haptic HONGI: Reflections on collaboration in the transdisciplinary creation of an AR artwork

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1. Introduction

This chapter explores the complexities of collaborative digital creation through *haptic* HONGI, an Augmented Reality (AR) project that is both transdisciplinary and intercultural in its conception. *haptic* HONGI aims to use contemporary digital technologies to bridge troubling intercultural relationships in Aotearoa New Zealand by creating a face-to-face tabletop encounter. The project both addresses the cultural divide between Māori and non-Māori in Aotearoa New Zealand, but also explores how the tension between artists and technologists can be overcome to create a transdisciplinary piece. In this chapter we describe the technology developed and reflect on lessons learned that could be useful for other teams creating transdisciplinary artwork using AR technologies.

We begin by describing the background and motivation for the work (section 2), then the participant experience with the piece and how it was created (section 3), and the feedback collected (section 4). In section 5 we examine *haptic* HONGI from a design perspective, and the lessons learned from developing the project (section 6). Finally, in section 7, we end with conclusions and directions for future work.

2. Background and Motivation

Like many countries of the British Commonwealth, Aotearoa New Zealand is grappling with messy colonial leftovers. Contemporary NZ society bears witness to the results of colonisation: dispossession, disenfranchisement, and entrenchment in binary oppositions, especially amongst its indigenous Māori people. The aim of *haptic* HONGI was to address this and provide opportunities to discuss what society is currently like, whilst enabling participants to collaboratively contemplate and practise what it could be like in the future.

In Māori society, the hongi is part of a traditional greeting. It involves the pressing together of noses, and often foreheads, so that two people in greeting share the breath of life as a gesture of unity (see figure 1). Māori Psychologist Cleave Barlow (1991, p. 26) described this as:

> ...peace and oneness of thought, purpose, desire, and hope; and such is the desire of the hosts and visitors when they greet (hongi) one another [...] the second meaning of the hongi is as a sign of life and immortality, and it symbolises the action of the gods in breathing into humans the breath of life. By this action, the life-force is permanently established in the spiritual and physical bodies become a single living entity.

Figure 1: Still frame of a hongi from short film *Glory Box* by the main author.
https://www.youtube.com/watch?v=GpZuD3PAupE

One goal of *haptic* HONGI was to recreate the traditional hongi greeting experience and use it as a catalyst to trigger reflection on the social division and awkwardness, or discomfort, between Māori and non-Māori. Another was to give visitors a safe experience of close proximity to and interaction with people from a different culture. Its particular focus is the moment of first contact between different people.

3. The *haptic* HONGI experience

In *haptic* HONGI, the visitor sits at a table adorned with a checked tablecloth and a vase of fresh foliage to connote a convivial domestic scene and to connect them to Papatūānuku (Mother Earth) (see Figure 2). They wear an AR head mounted display (HMD) and through the AR HMD, they can see a volumetric virtual avatar of Tania Remana (see Figure 3), a Māori multimedia artist and performer from the Ngāpuhi tribe. The pre-recorded 3D virtual video of Tania appears across the table, is visible to the visitor, and locks them in a mutual gaze.

Figure 2: haptic HONGI setup with table, tablecloth, vase of foliage,
black wall and HoloLens 2 with actuator.

When the visitor sits at the table, Tania greets them in a re-imagined, contemporary first encounter between Indigenous Māori and newcomers from shores distant to Aotearoa New Zealand. She says:

> *Kia ora! Hi! Are you all right? Can I help you?*
> *You just seem lost. Where are you from?*
> *No hea koe? Where are you from? Oh! Wow! What's your name? Ko wai koe?*
> *Ko Tania ahau. I'm Tania. Welcome to Aotearoa. This is my home.*
> *And when we see someone we've never met before, we often hongi and we greet each other with a hongi, we close our eyes, we press our noses together and we feel the wairua.*
> *I'll show you...*

At which point her virtual avatar appears to lean forward and press her nose against the visitor, who at the same time feels real pressure against their nose and forehead. Although the encounter is only brief, the combination of a virtual person superimposed over the real world, and real touch sensation provide an engaging experience.

Figure 3. Tania's virtual avatar greets the visitor
"Ko Tania ahau. I am Tania", then leans forward to hongi.

3.1 The technology behind haptic HONGI

From a technical standpoint, *haptic* HONGI is a volumetric capture and playback system that can accommodate peripheral devices for haptics. The key components are; (1) a volumetric capture system, (2) an AR display, (3) a haptic feedback system, and (4) a playback system. Each of these are described in more detail in the rest of this section.

Volumetric Capture

Tania's performance was recorded with an Intel RealSense D435 depth sensing camera. This camera captures both colour (at 1920 × 1080 pixel resolution and 30 frames per second) and depth information (at 1280 × 720 pixel resolution and 90 frames per second). We used DepthKit (depthkit.tv) software to record the volumetric data from the RealSense camera and stored it as point cloud data. This was chosen due to its light-weight encoding that is relatively easy on computing resources. It enabled us to have a completely stand-alone and portable solution. Prior to using DepthKit, we used a variety of off-the-shelf and in-house built tools used for recording and playback with the Unity game engine. The output from DepthKit was a three-dimensional point cloud of Tania speaking, ready to be included in the AR viewing application.

AR Display

The current version of *haptic* HONGI is a standalone application viewed on the Microsoft Hololens 2 AR HMD.[1] The Hololens 2 is an optical see-through AR display that allows the wearer to see virtual content directly superimposed over the real world. It provides a high resolution AR display with 54 degree diagonal field of view display and 2048 x 1080 pixel resolution per eye. It also has integrated cameras and inertial sensors that can precisely track the HMD relative to the real world and ensure that the virtual content appears fixed in space.

Haptic Feedback

A key part of the experience is the haptic feedback which is provided by a mechanical actuator that sits in the HoloLens 2 and applies pressure to the wearers' forehead and nose. This was achieved by using Shape-memory Alloys (SMAs) and flexible 3D printed structures, and inspired by earlier work on Cloth Tiles (Muthukumarana et al., 2021). We used a Shape Memory Alloy strip from Toki Corporation (Japan), which is a bimetallic material that can change its length through applied electrical current or heat.

We designed a 3D-printed housing that can hold an SMA loop inside, which can pull and flip both ends of the housing structure. The SMA wire strip can warm up to 60ºC when

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[1] see https://www.microsoft.com/en-us/hololens/

activated. The SMA wire inside the actuator generates the internal force to drive the actuator. The 3D printed design holds the SMA wire and determines the motion of the actuator based on its properties such as thickness, shape, and orientation. We attached small sculpted pieces of makeup sponge to both moving ends to realize gentle haptic feedback and to prevent direct contact of the SMA to the visitors' face.

