Chapter 3
Why We Might Augment Reality: Art's Role in the Development of Cognition

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3.1 Introduction

In discussing Augmented Reality (AR), it is common to begin with art: the premise that art exists, that computers are one means to create it, and that AR is one motivation to create computer art. As art is primarily assumed the domain of aesthetics, this further leads one to consider computer art a means of expressing aesthetics. While hardly inaccurate, this path is a misleading for us here. Behavioral Art (BA), and its relationship to AR, is profoundly different. To consider BA, we are required to abandon the notion of aesthetics, at least temporarily. We begin by thinking instead about a function involving linguistics and (cognitive) development in a somewhat novel way.

For instance, when discussing cars, it is hardly objectionable to tacitly assume that the car is used as mode of transportation. We do not ordinarily assume the discussion will be about the car as a (stationary) couch. When discussing seating in general, car seats are indeed likely considered. Likewise, the computer's unique and unprecedented ability to execute code is implicit in our discussion of computers. Just as one could freely purchase a car, only to be used exclusively as a couch, a computer certainly can be used for media. Moreover, the influence of psychology on human experience is far more central to BA (Hoffman 1998).

Furthermore, absolutely all digital creations, presentations, and/or editing have long been accomplishable using analog tools. There would be no reason to differentiate media production created by certain tools and not identical works created by others (Reeves and Nass 1996, pp. 193–210). On the other hand, when we discuss the process by which we conceive of some problem in terms of a logical syllogism or *algorithm*, notating that logic into one or more formalized codes, to be rendered mechanically, only one such tool excels far above any previous invention. Regarding

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programming, there is now little impetus for us to mention couches or media. They are unrelated to our discussion here regarding perception (beyond the visual) and this programming tool.

3.2 Development

We humans are unique from other species, in that we undergo an unusually long period of development. Since this is 'costly' in terms of survival fitness, it is unlikely to be accidental. It also indicates that the minds we enjoy are qualitatively different than minds assembled by biology for briefer purposes. This is not to imply that turtles are 'smarter' than dolphins, but that a longer juvenile period results in different needs. Shorter-lived organisms and machines function sufficiently, without need to fine-tune behaviors much, if at all, to an unpredictable environment. The environment of many organisms can be expected (by evolution) to remain fairly static during the organism's lifespan. Not long ago, it was believed that when learning does seem to take place in other organisms, it must be due to a reward system. Though Behaviorism was generally abandoned decades ago, the model of *instrumental conditioning* (IC) remains deep-rooted in popular conceptions about learning. A ramification of IC is the view of communication proposed by Claude Shannon (Ash 1965; Shannon and Weaver 1949). Even that children are tested and receive grades is a form of reward/punishment aimed at training for a desired response. Though many children do benefit from this traditional methodology, it is hardly universally helpful and can even be debilitating for many students (Dewey 1910; Kohn 2008; Phillips and Soltis 2009; Tough 2012).

3.2.1 Machine Learning

No doubt, the inner workings of the pre-processor in the computer may strike many readers as unnecessarily esoteric. Unfortunately, the counterintuitive details addressed in this preliminary section illustrate a fundamental premise in BA and give AR its role therein. Beyond casual conversation and speculation, the common-sense model of *machine learning* applies exclusively between machines and not to organic brains (further discussed in Wright 2012a, 2013a). Shannon's heavily influential notion of communication is prohibitively restricted from development, and thus learning, in any biological sense. We humans are in no position to insist learning is entirely synonymous with mechanistic causality (Fischer 2011; de Waal 2016). In Shannon's defense, much more is now known about the learning process than was available to him at the time. Though we might refer to successful strategies of stimulus storage, transferal, retrieval, and broadcast, these are only preliminary tasks, insufficient to account for 'borrowed intelligence' (Wright 2013b). Particularly, insightful has been the more recent distinction in linguistics between *signaling* and *communication.*

