index_en.html.* **10.** *The artists have stated that the prototype was invented "for examining how new relationships (amongst strangers and friends) can form based on proximity and chance." See www.distancelab.org/projects/mutsugoto/.* **11.** *See www.distancelab.org/projects/mutsugoto/.* **12.** *Indeed, in "The Poetics of Augmented Space," for example, Manovich states that one of the objectives of the article is "to focus on the experience of the human subject in augmented space" (220). But this otherwise brilliant examination of the aesthetics of augmented space does not address the crucial question of interpellation or, more specifically, the type of user participation usually required by augmented reality artworks.* **13.** *Serge Tisseron,* Virtuel, mon amour: Penser, aimer, souffrir à l'ère des nouvelles technologies *(Paris: Éditions Albin Michel, 2007), 20.* **14.** *Manuel Castells, Mireia Fernandez-Ardèvol, Jack Linchuan Qui, and Araba Sey,* Mobile Communication and Society: A Global Perspective *(Cambridge, MA: MIT Press, 2007), 248 and 92.* **15.** *Mizuko Ito,* Personal, Portable, Pedestrian: Mobile Phones in Japanese Life *(Los Angeles: Annenberg Center for Communication, 2004), 1.* **16.** *Ibid, 92–94.* **17.** *Rafael Lozano-Hemmer, "Pulse Park": www.lozano-hemmer.com/english/projects/pulsepark.htm.* **18.** *Pulse Park video: www.youtube.com/watch?v=uUfTX6KaAnI.* **19.** *Lozano-Hemmer, "Pulse Front"; www.lozano-hemmer.com/english/projects/pulsefront.htm.* **20.** *On similar forms of synaesthesia confusions in digital art, see Christoph Cox, "Lost in Translation,"* Artforum *44, no. 2 (October 2005): 240. I wish to thank Veronica Vincent for referring me to this article.* **21.** *Jacques Rancière,* Aux bords du politique *(Paris: Folio Essais, 2004), 176 [my translation].* **22.** *Castells, Fernandez-Ardèvol, Linchuan Qui, and Sey, 249.* **23.** *Janet Kraynak, "Dependent Participation: Bruce Nauman's Environments,"* Grey Room *10 (Winter 2003): 22–45.* **24.** *Alain Touraine,* The Post Industrial Society: Tomorrow's Social History: Classes, Conflicts, and Culture in the Programmed Society, *trans. Leonard F.X. Mayhew (New York: Random House, 1971), 9 ("Alienation means canceling out social conflict by creating dependent participation.").* **25.** *Rebecca Allen, "Coexistence," http://rebeccaallen.com/v2/work/pop.text.php?view=longDesc&ID=12.* **26.** *Michel Serres,* The Parasite, *trans. Lawrence Schehr (Baltimore: John Hopkins University Press, 1982), 79.* **27.** *Jens F. Jensen, "Interactivity: Tracking a new concept in media and communication studies,"* Nordicom Review *19, no. 1 (1998): 201. Jensen reconfirmed his definition in "The Concept of Interactivity—revisited: Four new typologies for a new media landscape,"* ACM International Conference Proceeding Series *291 (2008): 129.* **28.** *Slavoj Žižek, "The Interpassive Subject,"* Traverses *no. 3 (1998): www.lacan.com/zizek-pompidou.htm.* **29.** *Erik P. Bucy, "Interactivity in Society: Locating an Elusive Concept,"* The Information Society *20 (2004): 376.* **30.** *Ibid., 379.* **31.** *See Jean-Luc Nancy,* The Inoperative Community *(Minneapolis: University of Minnesota Press, 1991).*