Several versions of the actuator were implemented and tested to determine the ideal shape and size. The finalised version of the actuator was designed to be placed above the forehead and nose area of the user with two moving elements to mimic the touch sensation in two distinct locations (see Figure 4). Since the SMA wire requires a comparatively high current (1.4 A) to activate, a custom-made circuit board was designed to interface the actuator with the AR application. A serial command from the application could control the actuator, and trigger time and activation duration were the controlling parameters.

Figure 4: The SMA actuator set into the HoloLens 2 visor.

Playback System
An AR viewing application was developed in the Unity game engine to view the virtual volumetric video of Tania and trigger the haptic feedback at the end of her speech. Creating the viewing application in Unity required positioning the recorded point cloud of Tania, adding lights to the scene, and writing some shader code to correctly render the volumetric video. One of the most challenging aspects was making sure that the audio of Tania's speech was correctly synchronized with the visual recording.

The haptic feedback unit is completely independent of the main application. This ensures that a demonstration can proceed without haptics even if the haptic component failed. To enable a smooth running of the installation for the exhibition, we connected a Bluetooth keyboard to the Hololens 2, enabling the person showing *haptic* HONGI to use key presses to test out individual components like playback, termination, and haptic feedback and so on.

Once all devices are in operation, a command to activate the actuator, issued by the *haptic* HONGI application running in the HoloLens 2, is picked up by the microcontroller (connected to the same network via Wi-Fi hotspot). The microcontroller then activates the SMA actuator.

4 User feedback from the experience

The latest version of *haptic* HONGI was shown during the Ars Electronica Garden Aotearoa exhibition (Wellington 2022) and feedback was collected from a diverse range of people. Some smiled and laughed, whereas others sat stock still and a significant number of people wept. After trying the experience, some were offered the short written survey that allowed space for further comments, or a longer voice-recorded interview depending on the time pressures and the inclination of the visitors. These interviews were each about 15 minutes duration. The discussion was rich, honest and sometimes emotional. It was exciting to have such lively and positive interactions with members of the public and the professional community.

Likert scales benefit from larger sample sizes and are highly dependent on the relevance of the questions. Discursive design processes are more aligned to long form discussions that may include the lived experiences of participants and their subjective, even contradictory impressions and observed reactions, including body language and tone of voice. What is valued is the stimulating discussions that are not necessarily quantifiable.

4.1 Quantitative assessment

Visitors to *haptic* HONGI at the Ars Electronica exhibition were asked the following three questions:
1. *How confident would you be to recognise Tania if you saw her on the street?*
2. *How comfortable would you be to say "hi" to Tania if you saw her?*
3. *How similar was haptic HONGI to a meeting with a real person?*

These were answered using a Likert scale from 1 to 5, where 1 = Not Very, and 5 = Very. In order to explore the impact of the haptic feedback on the user experience, we collected 8 completed questionnaires from people who tried *haptic* HONGI with the haptics turned off (No Haptic condition), and 18 questionnaires from people with the haptics turned on (Haptic condition). Figure 5 below shows the average scores for the responses for each of the three questions, for each condition.
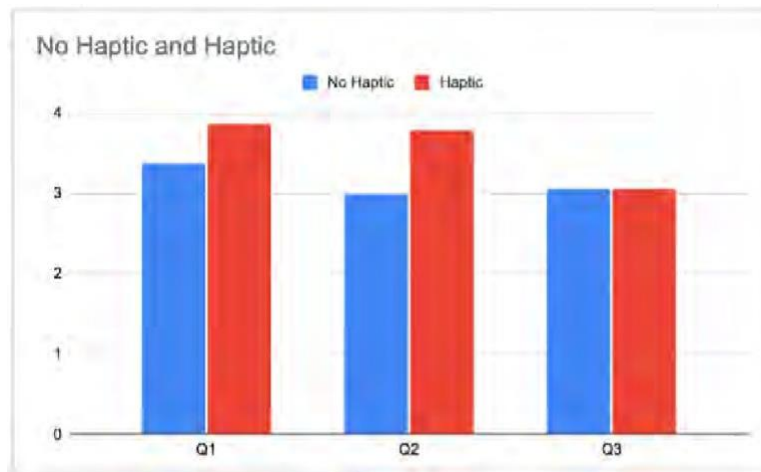
Figure 5: Average scores for each of the user survey question, for each condition.

Although the overall number of questionnaires was not large, the results from questions one and two seem to show that providing haptic feedback in the visual hongi helped visitors connect more strongly with Tania.

4.2 Qualitative assessment – a discursive approach

To collect qualitative feedback, as part of the questionnaire, there was space for visitors to write additional comments. These are telling, and some of the key themes from the comments are summarised below.

Firstly, there was a high level of presence, and Tania appeared very real to some visitors. For example, one person wrote: *"It felt like it could have been a live feed and she was really there"*, and another wrote *"I felt I stood in front of a real person named Tania. I wasn't sure how to respond but ended up talking to her and tried answering her questions".* Several other people mentioned how it *"felt like an in-person experience",* and that they felt that they should respond to Tania.

Visitors appreciated the human interplay, the 'conversation' between cultures. In particular one person wrote: *"I found this really moving. I feel usually when Pākehā meet with Māori it is a matter of interfacing on Pākehā terms. We see them through our lens. I think this changes that dynamic. Suddenly Pākehā are in a foreign cultural context."* For this person, *haptic* Hongi clearly achieved its goals. Another person left the message: *"Just so awesome that AR can facilitate kōrero (discussion) like this!".*

The actuator, the haptic component of the hongi, added to the feeling of connection for some. For example, one person wrote *"The hongi was amazing – certainly helped to break the ice and establish a connection with her",* while another wrote *"Feeling the hongi was*

quite dramatic", and a third wrote that they *"Enjoyed the light touch of the hongi."* For many the hongi was the highlight of the experience.

Many of the visitors were able to respond by using a few words from the Māori language. Perhaps the wall poster of the exhibit, including a Māori word in large font and a portrait of an obviously Māori woman performing part of a Māori ritual, acted as a filter by inviting those drawn to te ao Māori (the Māori worldview) and repelling those who are not so.

