

Augmenting a Human-Plant-Data Assemblage: The Contact Projects

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Through the *Contact Projects* an iterative series of three artworks (*Contact Zone*, *Contact/Sense* and *Signaletic Flow 2.0*) we experiment with performance techniques within the medium of head-mounted Mixed Reality (MR). Combining gestural, computer vision, tactile and sonic instruments with physical bodies (human and plant) the concept is to generate a different mode of MR from the dominant paradigms being advanced by industrial and commercial interests. This research investigates potential for multimodal performance in MR using a bespoke technical set-up that combines the HTC Vive (with Leap Motion head-mounted), the MIDI Sprout interface, Logic X, Touch Designer and Unity 3D. Playing with experimental physical techniques for affectively co-composing with expressive conjunctions of augmented materials (both digital and organic), we perform through processual strategies such as: modulating augmented data in real-time; sonifying bio-electrical signals from plants; choreographing hand micro-gestures to weave tactile and signaletic connections with plants and digital augments; and, passing augments through the Leap Motion interface in a head mounted configuration, while sending plant signals to Touch Designer. We propose a new method, technique, and practices for performing with MR environments and various interface technologies, informed by embodiment and electro acoustics, and underscored by new materialism and critical posthumanism.

1. *Contact Zone* was performed at The Black Box, UNSW Art & Design in Sydney, Australia, 23 November 2018. *Contact/Sense*, was performed at the SIGGRAPH Asia Art Gallery, 17-20 November 2019, Brisbane, Australia.

Signaletic Flow 2.0 is curated by Kathy Rae Huffman in the forthcoming exhibition 'Digital Power: Activism, Advocacy, and the Influence of Women Online', launching July 17, 2020.

1. Introduction

This article discusses three iterations within the *Contact Projects*¹ in MR performance where new methods and techniques have been investigated: firstly, a live mixed media performance called *Contact Zone*, secondly, as *Contact/Sense*, a participatory installation and live performance, and lastly, as *Signaletic Flow 2.0*, a digital file that re-works live performance footage as a speculative fiction. These three phases of the *Contact Projects* explore various modes through which human interlocutors can co-create with nonhuman entities (data and plants) to generate new speculative futures and systems that challenge relations of control and power. Data harvested from human bodies as well as from plants, is set in motion with gestures and software to consider the potential of a morphological shift in MR that would expand the field as artistic exploration. Electrical signal is a crucial element of our production design, and participates in different forms: emanating from plants, passing through devices, in contact with bodies. At some point, always transduced to code, then becoming sonic, visual, or haptic. Motivating transposition across a spectrum of emergent entities, signal expresses its morphological potential.

2. Project Overview

In both *Contact Zone* and *Contact/Sense*, the surface of living plants becomes an intra-active site, where an array of materialities engage and negotiate. The first signal in this network, is sonic data created by the bio-electrical impulses of the living plants, visualised in Touch Designer. Then, digital augments are generated as a response by human hands engaged in a liminal form of choreography, seen through the Leap Motion, sent by custom software made in Unity 3D, then also streamed through Touch Designer. Plants are emitting signals that are captured in real-time through MIDI, responded to by an HMD performer (using gestures) and a human sonic performer (who adds their own touch to the emergent sonic scape). While the HMD performer is directly composing their gestures while carefully listening to the bio-electrical signals from the plants, a second performer co-creates with the plant signals using synthesisers and virtual instruments. Through this network configuration, rule-based computing meets the raw and uncontrolled impulses of living plant, and the mediating influence of human touch. Embedded and embodied in the design, the potential for co-composition with living plants is a central line of inquiry. While obviously, the human interlocutors, have established a highly delimited situation for plants to participate as co-composers, this contribution to the artwork falls at least partially outside of human control. The bio-electrical signal emitted by the plants emerges without human intervention, in a nonpredetermined way, as a material flow of signal that the human interlocutors must work with to craft a performance.

Fig. 1. Rewa Wright in the *Contact Zone* mixed reality performance, November 2018, Sydney. Photo by Charu Maithani.