A qualitative difference lies between signaling, akin to graffiti, viewable by any, for as long as the graffiti remains legible, where a unitary message is sent and received and is not generalizable to other contexts, and communication, where multitudes of messages effect the further stream of messages, as per the needs of all conversationalists involved, where the successfully communicated message influences subsequent messages. Both synchrony and self-synchrony are extremely relevant in that signalers, such as nonhuman animals and machines, do not render messages by other physical means than the medium specific to the message (Bavelas et al. 2002; Knapp and Hall 2006, pp. 43–54). For instance, humans can speak the same text verbatim, employing a wide range of behaviors to ultimately convey very different things, or use a wide range of syntactical means to convey essentially the same content. In such cases, which are only conclusively evident in humans, and we have very little understanding of how this might be automated, the message is one of several means for directing (not causing) further interaction. Once we have better understood how these problems are solved in organic minds, via some form of nonverbal communication, we might then revisit how the computer could be implemented, not directly (again, as if the computer were a graffiti generator), but as a prosthetic tool (Licklider 1960; Wiener 1950). Though it is popular to say that computers and brains are nothing alike, it is also popular to apply the same model of processing to the brain as to machines, with only a vague sense of how that processing might take place. For this reason, while we do not intend to outright debunk the notion that intelligence can be synthesized (Horzyk and Tadeusiewicz 2005), we do need to initially discuss a nuance of processing, which bears on a particular role of communication, consciousness, and ultimately AR.

Computers are mechanical tools, which inventors have adjusted to correspond to our concept of mathematics. Programmers then apply this numerical correspondence to concoct complexes of syllogisms, which can be further reformulated in very un-mathematical-looking graphics. Insofar as one might metaphorically envision circuits and transistors as hierarchical conditional tree diagrams (as in Lakoff and Johnson 1980), a similar assemblage of metaphors in the imagination allow one to make sense of Boolean logic, as applied to digital processing. The assumption is that this empirical scheme applies to any cognitive function may be more about personal perspectives than about a priori truths (Baron-Cohen 2009; Boyd 2004). The case is argued passionately both by those who feel this is obviously true (Shanahan 1997; von Neumann and Morgenstern 1944; Glimcher 2009) and those who feel this is ridiculously impossible, particularly considering human interaction (Ackernan and Bargh 2010; Edelman 1992; Koch and Tononi 2011). 'Every Boolean function no matter how complex, can be expressed using three Boolean operators only: And, Or, and Not' (Nissan and Schocken 2005, p. 9). The question remains then whether every task can be expressed as a *conditional statement*, using one of several variants on the theme 'if *x*, then *y*.'

It is further restrictive that, due to the evolutionary construction of the brain and DNA, a 'lesson plan' must simultaneously be somewhat useful in our current environment, but applicable to some ancestral species-specific environment (Bjorklund and Pellegrini 2001). Olaf Sporns, in his overview of neural networking, states that 'Nervous Systems do not converge onto a final stable pattern of optimal functionality, rather, their connectivity continues to be in flux throughout life' (Sporns 2011, p. 252). Thus, no matter how similar a neural network in an organic brain and one in software process computational tasks, there is still an additional, perhaps far greater task, which is not remotely addressed by mechanical means, in ongoing re-contextualization of data, from generalizing to other domains, to inferring detailed implications (Koch and Tononi 2011). Because this ability is not instantly formed (by phylogeny), but develops gradually via subjective learning (in ontogeny), it is not a candidate for the static instructions of software. Insofar as physical laws, the inner workings of the machine are chained merely like dominoes (Fig. 3.1). Accumulating more and more simple physical reactions can never possibly yield an increase of intelligence to the system. Strict adherence to mathematics is both a strength and a

Fig. 3.1 Even at the detailed level of the internal workings of the computer processor, essentially a transistor of switches, physical laws merely operate in non-complex chain reactions. Mechanical intelligence can only be accomplished by the computer, as much as intelligence might by configuring more dominoes

weakness. 0 + 1, if calculated by the rules, no matter how many times, will never get to 2. Manipulations of binary digits simply do not accumulate anything.