However, there were a few remarks from people whose experience was hampered by ill-fitting HoloLens or problematic lack of aligned registration. For example, one person wrote *"It would be better if we could see a bit more of Tania",* which was due to incorrect alignment of the AR HMD. The haptic feedback was also weak for some, with one person leaving the message *"... my hongi was a thin pressure across the bridge of my nose, which gave me a fright!". It is clear that improvements could be made in these areas.*

Those who had experienced a real life hongi could, naturally, point to the deficiencies of this virtual experience. One comment was: *"Sharing a hongi is about sharing the breath, the "ha", so that was missing, and the warmth of another person"*, and another wrote about breathing the same air being more important than the haptic element. It is important to note that *haptic* HONGI was never intended to replace real life hongi, but to practice and prepare for engagement with Māori.

4.3 Māori Responses

For Māori the hongi has different significance than for non-Māori, and so an important question was how Māori visitors would react to the experience? What follows are excerpts from a recorded discussion with a female Māori visitor.

> *Designer: You moved forward with your eyes closed… You were in it.*
>
> *Visitor 1: I did. I found it incredible. It was really… enriching. I felt the wairua (spiritual aspect) when I did the hongi. It was really weird… how much I felt that. Thank you.*
> *I didn't know where it was going, but actually to feel the hongi… the way in which you did that, invited me. I felt like I was being invited in to a really special place and I felt that.*
>
> *Designer: So, this isn't the idea that technology will replace real life, but can you see a use forthis technology?*
>
> *Visitor 1: There's huge amounts of potential. So, what I do know is…with a lot of older people… the biggest health issue is loneliness. And so… a few months ago I wasjust discussing technology to have in people's homes, so that they can actually have, you know like, connection with people.*

This visitor was thankful for what the team was doing to help people be more open to engaging with Māori. Another Māori visitor said *"So, I suppose this is the way it's going to be now"*. Not necessarily… Real in-person, kānohi ki te kānohi (eye to eye), will always be preferable, if there is that option. However, Tania's recorded presence simply IS open and welcoming. She consciously chose that stance, rather than vehemently telling everyone to go away.

[A video of Tania and her visitors responding to *haptic* HONGI at Ars Electronica Garden Aotearoa 2022 https://youtu.be/wsE8JfZHZ7s]

4.4 Immigrant Responses

It is interesting that people from different cultures may have vastly different responses to the experience than local people. Foreign visitors seemed especially moved and affected by the experience. The following is a voice recorded discussion with a German visitor, resident in Aotearoa New Zealand.

> *Visitor 2: That was an absolutely fantastic experience. That was so engaging, I was so immersed and the interesting thing is it's AR but it's real. So it's the, you know, the thing is that I am looking at the wall but I am not just looking at the wall.*
> *And the interaction and of how the body language is and how it draws me in to react to it and not feel stupid about it. This subtle… introducing te ao Māori (the Māori world).*
> *And then, at the end, the hongi, where you have the physical touch on my nose… It blew me away! This is fantastic! It's one of the best experiences I have, I tell you. It's… It's deeply moving.*
>
> *Designer: Brilliant. And so, you had the actuator actually on your nose when you started. But you could still feel it pushing?*
>
> *Visitor 2: Yeah, absolutely.*
> *And the actuator is also built in a way that it has the right softness and the right scale so that you do not feel that there is like a, just a pinch, or like a fingertip…. a, a touch. It's actually… it's a nose touch, so there is a certain length to it, there is a certain softness, and warmness to it…*
> *And the interesting thing is, I mean perhaps minute or so long. But it didn't take long to build this human connection.*

Our German visitor was certainly enthusiastic about the experience, including the softness and warmth of the actuator. Interestingly, many visitors responded to Tania's avatar as though it was an actual person from the start of the experience. They waved, nodded, and spoke aloud, telling 'her' their name and saying where they were from. The hongi and actuator action came at the end, so could not be entirely credited for the elevated presence that visitors felt from the start.

Another English visitor was still unsure whether 'Tania' was present even after the experience came to an end. He seemed flabbergasted. How was he feeling?

> *Visitor 3: Very on edge of wondering what you're talking to… That's what I would say, yeah. Like, whether they are listening to what you're saying. That's the biggest takeaway. It's like I don't know if she was actually able to… so I was like, I froze on the spot. I didn't know what... I couldn't say what I wanted to say back… very strange. But cool.*

> *Designer: She felt three dimensional to you?*

> *Visitor 3: Yes, yeah kind of eerily so, because I wanted to converse. That's the thing. That's how it felt. Like I wanted to make conversation.*

> *Designer: So how similar was the haptic HONGI experience to meeting with a real person?*

> *Visitor 3: Like, you're still aware that it was digital, but um pretty close.*
> *I would say the sound was most impressive. Like the voice, it felt like it was, with the visual… it felt like a conversation, like a real live person.*

Another woman, a Canadian, commented on the warmth of Tania's performance.

> *Visitor 4: Well, I think she just was so warm... "And this is what we do... ", and the way that her facial was just so gentle and calm, so that made me comfortable.*

> *Designer: What did you enjoy most about the experience?*

> *Visitor 4: That I can be so moved by… (weeping)*

> *Designer: By the avatar?*

> *Visitor 4: Yeah.*

Clearly, in line with filmmaking tradition, the quality of the script, the performance, the lighting, audio recording and the resolution of the video capture and output are defining factors relating to the audience experience. One visitor appreciated the technology and its application to human connection, while acknowledging that it also threw him out of the experience

> *Designer: How much did the hongi help you to connect with Tania?*

> *Visitor 5: It was yeah it was nice. But I will say that when the 'dial' (actuator) makes its noise and then it's like a soft pad just hitting, it's like you're having a connection and then you're just repelled after being… and then you're... "OK, I know this is a fiction".*

> *Designer: Yeah, yeah. So, you know, the sound and the pad hitting here… it's an artificial...*

> *Visitor 5: Yeah but it's good, though, like, because it's also awkward.*

There's an emphasis on technology to make things so hyper-realistic and I guess so realistic that it feels real, but I think it's also interesting to have imperfections. I wouldn't say clunky... but it's also intellectually interesting to experience and I think it's good, it's not a bad thing.

Designer: Good. That's interesting. I think is a bit clunky.

Visitor 5: No… it was good. It was authentic and nice and you're trying to deal with thematically authentic topics. It was lovely.