The visual and sensing apparatus worn by the human performer in both *Contact Zone* and *Contact/Sense* performances, proceeds from a particular type of interface and sensor combination: the Leap Motion gestural interface worn as a Head Mounted Display (HMD) that doubles as a ‘look through’ infrared camera. Configured in this way, the Leap Motion is able to transpose hand data (to bespoke software created in Unity), and operate as a visual ‘window’ for a human performer wearing an HMD. However, looking through the grayscale image stream captured by the Leap Motion camera, colour is removed from ocular perception. The grayscale picture plane of the Leap Motion’s near field infrared camera becomes the performer’s new visual apparatus. By imposing infra-red vision as a physical limit to our human perceptual cortex, questions of the ‘posthuman digital’ emerge to cloud the frame (and our analysis) further. We might call the new mode of embodiment brought about by this software assemblage, a *critical posthuman* performance modality. A performer/participant, experiencing the performance of the *Contact Projects* via the infrared signal and under the physical constraints of the HMD, is acutely aware of this apparatus as instantiating boundary-making practices that shift their regular ‘human’ senses of embodiment. That something else, however, is not an enhanced or *transcendental* posthumanism, but *critical* posthumanism as articulated by Rosi Braidotti, Donna Haraway, Francesca Ferrando and Claire Colebrook, amongst others. While ‘transcendental’ posthumanism explores the notion of aligning with a computer simulation to enter an enhanced state of immersion (as in technologically enhanced or transcendental posthumanism), ‘critical’ posthumanism seeks to interrogate the underlying conditions of a human body mediated by computational methods. For example, N. Katherine Hayles has shown that a view that ‘configures human being so that it can be seamlessly articulated with intelligent machines’ (1999, 3) was a popular theme of second order cybernetics. Interrogating cybernetic narratives that would separate information from the human body, Hayles questioned the notion that the corporeal body might be replaced by an enhanced posthuman form of physicality (1999, 1). Moreover, she argued vociferously for the need to posit ‘interventions ... to keep disembodiment from being rewritten, once again, into prevailing concepts of subjectivity’ (1999, 5).

Specifically addressing our series the *Contact Projects*, this article will address the theoretical and artistic precedents, before examining the methods and techniques of MR performance (*Contact Zone*), incorporating public reactions from a participatory installation (*Contact/Sense*), and examining the digital film created as a consequence of the need to convey the work after the installation concluded (*Signaletic Flow 2.0*). Finally, we speculatively conclude with some thoughts on the potential of a posthuman digital design as a modality of becoming with ‘technology’ and ‘nature’. Before exploring the specific nuances of this practice-based research, we shall examine key precedents that have contributed to this trajectory.

2.1. Theoretical Pathways for Emergent Arts Practice in MR

The *Contact Projects* are informed by a concept that draws on aspects of new materialism and posthumanism, which we term a ‘software assemblage’. Developed and modified through practice-based research, the *software assemblage* is generated in resonance with Gilles Deleuze and Felix Guattari’s conception of the *machinic assemblage*. Various: a ‘surface of stratification’ lying between two layers of strata (1987, 40); and, a ‘machinic assemblage of bodies, of actions and passions, an intermingling of bodies reacting to one another’ (1987, 88), the *machinic assemblage* provides the compositional drive that assists like elements to coalesce and re-assemble from a material flow. Deleuze and Guattari located the agential drive of their machinic assemblage in its capacity to attract, compose, and re-assemble heterogeneous material flows such as those comprising people, objects, or energies. Like the machinic assemblage, *software assemblages* do not generate material formations that follow an already constituted model nor do they pre-determine what kinds of phenomena emerge from changes in data as a fluid mode of matter. In this current era of increasingly computational autonomy, programmatic software enters into negotiations with fleshy, tactile, organic, fluid and other modes of materiality. The software assemblage affords a meandering path to walk through the nuances of code, bodies, signal: not as ‘formed matter’ in the Modernist sense (or ‘assemblage’ in that sense either), but as materialities that oscillate differently in contingent networks.

The *Contact Projects* explicate the software assemblage as both theoretical formulation and a vector for practice and experimentation. Locating the processes and methods of code as a compositional engine, a consideration of media artworks as software assemblages recognises rule-based, algorithmic, generative and other modes of computing, as experiential forces that re-assemble human perception. Software is not simply a tool, but an affective force of the nonhuman, whose programmatic capacities contribute to the artwork’s affordances. Software assemblages, as a mode of practice-based research, contribute to an investigation of the role of code and algorithms in generating not only computational structures, but experiential