3.2.2 A Grouping Impulse

Humans also have a tendency to speak of messages metaphorically (in the non-technical sense) as packages that are designed by some external force, and travel to us, into our minds. Beyond the convenience it may provide in colloquial conversation, it is highly speculative and assumes dualism, where the mind and brain are linked by some mystical force, not subject to physical laws. Though a few researchers have questioned this Platonist view in the last 100 years or so, it would appear to remain the devout doctrine of uneducated laymen and the most educated scientists, in most every field. Firstly, we should point out that these messages need not come from intelligent sources. There need be no actual sender. Rather, a message received seems to indicate intelligence only in whichever source the recipient assumes authored the message. Of note here is *attribution theory*, in particular the famous experiment by Fritz Heider and Mary-Ann Simmel (1944), where subjects were shown an animation of simple geometric shapes. Afterward, the subjects nearly unanimously described the events on screen as if the shapes had personalities and volition. Likely each individual did realize that these obviously drawn abstract shapes could not possibly behave in social ways. Regardless, it is notable that the subjects suspended belief to the extent that it becomes ambiguous exactly to what extent these subjects are certain their descriptions reflect their interpretations. But note, we would not insist these subjects were wrong, mistaken, or lying in their reports, merely that humans have an idiosyncratic perceptual/conceptual system that is usually effective (in the Pleistocene) but far from ideal in all modern situations (Wiener et al. 2011), namely AR.

Computers manage the assembly of computers. But *recursion* is hardly sufficient to qualify as intelligence. What is intelligent is that the execution is not an end, but a means concocted, with no explicit connection provided between the goal and the strategy. In this scenario, there is no reason to believe the computers coming off the assembly line on day two are any more or less intelligent. Than those made on day one. The computer/manager did not decide more computers would be a benefit, the machine is only routinely obeying code (written by someone who believes more computers would be a benefit). Only the human, who designed this system as a solution to a personal need shows actual intelligence. The managing machine cannot be said to have needs. But the attribution of personality traits to the inanimate computer/manager often fools, not only those in search of evidence of *artificial intelligence*, but many of us who merely engage in tool-use during play.

However, before we decide that this *impulsive projection of communicative meaning* (Wright 2012a) is an inaccurate—and thus 'wrong'—view, consider alien abduction stories. In many cases, these theories hinge on false-positives. The truth of the matter is not actually provable, nor is ultimately relevant. What often is the case, these soon-to-be-abductees (StBAs) suffer from some experience that is inexplicable within the world they have constructed (Clancy 2005). This event need not be traumatic, but may simply be due to a confounding life of accumulated mundane causes. However, in the larger scheme, the StBA may feel that life has been unusually difficult, disappointing, and/or depressing. Though alien abduction would hardly be their first explanation to justify some disconcerting event, eventually all other reasons fail to satisfy. Alien abduction further has the benefit that the StBA, who previously felt undistinguished by luck, can now feel chosen. A peculiar result, that Susan Clancy found, was that once the dubious alien abduction story was accepted by the abductee, that person's outlook often changed for the better. The truth is irrelevant, and inaccessible, but this augmentation of reality serves a higher psychological purpose in creating a 'patch' for a damaged worldview.

A peculiar and unique tendency in humans, we discuss extensively elsewhere, is to impulsively elect to divide fluid stimuli, such was a rainbow into 2–8 colors, or sonic frequency spectrum into musical notes (Wright 2010, 2013b). Further, this division depends on the acquired culture. These groupings are in no way real, but imaginary. Yet they remain salient byproducts of a typical human perception process (and prove informative in atypical instances, as with lesion studies). Particularly when we consider that the computer, which appears to calculate ideally, we are forced to consider what purpose might this idiosyncratic grouping effect serve?

"One notable feature of the major scale is that it contains several intervals whose frequency ratios approximate small, whole-number ratios. For example, … 3/2, 4/3 and 5/4 … This is no coincidence. Western music theory has long valued intervals with simple, small-number frequency ratios, and these ratios play an important role in Western musical structure. The Western fascination with such ratios in music dates back to Pythagoras, who noted that when strings with these ratio lengths were plucked simultaneously, the resulting sound was harmonious. Pythagoras had no real explanation for this, other than to appeal to the mystical power of numbers in governing the order of the universe" (Patel 2008, p. 15; *see also* Levitin 2006, p. 37).