5. Reflections on Design

haptic HONGI was a transdisciplinary work with a production team comprised of a community-focused Māori improvisational performer and multi-media artist from outside the academy, a Pākehā (descended from European Settler/colonisers) designer, a UK-based lecturer, character designer, animator and creative technologist, and AR developers and software engineers from Aotearoa New Zealand, India, Japan, China and Sri Lanka, who specialise in human-computer interaction, including haptics. Crossing epistemological boundaries is encouraged in the academy yet remains challenging for those who are steeped in our own disciplines' conventions. We hope this project will highlight where some common ground lies so we can use those overlapping territories as a foundation on which to build truly transdisciplinary practices.

Our starting point was the desire to support relationship building between cultures, including between designers and computer engineers. While working together on this project, we employed a discursive design approach (Tharp & Tharp, 2018), to explore whether Extended Reality (XR) technologies (see Figure 6), more particularly Augmented Reality in the middle of the Reality-Virtuality Spectrum, could help to create cognitive and behavioural shifts in our local reality.

Figure 6: The relationship between XR, MR, VR and AR © Mark Billinghurst.

Design as a discipline emerged out of a need to continue economic growth post-World War 2, therefore it focused on increasing the sales of products by enhancing consumer appeal (Krippendorf, 2006). Many designers and design schools challenged this superficial role of design, noting that the discipline offered far more for the positive improvement of

society (Whiteley, 1997). In contemporary society, design is pervasive, but, due to this omnipresence, it has also been explored as a discipline to much greater depth (Willis, 2019). Beyond a commercial paradigm, one branch of theoretical exploration emerged from critical, speculative and fictional approaches to design; this has been described as "discursive design" by Tharp & Tharp (2018, p. 5). They explained that:

> Design has the opportunity for intellectual service. Discursive design's primary agenda is to convey ideas... Discursive design asks its audience to take an anthropological gaze and seek understanding of its artefacts beyond basic form and utility.

Development of *haptic* HONGI is well-aligned to this design framework, and we made use of Tharp and Tharp's "nine facets" to narrate and explore the research project through their series of sequential themes of Intention, Understanding, Message, Scenario, Artifact, Audience, Context, Interaction, and Impact (2018, pp. 25-7). In the rest of this section we describe how *haptic* HONGI addressed these nine themes in more detail.

5.1 Intention: What's a discursive designer to do?

Tharp and Tharp write that a discursive designer should have five specific aims: to remind,

to inform, to provoke, to inspire, and to persuade (ibid., p. 27). A provocation can come in many forms. In this case, we sought to create a short XR experience designed to remind us all of the potential for reconnection and collaboration from a time before Covid-19 and beyond in Aotearoa New Zealand; such provocation could inform the visitor about Māori rituals of encounter as the piece provokes interaction as it inspires and uplifts the visitor with a warm welcome and an inkling of potential. Imparting information via Tania's script was instructive, thereby creating more certainty in the minds of the visitors. Certainly is one way to allay fears. While the persuasive aspect may be present, it must be subtle because in today's Aotearoa, some are resistant to the use of te reo (the Māori language) and tikanga (Māori philosophies of best practice, or rightness).

"As a designer, the discursive practitioner is also prescriptive–planning and creating artifacts—but rather than driving toward usefulness, usability, and desirability, their goal is communicative." (Tharp & Tharp, 2018, p. 5). The designer initiated and facilitated meetings (conversations) with and between all members of the team. *haptic* HONGI itself took a conversational form and provoked further discussion that is ongoing. This was the main focus. The filmmaking practice that backgrounded this research prioritised people and context, and sought to make technical artefacts, such as cameras, lights, microphones, wires, cables and so on, vanish. The developers, however, were building the primary tool without which the project and the brief could never have been fulfilled.

The genesis of this research arose out of moving image-making practices and historical investigation into societal currents that resulted in separation and alienation. Left unaddressed, such a state of affairs could be destructive in the extreme. We know this. While coverage of local hate-crimes is outside the scope of this chapter, we have seen their aftermath and have taken part in organised events aimed at countering their destructive forces. We have been asked to share the heavy-lifting, to work with our own communities to shine a light on and work to bridge gaps between people from different cultural backgrounds. Our work was backgrounded by some deeply challenging historical events. While many details were left unspoken, our knowledge and understanding let to a commitment on all of our parts to create the best possible artwork to stimulate discussion and initiate cognitive shifts.

haptic HONGI is a consciously intercultural experience. We use the term 'intercultural' to highlight the enmeshed and interactional nature of our alliances. Expanding on this set of relationships, we describe our research and research community as 'transdisciplinary' to highlight our expansion beyond the university, to include members of non-academic communities. The Organisation for Economic Co-operation and Development (OECD) definition of transdisciplinary is:

> ...a mode of research that integrates both academic researchers from unrelated disciplines - including natural sciences and SSH - and non-academic participants to achieve a common goal, involving the creation of new knowledge and theory. In drawing on the breadth of science and non-scientific knowledge domains such as local and traditional knowledge, and cultural norms and values, it aims to supplement and transform scientific insights for the good of society. (OECD, 2020, p. 9)

Transdisciplinary research

For this work to bear fruit, its completion and success is totally reliant of the knowledge and experience of engineers and developers from the Empathic Computing Laboratory[2] and others, not least the artist Tania Remana. Our collaboration began as a transdisciplinary[3] project and ended with implementation of bleeding edge[4] technology that our creative endeavours rested upon. Contrary to assertions in papers such as Driver et al.'s (2010, p. 6) that empirically explores scientists' perceptions of design and designers, the lab always seeks to engage designers and artists as valued creative partners. Although we are situated

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[2] http://www.empathiccomputing.org/

[3] https://hci.auckland.ac.nz/2020/09/10/abi-and-cai-work-together-to-show-their-arty-science-side/

[4] Bleeding edge refers to a product or service that is new, experimental, generally untested, and carries a high degree of uncertainty. From https://www.investopedia.com/terms/b/bleeding-edge.asp Accessed 11th August 2022

in different disciplines, honest communication supports our collaborative impetus and helps us rise above or drive through our differences.

In the case of *haptic* HONGI, some of the technical aspects of programming took place in an organic process within sub-teams which were then integrated into more and more granular prototypes that the full team could then provide input on. While the coding and electronic development was in process, the role of a designer was to be a project manager, a provider of tangential information, a procurement worker to find and provide resources, and a grant writer. The team offered up ideas and discussed opportunities, while the designer tried to elicit expressions of concern, then backed off to let people get on with their work.

There were some non-negotiable fundamentals, such as - all work is based around a table, all work supports human interaction, all work includes a direct, mutual gaze, all work respects yet encompasses cultural difference. Other than that, there was a lightly held wish-list. Overly specific or unrealistic expectations could have created real problems. In this way, we avoid putting undue pressure on our co-creators with an emphasis on gratitude for whatever they manage to produce.