meaning for human interlocutors. Deployments of assemblages—whether these be of the interface or code—are significant for this study and afford diverse material elements the capacity to coalesce according to their own affordances, intensities, flows and attractions. The assemblage itself then becomes a re-configurable morphology that actively resists structuring or engineering as a limited technical operation: its elements continuallyprehend a desire for shifting, differentiated re-assembly. Yet, it is not that software only informs this design, and we are not suggesting that software is a ‘controller’, rather a nonhuman force that shifts relations, and re-assembles emergent materialities. Software is incorporated to a multi-modal feedback oriented system where affective interventions operate from all sides: humans have produced the software that now intervenes in their performative processes, while plants generate the signal that motivates the human performers, whose soft touch on their leaf-skins is felt and shifts electro-chemical processes as they generate signal itself. The other non-human force at work here is plants, specifically their bio-electrical signals which generate polyrhythmic timings and unexpected frequency shifts that challenge the human ear. In the software assemblages that comprise these artworks, all technical design began with the plants. They were the source of the signal and the first part of the network. Thinking with the idea of decentering human influence, the design choice to place plants at the start of the software assemblages network configuration, resulted in the unique phenomena that followed. It was a choice that raised questions of agency, emergence, and embodiment. It intensely challenged our performance capacities by re-directing the source of intentionality toward the nonhuman.

In critical thought from the developing Western framework of post-humanism, the concept of decentering the human accompanies a desire for more equitable relation with other species. Examining the notion that human agency is observationally set apart from the nonhuman, Karen Barad describes ‘human participation within nature’ as ‘agential reality’ (1996, 176). She describes agential realism as ‘... an epistemological, ontological, and ethical framework that ... provides a posthumanist performative account of technoscientific and other naturalcultural practices (Barad 2007, 32). Drawing upon her research as a quantum physicist, Barad demonstrates that nonhuman matter is far from inert, and does not passively awaiting a human hand to provide the agency needed for it to take shape. Rather, matter is ‘produced and productive, generated and generative’, activated processually by its own quantum potential (2007, 137). Through her agential realist framework, Barad disputes the boundary between human and nonhuman forms of matter, advancing a mode of critical posthumanism that de-centres human agency by acknowledging the multi-valent agencies of the nonhuman, as a dynamic collection of entangled forces. Agential realism and the notion that all matter enacts situated modes of agency (not all of which can be visibly measured by a scientific apparatus), leads to our

speculative approach that nonhuman and human perceptions might be brought to collision in a mediatic environment. Such an approach opens a critical posthuman pathway to inter-species thinking, in particular the role of the nonhuman in acts of co-creation or co-composition. Thinking from an inter-species perspective, Donna Haraway points to her fascination ‘with the molecular architecture that plants and animals share, as well as with the kinds of instrumentation, interdisciplinarity, and knowledge practices that have gone into the historical possibilities of understanding how I am like a leaf’. (Haraway 2000, 132) Her acknowledgment of our shared genetic matter can assist in the re-assessment of new situated potentials for inter-species contact, where human cede control in order to afford companion species a space to emerge from our shadow.

Related, but differentiated from, notions of Haraway’s inter-species companionship, are indigenous ways of knowing and being that incorporate nonhuman others. While there is scholarship in the posthumanities forming kin with indigenous knowledge, it is crucial to not conflate the two modes of thought, least of all because of the significant relations of power at play and hierarchies of Western appropriation, already well known through postcolonial studies. At the foundation of Rewa Wright’s artistic practice, is her cultural heritage as an indigenous Māori from Aotearoa/New Zealand, are the concepts of ‘mauri’ and ‘wairua’: that all things in the universe have their own, agentially situated, life forces (Pohatu 2011, 2). Interestingly, physical proof of the (agential) reality of this concept has been recently discovered in Western thought via quantum physics, where sophisticated imaging techniques have revealed the invisible connections between disparate yet connected modes of matter (Barad 2007). Indigenous Māori philosophy—called ‘matauranga Māori’—is a distinct episteme that has consistently investigated, through senses other than sight, the material connections between human and nonhuman forces, objects, species, and phenomena. The invisible world of matter was never a subject that fell out of matauranga Maori: rather it persisted as a mode of inquiry, and was maintained in cultural practice through poetic chants (tauparapara), and other modes of vocal work, where, broadly speaking, sonic vibrations call matter (physical and digital) into contact with one another in a meshwork of relations. Drawing on matauranga Māori as an embodied thread woven in her bloodline, Wright favours network configurations that open fissures to nonhuman forces, deploying gestures and movements that resonate with traces of data and bodies as iterative entities.