As any salesman will tell you, insisting that customers 'buy it!' will not be nearly as effective as when customers come up with the idea to do so on their own. What is interesting is the very personalized ways in which each individual 'comes up with it'. Howard Gardner's *Theory of Multiple Intelligences* (Gardner 1983) is a good way to think about this. Gardner shows how children may learn better by seeing a colorful example or may learn better by singing a song in a group, but will tend to choose their own *learning style* in play (Humphrey and Gutwill 2005; Piaget 1962; Sfard 2008: 76–80). Unfortunately, these preferences are inevitably restricted somewhat by which 'teaching styles' are readily available, given their teachers' methodology and within the child's culture (Castelfranchi 2011). However, parents might breathe a sigh of relief to know that this is only 'somewhat' the case. In general, as many parents have surely experienced, children can be very clever in finding ways to explore these learning styles. Nonetheless, even if we concede that the practice of art *appears* to have grown out of markings of environs by artists. In the parlance of Chomsky (1957: 15), Hauser (1998), Chomsky (2000) art serves a far more crucial function for cognition (as distinguished from machines) as *deep structure* and less as *surface grammar*/effect/decor. It is a biological strategy that has evolved for cognitive development and maintenance. Ultimately, an instance of this strategy is AR.

3.3 Augmentation

Though it is popular to say that learning occurs socially, what we intend to investigate is the means by which cultural groupings of behaviors are distinguished from non-cultural events and behaviors. This subtle exchange requires not just dictating of factual data, but confirmations and clarifications to coordinate participants (Millikan 1995; Wright 2012a). In discussing this essential aspect of learning, Lev Vygotsky's influential theory (1986) theorizes how minds make a reasonable assumption about the subtle relationship between social behavior and culture, but it is an assumption, nonetheless. Firstly, it assumes that culture actually exists externally to the perceiver (as in Platonism), rather than as an internal conceptual gestalt. Secondly, it does not take into account human's predisposition toward grouping as essential to perception, interpretation, and subsequent conceptualization. This is where AR comes in. What physical, concrete cues exist that might reveal that social behavior is manifested in intelligently organized clusters, which we might call culture? Before answering, consider that the man-made machine (i.e., a computer) can only detect and calculate exclusively employing concrete physical reactions. Conditionals ("Is it a square or not a square?") might be explicitly coded or implicitly sought (as in AI), but never invented ("What should I notice about this scene?") In other words, AR is a technique by which a computer views reality, devoid of the subjective associations which humans impulsively experience the world. At this point, we find that art serves three crucial roles. An author (1) embodies a cultural concern. An audience member can (2) show interest (e.g., visit the art gallery) or (3) further create embodied concerns that are non-non-sequiturs. These culturally specific concerns are profoundly amorphous, and so we will begin with the simplest format, storytelling.

But we must not be too excited about the need to involve technology. For example, storytelling as a linguistic exercise is useful for development of older children, who are comfortable with verbalizing thoughts. However, by 'story telling' we refer to something beyond merely descriptions of imagined events. It is the ability to organization of conceptual objects and understood dynamics. Early training on the violin or listening to Mozart (Campbell 1997) was believed to enhance general intelligence, the impetus for this resting on dubious understanding of the brain. Rather, for younger children, this can be frustrating, as the necessary neuroanatomy has yet to be fully developed. There is even some informed speculation that pressure to conform to premature learning has long-term harmful effects (Several criticisms are discussed in Bjorklund and Pellegrini 2001, p. 248). Though intuitively one might believe early academic exposure would be stimulating, the scant evidence does not indicate this. More precisely, not all expression is equally 'good for you.' Written story telling may only be helpful to students who demonstrate a certain level of linguistic affinity. It likely only aggravates development to train earlier, whereas pre-language-fluent children would likely be better off making torn paper collages, in order to describe an event (a lesson my wife, who teaches art, does with her pre-kindergarteners).

It appears highly likely that art, as it is commonly understood, including organizations of kinesthetic movements as dance and sounds as music, is practiced exclusively by humans. But even just to say this, immediately calls to question, how we distinguish art from non-art. Not too long ago, the label 'artwork' was primarily limited to paintings, sculptures, media that had long traditionally been identified as art. Only an occasional break of 'the fourth wall' would challenge these labels. Not long ago, serious reconsiderations were applied to architecture, craft, and so on (Benjamin 1929). John Cage, Jackson Pollock, Andy Warhol, and countless others had certainly revealed insufficiencies inherent in this labeling scheme (Cage 1961; Joseph 2003). Subsequently, it became popular to announce that, 'anything could be art!' However, this is equally disturbing. While originally, the label 'art' was invoked in ways the audience was not fully acknowledging, this alternative rendered the label fairly meaningless. Perhaps, a precise definition is elusive and subtle, but a *distinction* is made. Certainly, the thermostats on the wall at the Metropolitan Museum of Art do not receive the same attention as the paintings (Fig. 3.2).