However, one issue that arose, was the invisibility of our tacit knowledge. We did not know and could not see what our team members knew, or did not know. Only time, shared experience and trusting relationships can help this surface. Pushing co-creators to perform can result in myriad stressors so we must all learn to be honest with ourselves and others. This is not easy for everyone and it helps to acknowledge that we are entering unknown territories together. Discoveries are made during and because of the practice. This is the magic of research, and particularly practice-led research. It is in the doing, rather than the knowing that reveals hidden treasure. The knowing, or understanding is secondary. It comes later.

Such revelations add to the lived experience of all participants who perceive and experience personally degrees of intercultural awkwardness or connection. When do we feel alienated by difference? When do we feel connected? What supports or hinders connection? What we know can be a yearning for an experience, rather than a memory of one. In a broader context, what we know includes existing knowledge of other XR experiences and the relevant corpus of literature. In practical terms, it serves this work to start from the ground up, from pragmatic domestic wisdom. Is there a better place for human engagement than the dining table?

Commensality

At its most elemental, commensality means sharing a table[5], whereas others use it to mean a shared meal (Spence et al., 2019). Anthropologist Tan Chee-Beng (2015, p. 29) provided a deeply considered interpretation:

> …[commensality] is the expression of the value of hospitality, of expressing care and love or valuing a relationship. This institution of hospitality has helped in human social evolution and organising and maintaining social relations beyond the domestic unit or a small human group. It continues to be useful for organising social relations in this even more globalised and cosmopolitan world. Commensality [...] is a way of inclusion in the human world that is differentiated by ethnicity, and nationality, religion and class.

As can be seen, *the haptic* HONGI installation literally has people sharing a table with Tania, and so it is a stage set for commensal encounter. *haptic* HONGI is the latest in a suite of XR experiences collectively entitled *common/room.* Each of these XR experiences is situated at a dining table, signifying the place where ideas are fomented, connections are deepened and where lively philosophical conversations might crystallise into strategic, collaborative action. The table is the ground that becomes a crucible, not in the sense of a melting pot, but an alchemical tool and platform, a representation of common ground, where we may initiate potential relationships between strangers as a first step towards commoning.[6]

5.3 Message: What's a discursive designer to say?

The process leading to *haptic* HONGI has been experimental and iterative. However, the intention was always for technology to play a bridging role across cultures - for the technology to encourage broader social discourse. The desire to reach across from the virtual/digital and into the real meant that a large part of the scripting of the message, was resting on the shoulders of the women who were captured, to later appear in AR at the table across from the visitors. They are the voices of the experience.

Tania Remana was raised by a Pākehā (a white person of European descent). She is an artist who is comfortable with reconstruction and imagining the new. As a performer, she played the role of someone charged with welcoming visitors. Although she had never seen an AR experience, she gleaned what was being asked of her and acted accordingly. Her performance and timing lifted the degree of presence in the work. However, Tania was also

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[5] From https://www.merriam-webster.com/dictionary/commensal Accessed 29th September 2021
The etymology of *commensal…* derives from the Latin prefix *com-*, meaning "with, together," jointly and the Latin adjective *mensalis*, meaning "of the table."

[6] From https://www.onthecommons.org/work/what-commoning-anyway accessed 2nd August 2022
The act of commoning draws on a network of relationships made under the expectation that we will each take care of one another and with a shared understanding that some things belong to all of us—which is the essence of the commons itself. The practice of commoning demonstrates a shift in thinking from the prevailing ethic of "you're on your own" to "we're in this together."

challenged by having to construct her own ritual because she is still learning aspects of Māoritanga (Māori cultural practices), including the language, te reo.

As this excerpt from an interview with Tania shows, the playfulness of the project and the company of members of the team from across the globe excited her:

> *Tania Remana: I am a middle-aged woman who now identifies as Māori. It's taken me a while to take that culture on as my own, knowing that I had other blood strains in me, which I knew little of, as well as my Māori side.*
> *I was quite intrigued when you approached me about being part of it, be a part of the conversation around a table, 360 degrees. I was intrigued because it was different. So it was an opportunity to be out there and put my fingers in a few little puddles, pies, whirlpools, who knows, it's great. I loved it.*
>
> *Designer: You're a performer. But in this role you're kind of being put in the role of...*
>
> *Tania: Tangata whenua (people of the land - in a jokey way).*
> *You know, in the day... I hated pushing noses up against snotty old men and I just couldn't do it. So go around the back in the kitchen, there I was, in the kitchen. That's where it all happened... in the kitchen with all those kuikuis (old ladies).*
>
> *Designer: But in a way, you're safer than being at a real pōwhiri where you do have to greet strangers and hongi...*
>
> *Tania: I'm just actually reflecting now and that's the kaupapa (the principle idea) of it. I wouldn't hongi anyone back in the day, I wouldn't. I wouldn't be part of that tikanga of doing the hongi. And this is actually a kaupapa where it's haptic hongi. I've just clicked. So, it's perfect. No wonder I felt so at ease with it.*

It was only during this discussion that Tania realised why she had been so relaxed – the technology had afforded her a large measure of safety. We had often discussed this aspect of AR in the Empathic Computing Laboratory (ECL), but, activist and academic, Tina Ngata, has advised to never make assumptions about the safety of Māori based on one's own non-Māori experience.

5.4 Scenario: How Does a Discursive Designer Set the Stage for Discourse?

"The designer can vary what we refer to as the clarity, reality, familiarity, veracity, and desirability of the scenario." (Tharp & Tharp, 2018, pp. 26,7). In developing new iterations of the work, some aspects were non-negotiable. The dining table, the vase of flowers or foliage, and the cheery tablecloth. On every count of the above set of requirements, the dining table is effective. Visitors commented, unprompted, that they see mealtime discussion as fundamental to a good life. Māori have previously commented that important discussions happen at the tables in the wharekai (the dining room). Unlike formal discussion in the wharenui, the big ancestral house, women can join in and take charge of discussion

around the dining table. This is exactly what Tania was referring to in the above conversation.