Hybrid movements and philosophies find their way into Rewa Wright’s choreographed performances in the *Contact Projects*, as she incorporates elements from kapa haka (a Māori choreographic modality), and martial arts, studied as a child. Gestures such as *wiri wiri*, a fluttering of the hands at the wrists, handed down through the ancestral dance form called *kapa haka* also has an ecological metaphor to its movement: it is said to mimic the rippling

patterns of waves on water. This is also part of the visual effect of shifting the data, the digital augments that are attached to the performers hands and tracked by the Leap Motion interface. Augmented materialities, configured in this software assemblage, similarly ripple with the *wiri wiri* enacted by the performer. Hand movements including *wiri wiri* and other embodied gestures of the performer, are used here to generate patterns of diffraction, to engage interference as data passes through hands, iterative in different stages via these processes of body-data-plant interfacing. Embedded and embodied in this 'interface-iality', data shifts scale, magnitude, intensity, as it is woven into emergent agential realities. Gestures and movements pass to the screen, yet do not pause there: they continue their journey to oscillate back out, catching their hooks once again in the physical world of flesh. Fluttering hands pass data between Unity 3D and Touch Designer, the body as an interface for mediating signaletic flows. While bloodlines are an important thread linking indigenous and non-indigenous peoples to their ancestral kin (both human and nonhuman), and this is a well-known genealogical line of inquiry, much less is said about the shared DNA that we hold with the plant kingdom.

Fig. 2. *Signaletic Flow 2.0*, screen capture, Rewa Wright's hybrid movements in mixed reality. Full video at <https://vimeo.com/390429591>



The following section explores some important artistic and cultural precedents for our approach.

2.2. Historical Precedents: Weaving Together Art and Science

The *Contact Projects* combination of data, plants and bodies, builds upon a rich lineage of inquiry, that references artistic, philosophical and indigenous threads, where various approaches have been suggested. Art that connects plants with media technologies emerged as a notable preoccupation in the 1970s, through influential pieces such as Nam June Paik's *TV Garden* (1974), sound performances such as *Child of Tree* (1975) by John Cage, and bio-sensing installations such as those by Richard Lowenberg and John Lifton. In recent media art, a shift has taken place, where the organic realm

is no longer treated as primarily aesthetic material for mere sculptural or representational potential. Rather, artists like Natalie Jeremijenko, Eduardo Kac, Miya Masaoka, Gregory Lasserre and Anais met den Ancxt, Laura Beloff and Jonas Jørgensen, and many more, create projects that communicate the idea that plants have their own particular agency. For example, in the seminal installation, *Interactive Plant Growing* by Christa Sommerer and Laurent Mignonneau (SIGGRAPH 1993) participants were able to touch real plants and precipitate the on-screen growth of up to twenty-five species of digital plants. Tactility emerged as a strategy that might afford a richer interrogation of plant-human relations beyond visual aesthetics.

Typically, MR is designed to convey a clear window on the world, so that the view will have a clean perception of reality. Augments themselves are intended to blend in seamlessly with the physical world. This is the desirable goal in most industrial applications of MR as well as recent examples from an evolving new Fine Art Canon of MR art (such as Marina Abramović's *the Life*, designed for display on Microsoft HoloLens 2). Partly the result of a migration of research directions from engineering and computer science to other fields, the clear window paradigm and its accompanying dictum of high resolution, illuminates an approach to MR displays that requires digital augments to behave as an informatic overlay. According to Paul Milgram and Fumio Kishino's eponymous research paper, "A Taxonomy of Mixed Reality Visual Displays", graphics should be pictorially realistic, metaphors need to grant presence to the screen world, and a coherent knowledge system should provide an indexical connection to the 'real' (Milgram and Kishino 1994, 1321). The persistent premise that digital augments (as informatic overlays) should contain semiotically meaningful content, derives from Milgram and Kishino's 'Reality-Virtuality' Continuum, which discusses the need for a 'presence metaphor' linking physical and digital space. Through the human-centred computing (HCI) approach, the clear window paradigm has been oriented toward the informatic goals of commerce and industrial applications. The advantage of this approach for such applications renders data as easily seen and interpreted, however this is not in fact a necessary condition for data in technology mediated art. Further, the influence of disciplinary knowledge formations from fine art emphasise realism/naturalism as a mode of depiction within the framework of three-point perspective. The clear window paradigm is therefore bound up with convergent knowledge practices that are rooted in specific canonical epistemes from both science and art.