"In the early nineteenth century, theater, such as the plays of William Shakespeare, attracted rich, middling, and poor alike, each seated in its own section and all participating in the performance. Audiences maintained control of the show by demanding encores of favorite parts, throwing vegetables, and even leaping onto the stage to interact with the actors, As middle- and upper-class Americans became more uncomfortable mixing with the lower classes, they began to demand separate theaters in which the audience remained passive and silent […] By the end of the nineteenth century, Shakespeare, along with opera, classical music and museum art exhibitions, became high art forms, and popular commercial culture emerged as entertainment opposed, and separate from, 'highbrow' culture" (Morrow 2006: 10).

However, like aesthetics, this particular mythology, that there even is such a social issue to defend or reject, threatens to dominate discourse about AR. It is

Fig. 3.2 Thermostat at the Metropolitan Museum of Art in New York. Photo by the author

hardly misguided to consider these very salient psychological byproducts of the phenomenon, but is entirely distracting from the cognitive issue here, the mechanism and raison d'être.

3.3.1 Creativity

The impulse to creatively express can be explained when we consider it to be precisely the same impulse as to creatively interpret. Just as optical phenomena (visual art) are subject to gestalt principals, so too are sonic phenomena (music) (Bregman 1999). But gestalt alone is not sufficient to impart meaning. It may often inform categorization of stimuli, but does not make the organizational scheme useful. Consciousness of a sensation is not simply the detection of sensation, supplemented later by the prefrontal cortex. Insofar as *frames* are cultural artifacts, human socialization (whether essential or not, lacking any practical alternatives) provides the initial step and direction of subsequent steps. Even if that interaction is merely the internal mental shift of attention (Ackernan and Bargh 2010; Dewey 1910, pp. 16–155; Schmeichal and Baumeister 2010, pp. 29–50; Searle 2001, pp. 33–60).

Like language, every culture it seems has a music theory that often differs in (learned) details, but between a few peculiarly limited parameters. This makes music a prime candidate to compare with language (Lerdahl and Jackendoff 1983; Patel 2008). Certainly, perception is culturally framed in composition and perception (Cohen 2006; Levitin 2006, pp. 57, 73–79, 114). Thus, some system must be shared between composer and listener for the music to make any sense (Jourdain 1997, pp. 74–78, 128–134; Becker 2004, pp. 108–116; Doidge 2007, p. 303). And like language, the grammar is rather culturally specific. A musical piece found quite moving to an American audience might sound like meaningless noise to members of a tribe in Bali (Kartomi 1980; Gold 2005; Wright 2012b) or the Middle East (Zonis 1980; Arbabi 2000), where exposure to Western music is minimal. A key element is interest (Dewey 1910, pp. 30–34; Allen 2004, p. 114), which is primarily interactively formulated by experience and culture. Noise must be potentially interesting before the brain determines that it is musical and thus worthy of a fuller assessment (Humphrey and Gutwill 2005). The role of some music theory is similar to Chomsky's *deep structure*, as revealed in his famous quasi-sentences (Chomsky 1957, p. 15), such as 'Colorless green dreams sleep furiously,' a verbal equivalent of a cat walking on piano keys.

AR is not a necessary result of sensory detection. There is a very gradual assimilation. Babies make nonsensical babbling *en route* to becoming children, who invent nonsensical stories before growing into eloquent adults. Manipulation of symbols, graphic, vocal, and otherwise, is an essential technique, in order to communicate, but communication is not at all exclusively the manipulation of symbol systems. Recall that in a biological view even noise serves a function, unlike most sciences where 'signal noise' is considered a bad thing, with the unrealistic the desire to eliminate it entirely. In recent neurological work, what we might be tempted to disregard as a baseline of noise may also serve an intrinsic global networking effect (Sporns 2011, pp. 149–169, 174–175). Both Vygotsky (1978) and Piaget (1929, 1971) further point out that at about four, the child will recite a narrative, termed *egocentric speech,* as that child approaches a problem (Crystal 2005, p. 83).