This domestic setup is a conscious counter to the sometimes unsettlingly abstract and confusing confections some designers and artists come up with in efforts to generate a futuristic or technologically savvy display. Giving priority to the kitchen table, the humble vase and the company of older women, is a conscious decision to insert a domestic construct, populated by mature women from different ethnicities, into the Metaverse. The Metaverse is defined by Dripke et al. (2022) as:

> *... a perpetual and persistent multiuser environment merging physical reality with digital virtuality. It is based on the convergence of technologies that enable multisensory interactions with virtual environments, digital objects and people such as virtual reality (VR) and augmented reality (AR). Hence, the Metaverse is an interconnected web of social, networked immersive environments in persistent multiuser platforms. It enables seamless embodied user communication in real-time and dynamic interactions with digital artifacts.*

In plain language, the Metaverse is a manmade virtual world mediated by technology. As such, it only contains entities and ideas created and invited in by people with sufficient resources. It therefore risks being subject to ideological, geographical, and wealth-based exclusivity.

5.5 Artifact: What's a discursive designer to make?

To provide the conditions for a virtual meet and greet, we use digital information as an interface between real and virtual people. We are generating a table-top encounter between a real-life visitor to a gallery/library/exhibition and a volumetric avatar of women who, by virtue of not being 'really there' can be kept safe from 'audience' demands and reactions in real time/place. The basic configuration of the technical preparation for these table-based experiences includes depth sensing cameras and AR headsets to display the captured data.

The current version of the *haptic* HONGI is the latest in several versions of the experience. The first iteration of *haptic* HONGI included a Computer Generated (CGI) avatar, created by UK-based character creator and academic Wendy Lawn, and the Māori co-creator, Tania. Wendy followed her own process for virtual character creation. The creation of Tania's virtual avatar relied on software from Reallusion – Character Creator 3, and iClone 7. Photos were taken of Tania in NZ as reference, and the Headshot application used AI to transfer the photo of Tania's head to a 3D human template in Character Creator. From there, the appearance of the 3D human model was edited to become a virtual replica of Tania. Discovering suitable clothing and hair assets took trial and error. Motions and lip sync

animations were then added to the character in iClone. Once animated, virtual Tania was exported from iClone and imported into the Unity game engine.

Assembling the character in Unity required positioning the character, setting up shaders and then applying the animation. The Unity project was then packaged and sent from the UK to NZ for team member Prasanth to introduce virtual Tania to the volumetric capture project. The challenges were largely around understanding how Tania would look and how virtual Tania would transition from the volumetric capture as visualised through the HoloLens 2 AR HMD. Wendy's challenges were around the inferred design brief and realising it without being present in the key capturing and developing sessions, making an avatar, then dressing and bringing to life someone she had never met in person. Distances can bring a disconnect that only regular and deep communication can remedy.

Dreaming up the idea of temporarily replacing the virtual avatar created by volumetric capture with a computer generated avatar and thinking it would be 'interesting' to compare audience reactions to the two different styles of virtual avatar, was conceptually alluring. But there was no knowledge of the degree of difficulty the teammates would face. In the mock-up/documentation for the online exhibition while the visitors, the manuhiri, consider a response to Tania's spoken invitation, the volumetric video transforms into a computer-generated avatar (see Figure 7) of the wāhine Māori (the Māori woman), who sings a waiata (a song), about human connection. In this version, the virtual avatar vanishes, and the volumetric Tania returns.
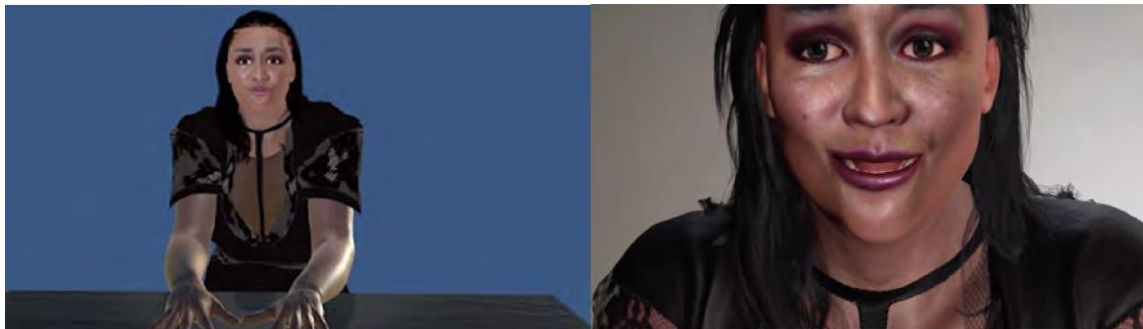

Figure 7. Tania's computer-generated avatar sings a song about social cohesion.

The defining feature of *haptic* HONGI was created in response to a concept identified and brought to the table by Tania herself. When asked what she thought should be included in a heartfelt, authentic, meaningful greeting, she identified the hongi.

During development, the *haptic* HONGI system was built and run on a variety of devices as shown in the table below (Table 1).

Venue/Iteration	Year	Playback	Capture	Portability
Come to the Table! Demonstration Siggraph Asia	2019	Meta II	Intel Realsense	PC
Siggraph Asia	2019	HTC VIVE	Intel Realsense	PC
First Contact -take 2 Ars Electronica (online Mozilla Hubs)	2020	AceSight H2 + T265(tracking)	Depthkit(Intel Realsense)	PC
haptic HONGI Ars Electronica (Online – mockup)	2021	Hololens 2	Depthkit(Azure Kinect) + iClone7(for CGI)	PC, Standalone
Ars Electronica Physical Exhibition	2022	Hololens 2	Depthkit(Azure Kinect)	PC, Standalone

Table 1. Overview of technical requirements for the different iterations of the system.

The first versions used the NED+ Glass X2 Pro as an AR display and added an intel T265 camera for tracking. The requirement was for a lightweight device that had SLAM tracking and has a good field of view, and this setup met the criteria.