Using Mixed Reality (MR) configured through an HTC Vive VR HMD/Leap Motion, rather than the clear windows of many current MR glasses (HoloLens, Magic Leap and others), follows from development pathways suggested by artists performing in a technologically 'virtual' space wearing HMD devices. For example, the VR artworks and performances of Char Davies, Micha Cárdenas (*Becoming Dragon*, 2008-9) or Adam Nash, all introduce two key

notions of virtual performance: to begin, abstractions of data that challenge human perception, and contingently, embodied movement as a means to explore sense other than vision. In the *Contact Projects*, the physical effect of the HTC Vive/Leap Motion apparatus is that the performer/participant is semi-immersed in an infra-red mode of MR: without colour, vision is de-privileged and tactile gestures and body movements take on greater importance as a technique for sensory inquiry. Immersed in the infra-red field of delimited vision via the headset, the performer is continually responding to and resonating with emergence. Wearing this apparatus, performers/participants in *the Contact Projects* have their vision profoundly disrupted by a jarring mixture of reality and the digital. Offering an alternative to the clear window pathway in MR performance practice, we instead proposing a grayscale gloom of infra-red vision as a method to open the alternative critical mode of the posthuman digital. From this position we speculate upon potentials for a technological future, not as a 'singularity' where humans and machines become one, as Ray Kurzweil and others suggest, but as a visceral, challenging, and murky path: more 'dark eden' than 'deep dream'.

3. Design at the Edge of Control: Method, Technique, Enactment

Barad's strategy of unwinding human agency by paying attention to the situated agency of nonhuman matter, of course, in the *Contact Projects* occurs within the conditional parameter that the human is still the designer. Then, the question becomes, how to think through ceding some agency to the non-human through design? What would it be to treat a plant as a living 'body', rather than, as in a Humanist scheme, an organic object called 'plant'? Can code that is not based in methods of autonomous software agents, or machine learning, take on a semblance of the agentially real?

To explicate a perspective that advances the software assemblage approach to MR, human agency must be de-stabilised as the sole privileged structuring force, so that consideration might be paid to the transformations between all kinds of matter, human and nonhuman, organic and digital. In this spirit of common links and a diminishing of human control, the *Contact Projects* uses bio-electrical signal as a thread that re-assembles the relations between plants, humans, and data. Linking with nonhuman others as bodies, in relations of care and chemistry, Wright's live process as a performer wearing an MR headset that de-limits her natural vision, operates with processes of intuitive investigation, where she co-composes with temporary alignments of signal and code that are generated by the nonhuman (data and plants). Perceiving these temporary alignments as 'augmented materialities', falling at the fringes of human-centred action, Wright develops physical strategies for co-composing with emergent flows of signal and noise. Emanating from plants, the human body, and data systems,

such a material field of digital and physical objects, of intersectional signalic flows, then becomes a resonant body that challenges conventional configurations of MR, ruled as it currently is by the dual commercial tenets of realism and resolution.

In this research, the agential realities engaged belong to the human performer, as well as to the living plants *and* the shifting movements of code that will both become intra-active matters/materials that re-assemble the making of mixed physical and digital space as indeterminate events in a shifting ecology of entities and relations. The ‘matters’ of code and plants, are seen to performatively enact their situated and conditional forms of agency, manifest as practices of signal that co-compose the work. Nonhuman matter is explored for its affective potential to relationally transform other entities with which it makes contact, such as the fleshy bodies and the plastic brains of the humans touched by its signal. In the *Contact Projects*, such a conception of matter as engaged in processes of contact and transformation, allows situated modes of nonhuman agency to assemble—signalic, computational, and environmental. Through this nonhuman agency, we beckon an alternative MR that plays at the edge of control, rather than pre-determined as an executable sequence of events.