"For example, a four-and-a-half-year-old girl was to get candy from a cupboard with a stool and a stick as possible tools. [The] description reads as follows: (Stands on a stool, quietly looking, feeling along shelf with stick.) 'On the stool.' Glances at experimenter. Puts stick in other hand.) 'Is that really the candy?' (Hesitates.) 'I can get it from that other stool, stand and get it.' (Gets second stool.) 'No, that doesn't get it. I could use the stick.' (Takes the stick and knocks at the candy.) 'It will move now.' (Knocks candy.) 'It moved, I couldn't get it with the stool, but the stick worked.' In such cases, it seems both natural and necessary for children to speak while they act; in our research, we have found that speech not only accompanies practical activity but also plays a specific role in carrying it out" (Vygotsky 1978, p. 25).

It would also be reasonable to say that the child is actually attempting to use her limited linguistic ability as an initial step in problem-solving. However, infants initially lacking conceptual concepts for their problems, will merely 'babble' (Eliot 1999, pp. 370–371). Importantly, Piaget also writes that children undergo a crucial transformation in distinguishing between internal and external worlds. Vygotsky's observations, quoted above, are all the more poignant when taking into account Piaget's *nominal realism.* This is the belief that words themselves are concrete substances, which are initially intrinsic 'appendages' of the objects named. The (imagined) objects that the words are located in the environment and, finally, conceptualized in the mind. At an early age, the word 'lamp' is usually thought to be located initially in the young speakers' mouth (Piaget 1929, pp. 71–72). A year or so later, the child may deduce that it is within the lamp (pp. 72–75). By about 9-years-old, the word is seen as located in the mind (pp. 78–80).

It has been theorized that the cave paintings of Lascaux were the remnants of a belief in magic, where these symbolic images may not have depicted (recently past) scenes, but instead thought to influence (upcoming future) hunting expeditions (Campbell and Moyers 1988, pp. 79–81; Solso 2003, pp. 52, 86–87). This would obviously be a primitive instance of AR, occurring long before the invention of computers. A hunt too can be seen as a problem-solving task, and thus an in doing so, the hunters might narrate plans, as modern children do, in a chosen symbolic system. That symbol system is the language which results in AR. Robert Jourdain (1997, p. 305) and others have further hypothesized that because the precise sites in those French caves where paintings were found had unusual acoustic properties, it was likely that the painters were accompanied by song. Theories regarding child development seem to reinforce the plausibility of these speculations. Singing (ritual) may be a form of problem-solving, as is painting or coordinating muscles in behavior (Curtis 1992).

This, coincidentally, is applicable to categorization of color perception, and exactly Joseph Campbell's point (1949), based on Jung (1935), regarding mythologies throughout the world. The crucial step in all of this is for us to recognize that myth is not only culturally specific, taught and learned by culture, allowing the individual to membership that culture, but also allowing for neurological fine-tuning. This describes music as well. In fact, music and myth serve essentially the same function, save the trivial matter of modality. That we might devoutly believe sonic events to be profoundly distinct from conceptual organization is ultimately a matter of how well we are fooled by our own human propensity to apply categorizations.

3.3.2 Utilizing Reality

A piece which gathers text from RSS feeds and converts the ASCII characters found into musical pitches would certainly qualify as AR. However, in the larger scheme, this experiment fails to set up a relationship between the intelligently organized text and chaotic output of the musical composition software. In *Composomatic* (2008), information was gathered from multiple feeds and thus from multiple authors, with multiple unrelated contexts. As an implicit result, no singular organizing scheme came through. Imagine if single notes (and rests) were selected from various compositions and strung together at random. The resulting music would not reflect what each note was leading toward. It now seems obvious that individual notes are somewhat arbitrary out of context, but are essential building blocks in creating a context.