Due to the Covid-19 pandemic, the early experiences had to be tailored for a digital experience for a global audience. Hence, we streamed the experience as a video to Mozilla Hubs. A high-level system overview of this version is shown below (see Figure 8).
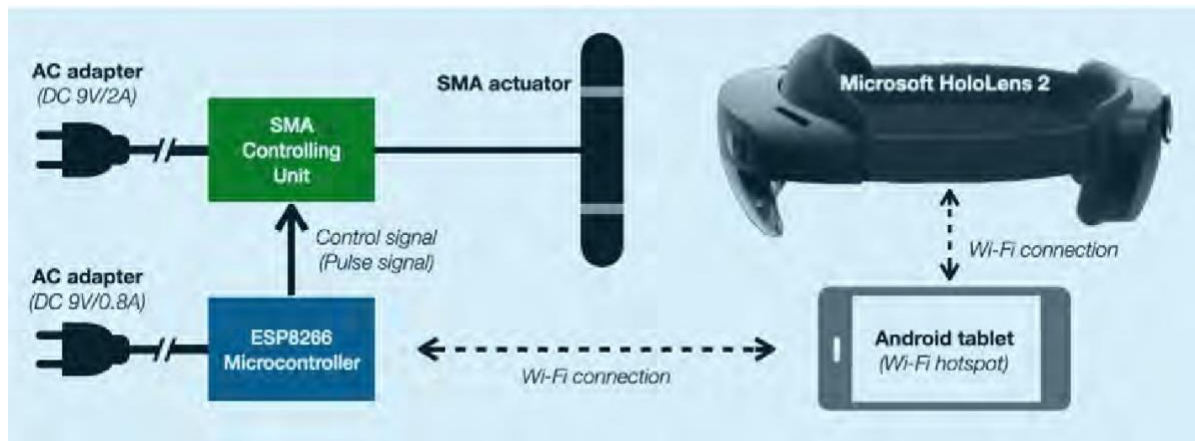

Figure 8. High-level system over-view © Prasanth Sasikumar

[The video outlining our AR research to date can be accessed here: https://youtu.be/4Tu2l4vcLJI]

5.6 Audience: To whom does a discursive designer speak?

In the very early stages of the development process, the designer engaged with the technical team and introduced them to Tania who would later appear, virtually, to address the visitors. The quality of this relationship between the team and the host determines the quality of the whole experience because, in the gallery/exhibition, the visitor, by putting on the headset, steps into the team's shoes to receive what the host/performer presented to them.

Tania has no control whatsoever over who visits her table. Anyone who enters the exhibition space is welcomed. This, in fact, mirrors the real world because the pōwhiri, the ritual of encounter led by Māori, is totally inclusive (Salmond, 1985, p. 142). Any doubts or conflict with certain visitors can be addressed after the welcome in further ritualised discussions designed to hear people out and respond in a safe process.

How does one create a visceral, empathic bridge between subject and viewer? Work in the field of XR makes space for and necessitates different kinds of collaborators. Theatrical performances require actors to project and emote to reach every member of an audience. In contrast to this, because of audience proximity to cinema performers enabled by ubiquitous microphones along with telephoto lenses and close-up shots, acting for film must be more internal and subtle. Our kind of art installation that is more akin to documentary filmmaking sits somewhere in-between, by inviting real people to put themselves forward while asking a great deal of them. "Be yourself" is an inadequate kind of direction. Although, in the spirit of decolonisation and true collaboration, we need to afford our co-creators agency. It is a difficult balance between putting words into performers mouths, thereby leaving no room for self-determined actions, and leaving them to flounder in the unknown.

Figure 9: Tania is a performer.

Tania, as an experienced improvisational theatre performer, was no stranger to self-direction (see Figure 9). Once she realised that no strong direction would be forthcoming, she pushed offers of interaction with a 'director' aside, opting instead for the empty space in front of her that she could populate with an imagined audience. She seized the opportunity, wrote her own script, based on foreshortened traditional Māori rituals of encounter, and took control. Her performance was expressive. It reached across the table and through the technological veil to her audience.

5.7 Context: How does a discursive designer disseminate?

The team demonstrated the first iteration of the AR experience (titled *Come to the Table! Haere Mai ki te Tēpu!),* at SIGGRAPH Asia (Brisbane, 2019) and at Women in HealthTech at the University of Auckland (2020). In that same year, we were invited to exhibit the second AR iteration *First Contact – take 2* in Garden Aotearoa, a local spinoff of Ars Electronica, the global festival for art, technology and society. Covid put paid to the physical exhibition in 2020[7] and again in 2021.[8] It was only in mid 2022 that we were finally able to see and share with others our completed version of *haptic* HONGI in the real world.[9]

Because these experiences are designed to engage and bring to our tables people from every community, the Gallery, Library and Museum sector (GLAM) is their natural habitat. However, to reach everyday members of the public, it is important to include more community-focused centres and local venues that are frequented by those who might feel daunted by or out of place in our grander institutions.

5.8 Interaction: How does a discursive designer connect?

Although it was hoped that the technology would act as a mere veil between the virtual and the real people, it needs to be said that what AR affords us as designers, developers, artists and visitors is substantial. Without the technology, the designer/demonstrator would be sitting at a table alone, hoping that Tania could spare some time to join her and the visitors. As it was, at Ars Electronica, *haptic* HONGI could run for six hours a day for a whole week; day in and day out, interacting with visitors who could meet with Tania virtually, while Tania pleased herself by enjoying the exhibition (see Figure 10), sightseeing or visiting friends. She was not bound to the table, although she was able to watch people reacting to her "performance". She was amazed how happy she was making them.

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[7] https://www.ars.nz/first-contact/
[8] https://www.ars.nz/haptic-hongi/
[9] https://www.ars.nz/haptic-hongi-2022/

Figure 10: Tania, wearing her korowai, her feather cloak, at the Ars Electronica exhibition opening.
Song Bai Photographer for Te Herenga Waka—Victoria University of Wellington

The project itself drew technologists to it (see Figure 11). The process of creating the *haptic* HONGI experience gave us all a real-world opportunity to practise intercultural engagement. No one needed convincing about the potential value of a work that sought to grapple with intercultural discomfort. We were all in agreement about that. Each time Mairi booted the Hololens 2, she smiled to herself while selecting the application created by the team that had been entitled "Counter-racism". The technology was therefore a catalyst for collaboration and creative production around a shared concern.

Figure 11: Team members Prasanth, Mairi and Ryo in the lab after preparation for
Ars Electronica was complete.

The HoloLens 2 headset sitting ready for action on the table communicated to exhibition visitors that this was some kind of virtual experience. It aroused curiosity and excitement. The headset was an attraction for some and a hinderance for others who felt rather embarrassed about it being their first time. This is where the tablecloth and the vase of foliage feature. The wires and technology are offset by the homely familiarity of a setup that speaks of domesticity, comfort, and conviviality. Even so, some visitors had to be invited and enticed to the table. The designer is there to help put the HoloLens on and to engage

the visitors in conversation after they have seen and heard Tania welcome them to Aotearoa. Tania communicates virtually; the designer connects directly with the visitors.

5.9 Impact: What effect can a discursive designer have?

The value of discursive design interventions can be measured by "the impact designers can have with their work upon society, other institutions, the design profession, and the designers themselves". (Tharp & Tharp, 2018, p. 27) What designers call 'impact' also encompasses "User feedback from the experience" in section 4, above.