3.1. Techniques for Co-Composing with Plants and Digital Augments

Working with data, on the one hand, and plants, on the other, generates some unexpected and productive intersectional phenomena, where plant and human impulses meet. Different techniques for co-composing with plants of a particular leaf structure were explored, such as slowly and gently folding the leaf of the agave backward and forward to shift the sonic pitch up or down over time, imaged in this screen shot from a MIDI region in Logic X (fig below). Playing alongside and in response to living plants emitting bio-electrical impulses, the performer adjusts their actions to elicit differentiation in tonality and harmony. A second performer, a sound designer working in real-time, is able to adjust the timbre and pitch of this combined human-plant sonics. However, one notable factor which the humans are unable to manipulate is rhythm, since this is created solely by the impulses generated by the plants. Plant sonics as a form of signalling, has been explored extensively by Gagliano, Mancuso and Robert (2012) and other biologists, who note that plants may be entering into a form of communication with other actors in their ecosystem. This resonates with our experiences with co-composing with sonified plants, where we note more or less activity in their impulse emissions, depending on how much contact human’s make with them.

Fig. 3. Techniques for co-composing with an agave attenuata.

Fig. 4. Bio-electrical signals expressed as MIDI. Images: the artists.



Different sonic results were generated through an array of physical techniques. Some tactile hand positions are applied to the plants, in order to modulate their bio-electrical signal and engage in the process of artistic co-creation. Other techniques are gestural, and applied to the digital augments, to move them across the digital space of the screen.

3.2. Contact Zone: Temporality and Bodies

At the beginning of the *Contact Zone* performance, a single performer sat at an agave attenuata plant, modulating its bio-electrical impulses that have been transposed to audible sound via MIDI. In synchronicity with, and activated by the performer's hand gestures, digital augments fill two large screens. On the left screen, there was the live feed from the Head Mounted Display (HMD) worn by the performer, and visible to the audience. On the right screen was a live stream connected to a second Leap Motion interface, controlling custom made software that responded to gestural data. During the performance, the performer would pick up this second Leap Motion, activating the data input. On both screens, digital augments are visible as well on the HMD display of the performer, whose infra-red vision is now punctured with brightly coloured traces of data. Such patterns are interferences that matter generates as it diffracts across bodies or objects. Negotiating their new and de-limited MR infrared vision, the performer navigates the responsive media environment (figures below and video asset link).

Figs. 5 & 6. *Contact Zone* 2018, live performance archive video. Right hand screens, live augments from Unity 3D. https://www.youtube.com/watch?v=N_OKQvCV3w0&t=13s



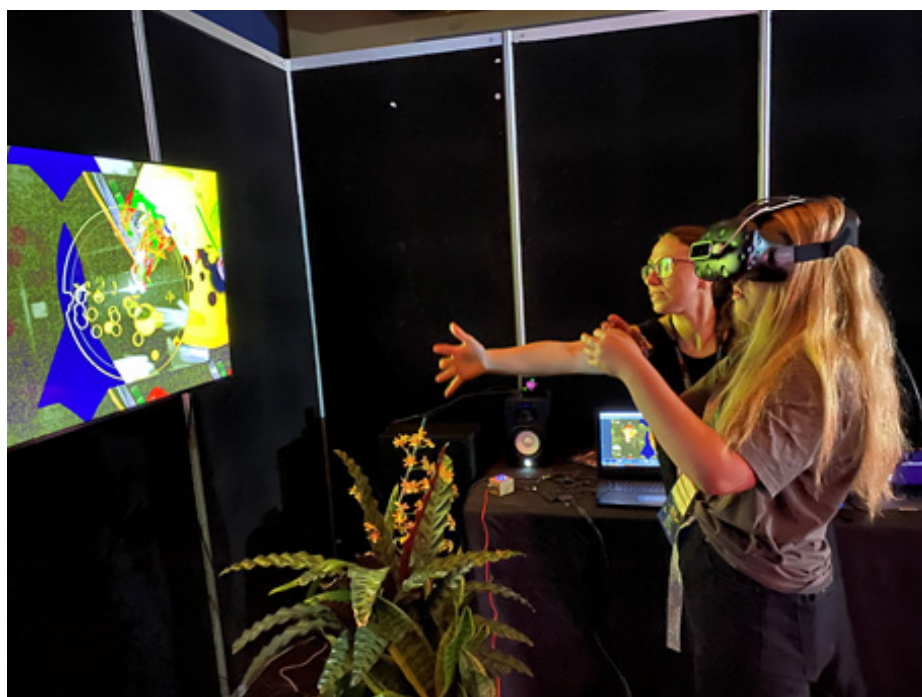
As the performer's hands enact choreographed micro-gestures, which are tracked by the Leap Motion's sensors, they come into tactile contact with plants and their signals: and, at the same time, the performer's head becomes the 'camera'. In order to deliver a coherent visual framework for the audience, the performer must frame a continuously tracked point-of-view shot through the gallery space. As the performance progresses, they

performer walks on a slow trajectory through the gallery space, activating sonic and visual augments as they move. Using hand gestures to engage with plants as they move around the media environment, the performer triggers a range of on-screen gestures whose data is visually transposed to digital avatars, using augmented reality techniques.