In *You've Got Bugs!* (2006), though the modalities involved are very different, the conversation is similar (Fig. 3.3). The screen depicts a closed-circuit video of the space in front of the screen, which includes the audience member. The scene is somewhat distorted and discolored as if the environment was rotted, but easily recognizable as a 'mirror.' One may wonder why this particular unappealing effect has been applied. An answer soon appears. Small virtual insects crawl onto the (live) scene. The audience member does not know at first, but the insects are crawling toward points of motion (and ignoring the static spaces). Thus, wherever the observer moves, the bugs seem to follow.

But most importantly for this piece, in the course of understanding what is happening on the screen, the audience member must experiment, behaving in ways that the gallery setting would not predict. An engaged gallery visitor will end

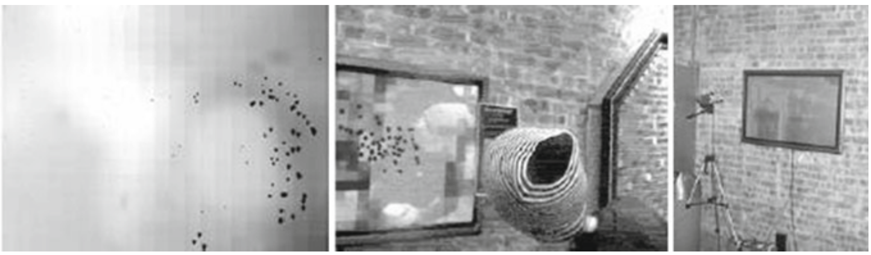

Fig. 3.3 *You've Got Bugs!* Screen shot and picture of installation with and without audience member

up ducking and swaying. This 'dance' is the viewer's spontaneous technique for understanding the environment, in this case facilitated by artwork, specifically AR.

3.4 Conclusions

Finally, we consider why evolution bothered to favor the ability for beat detection in humans alone. Begin by considering that whatever their authors' intention, mythologies are strategies used for culturally informed development. Any culture will do, none are intrinsically more or less ideal. This includes both traditional cultures, as well as ones invented in the course of a game. Nonetheless, we come to learn which patterns in the environment are significant to other members of that select culture. Ritual teaches us which artifacts to be revered, and in what ways reverence is expected to be shown. Symbiotically, the mythologist/artist, having assimilated the priorities of a given culture, arranges words and concepts into an explanation for these prioritized experiences. One might argue a piece such as John Cage's 3′44″ (silence, where the audience is intended to listen intently to the environs) highlights the experience. Random sounds may be heard by the audience member, but the mythologist-as-musician having arranged several of these sounds into a rhythm, provides the audience member with a means by which to discern meaning from chaos. In Cage's case, the composer pushes the responsibility of creating an organizing paradigm onto the listener (who may or may not very personally and internally accept such a responsibility). The audience member can now exhibit solidarity with the culture by dancing, tapping or otherwise demonstrating the successful application of cultural cues, as appropriate given these cultural rules. For instance, one might move vigorously at a club in response to music, but is expected to sit still when hearing 'Here Comes the Bride.' In both cases, these are taken as 'applications for social membership'.

Likewise, a painter may be drawn to the medium of paint, due to some personal *intelligence*, and is provided with tools to embody some otherwise un-articulate-able problem. There is no possibility that an inanimate tool, such as a computer, actually 'curates' the problem-solving task at hand, creating the mythology within the artist's mind. In the same way, the abacus does not perform mathematics, but embodies a part of the cognitive process where limitations of the human mind are most apparent. Furthermore, in a minority of similar tool-using cases (namely computers), there is clearly the sensation experienced of animate behaviors and anthropomorphic personalities attributed to some events on the screen and not others. These cognitive-perceptual-ability-enhancing cases we might call 'art.' An audience member too may then be drawn by a personal *intelligence* to gaze longer at particular paintings. From the painting, that audience member culls the necessary clues to show solidarity. The essential trick, however, is that the painting is not literally an intelligent being with a message. At the cost of over-interpreting scenes on the computer (or even the printed page, as AR p[recedes the computer), by utilizing AR we can come to submit to cultures, in instances when only scant clues as to the requirements of membership can be detected from literal, concrete sensations. AR (in whatever form) is an impulse-driven strategy for the ongoing task of updating the unusual pre-frontal cortex in humans.

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