The feature plant of this software assemblage, an *agave attenuata*, become a tangible interface that elicited sound, and whose tactile surface became the trigger for a computer vision system that activates digital augments. Yet, as well this agave plant is a kind of body, an electro-chemical formation of signal emitting matter, similar to humans and sharing DNA. Playing alongside and in response to the bubbling rhythm of this pulsing, the performer adjusts their actions to elicit differentiation in tonality and harmony. A sound designer, working in real-time, is able to adjust the timbre and pitch of this combined human-plant sonics. Again, one notable factor which the humans are unable to manipulate is rhythm, since this is created solely by the impulses generated by the plants.

3.3. Contact/Sense: Tactile Signals, Moving Hallucinations

Fig. 7. Participant begins a docented experience at SIGGRAPH Asia Art Gallery 2019.



2. *Contact/Sense* 17-20 November 2019, at ACM SIGGRAPH Asia (Art Gallery), the Brisbane Convention & Exhibition Centre. Technical Equipment: HTC Vive, 2 x laptops, webcam, Leap Motion, Touch Designer, MIDI interfaces and various other hardware interfaces and devices, living plants, 2 x large LCD screens, 1 x stereo sound system.

Contact/Sense at SIGGRAPH Asia Art Gallery (Wright and Howden 2019), the second iteration of the *Contact Projects*, consisted of daily performances by Wright and Howden, as well as docented participant experiences in the gallery space.² This was the first time that we had the opportunity to get sustained public feedback on the method and the techniques for intra-action. Sensing through a new situated mode of agency, governed by an apparatus (HTC Vive/Leap Motion) the HMD performer in *Contact Zone* and *Contact/Sense*, would be required to see and move from within the constraints posed

by infrared vision. We were especially interested to find out from participants what their perceptions were of this world space, within the grayscale of the HMD. How does grayscale vision influence the physical and perceptual process of performance? From our experiences, we knew about the affective shifts in perception that the work imprinted on ourselves: what of the effect on others who had no prior familiarity?

At the start of the experience, participants were given several minutes to orientate, where they watched the signals generate. While adjusting to the new conditions of their vision (grayscale), Wright would coach participants as to which way to move, how to begin to explore with the hand tracking and how to shift the augments in the co-ordinate space of the HMD display. Grayscale is the new vision condition, while augments erupt in multiple colours in all parts of this co-ordinate space, as soon as participants raise a hand (or finger) that can be tracked through the Leap Motion. As abstract combinations of the sonic and visual elements took over their field of vision and drew the attention of their hearing, it was interesting to witness participants adapting to emerging data outside of their control. Just as the cultural and social background of the participants varied, so did their responses and actions while in the assemblage. For example, several people described their sense of a hallucinatory feeling and an accompanying synaptic impact. Some asked what the 'goal' was, while others noted it was like a hallucination. Those with dance backgrounds immediately took to the work, realising it was a license for free play with abstract lines and tracked body moves. Those with a background in body movement, found it easier to negotiate this grayscale space and would perform for fifteen or so minutes, actually a long time for a first experience. By contrast, others could not spend more than two minutes in the HMD. Overall, participants noted that with vision de-limited, physical memory, embedded senses of spatiality, and senses other than the ocular took on greater significance: gestures known for a lifetime became techniques that permeated their intra-actions with data.

Observing responses to *Contact/Sense* added depth to our investigation of embodied movement and performance in MR. Data was clarified as not simply a phenomena that generates an on-screen reality; as well, its recursions are passed back through the physical body, as a network of responses that shift how the performers enact their iterative gestures in world space. The gulf between Wright's choreographed movements, and the gestures of a lay participant was manifest, and revealed the training to the HMD/Leap Motion device that occurred over time, and the specific techniques the apparatus itself encouraged (Figure 8). This apparatus afforded certain types of movement while excluding others, and a person performing regularly in these conditions would need to train to operate comfortably for long periods of semi-immersion.

3.4. Signaletic Flow 2.0: Mixed Reality Performance as Digital File/ Film

Signaletic Flow 2.0 is a digital file/experimental film that plays with the visceral intimacy of an MR live performance, attempting to transfer some of that feeling to the screen audience. By re-composing clips recorded live from a series of performances (at SIGGRAPH Asia 2019, and in our Sydney studio), *Signaletic Flow 2.0*, proposes a multiplied body in digital space that modulates itself with plant sonics and data generated by algorithms. *Signaletic Flow 2.0* visually explores synergistic embodiments that link data, the human body and living plants, in unpredictable and speculative trajectories. *Signaletic Flow 2.0* was performed, edited and directed by Wright, and specifically examines the role of her female body when multiplied in data space and coupled with nonhuman others such as living plants, and algorithms: what are the relations, gestures, movements that this space lures out of the body, and how does data shift perceptions of self toward the nonhuman? Triggered by plant signals, responded to with human hands, sensed by the Leap Motion gestural controller, abstract trails generated by digital augments visually shape this video. Composited within layers, nested in an image stream composed of performance images, digital augments and audio signals weave in and out of a meshwork of fluttering, pushing and twisting, hands, fingers and wrists, framing a body swaying in MR space and narrated as a speculative fiction. Sonically, this work is held together by a continuous narration that is part speculative future, part digital past, punctuated by real-time sound design mixed with synthesised textural elements. The performances depicted in this video, incorporate bespoke software, computational sensing, science fiction narrative, poetic sound design and imagery, to transport the audience to a liminal space beyond the physical world. The visual striking look of *Signaletic Flow 2.0*, results from a combination of screen captures from the performances of *Contact/Sense*, cut together with studio-based footage, a speculative narration and punctuated by sound design that utilises the bio-electrical signals from living plants as well as human generated melodies. A fluid meshwork of relations emerge between gestures, dance and emergent materialities, and these are explored through a distinctively expressive and embodied 'choreographic language' that re-assembles Rewa Wright's body as data in motion. *Signaletic Flow 2.0* multiplies her body in virtual space in order implicate it within vibrating, pulsing data, generated by the living plants. Oscillating through this speculative space, a multiplied data-body co-composes with software to challenge the clarity and singularity that has become so synonymous with the technological virtual of transhumanism, mixed or extended reality coming out of commercial and industrial paradigms.

Fig. 8. *Signaletic Flow 2.0*, performance still frame. HMD augment stream from *Contact/Sense* composited behind. Retrieved from <https://vimeo.com/390429591>



4. Speculative Conclusions Toward a Posthuman Digital Design

In the ‘transcendental posthuman’ view, technology is seen as the vector which will allow humans to transcend the limits of our current biological form: as the narrative goes, there would no longer be a material separation between virtual and real, as well as machine and human. Yet, as human animals we are already embedded in the biosphere: In an era where we need to urgently combat climate catastrophe, is it not a helpful intellectual position to push the notion of transcendence through technological advancement. Nicole Anderson suggests that a more productive thread—in sympathy with the critical posthumanism pioneered by Hayles and others (see Braidotti 2006, 2013; Ferrando 2013, 2016)—would be to allow ‘us to learn to live with these nonhuman others rather than in opposition to, in domination of [them]’ (Anderson 2017, 37). A worthy line of flight for this current epoch of climate change. Interweaving materialist and critical posthuman conceptions of matter, organization, and corporeality, *the Contact Projects* have generated software assemblages that entangle a multitude of elements as they co-emerge. These elements are drawn from three core material flows: the computational, the corporeal, and the organic. In the *Contact Projects*, various diffractive processes result from the intra-actions produced out of an ecology of plants meeting the electromagnetic spectrum (infrared signal), meeting sonified inaudible frequencies (ultra-sonic noise), meeting custom designed software (digital code), meeting my tactile and fluid human gestures (the performing body). The *Contact Projects* have been situated both in the context of development pathways from MR and VR, as well as various artistic mobilisations of plant ‘energies’ that have tried to rethink the material relations made possible by conjunctions of the technical and organic. The affective potential of a hybridisation of human and nonhuman forces, has been discussed, and this paper has explicated the software assemblage as a theoretical methodology for describing such networks in media art.

Fig. 9. *Contact/Sense*, Wright's performance archive excerpts. <https://www.youtube.com/watch?v=ZZh-I8tV3YE>



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