The effects of our AR experience exceeded our expectations due to the reliability of the technology, the high resolution of both the visual and audio components, the curation of the setting, the appropriateness of Tania's performance and the readiness of the 'audience' for such an encounter.

Ours is not a vehicle for mass audiences. It is a one-on-one experience; a slow burner – unspectacular, subtle and yet emotional for some. There are no loud sounds or flashing lights. Some visitors were concerned that we were situated in an exhibition backwater. In fact, at Ars Electronica, it was in a perfect position - a quiet spot with black walls and down lights. The original intention of the wider practice-led research was to determine whether XR affords greater support for deep interhuman connection, between subject and audience in a filmmaking/moving image framework. As a moving image work, *haptic* HONGI can only ever be seen/felt/experienced by a small number of people. This aspect of AR production in addition to the lack of an explicit, wider narrative was something new to contemplate.

Considering that we had no certainty that *haptic* HONGI would even function, the overall visitor response was very positive. Whether the experience was simply fun or deeply moving and engaging, visitors appeared to enjoy the mix of technology and real people. Above all, because of the form that the experience takes, as a conversation between two people at a dining table, many visitors were primed for and open to a lively chat about technology and about connection between people. These conversations were able to be accommodated at the table due to the slow trickle of exhibition attendees.

A major impact of *haptic* HONGI is within the research community itself. Aside from the technical and creative discoveries, we have also established a level of trust and pleasure in each other's company that is characteristic of lifelong friendships. These friendships span the globe. Certainly, Tania's experience was powerful. Advice from a Māori elder, to always bring Māori co-creators with you, has been hugely impactful. By virtue of Tania attending the exhibition, she was able to watch people enjoy her welcome (see Figure 12) from a distance. This was uplifting and interesting for all concerned.

Figure 12: A smiling visitor.

6 Lessons Learned

Several design decisions were made in creating *haptic* HONGI. We had been advised that including text/titles/credits can work against the magic of XR experiences. A choice was made not to use a computer graphic virtual avatar. The addition of a CGI avatar would have introduced an additional virtual character that would likely have raised further complex ideas and relationships that could have disrupted the integrity of the experience – the "low threshold", as a visitor called it, "diminishing the feeling of presence". The decision to focus on bringing the hongi to life, by inserting a haptic actuator into the headset and using a volumetric video avatar, opened new avenues for experimentation and discussion. The developers should be recognised for their contribution to local and global knowledge, especially as it pertains to supporting cultural understanding.

This was a complex coming together of creatives, researchers, technicians, academics and participants, in the making of a virtual-physical bridge to traverse social isolation, time zones, knowledge gaps, life experiences, expectations and multiple realities. What some might call "the cutting edge", or "the bleeding edge", a more appropriate phrase could be the "precipice of ignorance", in that we were always only a breath away from the unknown. The coding and thinking of the computer scientists and engineers was almost totally opaque to others. Working with new and developing technology meant that all co-creators were working with the unknown. This is exciting but risky. The individual and combined

contributions could all fail at any moment. Such risk-taking is what it takes to generate new knowledge.

Forming creative relationships with people from different cultural backgrounds can also feel risky for some. Our technical team was already drawn from different cultural backgrounds, but, although 'diverse', we were all non-Māori. Linda Tuhiwai-Smith (1999) pointed out that Māori are among the most researched people on earth. We are urged to question what Māori communities might gain from taking part in our research. In this instance, our work is more about forming bonds and working together, than putting Māori under the microscope. We also sustain connections to wider communities so we had no need to treat one person as the fount of all knowledge, to be interrogated at will, or to be held up as a representative of all Māori. We have learned that knowledge is not there for the taking.

Our advice would be to listen, then reflect and relate. Resist the temptation to seize upon assumptions based on stereotypes or fear. Keeping an open mind can be a conscious exercise. This is something we practiced and enabled through *haptic* HONGI, because visitors could never dominate, silence or abuse Tania. Their role was to look and listen. Relationship and reciprocity are paramount. In our colonised society, it has become starkly evident that these two practices have not been prioritised. Rather than being depleting, both, with time, can bring learning and creative, authentic friendship. This is a core concept in our work.

Advice from Māori elders formed the basis of our approach. Involve Māori from the very start to avoid inviting participants in at the last minute. This prevents tokenism, a kind of objectification through which the selection of collaborators rests on a shallow appreciation of the attributes of the person in question. The best way to avoid such an unfortunate situation is to work with and through existing relationships. In this way, we are introduced to each other by people who already know both parties. This supports ongoing relationships and creates broader networks by bring groups of people together. The success of a project can be shared by all, instead of some standing in the sunshine while others are jettisoned or marginalised.

Invitation from Māori to work with them as individuals or as a community is ideal, but even then, ongoing clarification and negotiation between disparate worldviews may still be necessary. The inherent challenges of navigating such deep, honest conversations are off-putting for some. But if, during these discussions, that go beyond mere politeness, shared values are unearthed, the rewards of mutual understanding and friendship are immeasurable. This is a current state of affairs of which our team can be proud. Opportunities for in-depth dialogue and evaluation are advantageous on many levels, including personal, intrinsic discoveries in addition to learning about others and the outside world from your point of view, and theirs. Pākehā academic, Alison Jones, (Hoskins & Jones, 2017, pp.185,187) writes about Pākehā-Māori relationships and collaborations.

> To those Pākehā researchers who would collapse the Māori-Pākehā hyphen into 'us' there is one harshly pragmatic response: it does not work. A research approach to Māori, whether as research collaborators or as subjects, that assumes a mutual interest, minimal difference, and the set of shared assumptions, is doomed to practical failure. [...] ... No mere exercise of a 'duty of care' or 'cultural sensitivity' or attempts at 'sharing' by Pākehā will in themselves create a Māori-Pākehā collaboration where differences are largely erased and shared work becomes easy; this, in my experience, can only be seen as a fantasy.

This approach to difference is to live and let live. It is important to be embedded in reality, to keep in mind the inordinate imbalance regarding access to equipment, funding and status when entering transdisciplinary collaborations with women, older people, people of colour, Indigenous other marginalised communities. An exploration of these complexities are beyond the scope of this chapter, but the certitude of this disparity should never be far from our minds. Covering costs and supplying food need to be routine, while taking participants to events and celebrations is a way to show respect.

In contemplating the reaction of people to the work, it might be helpful to refer to the thoughts of author and farmer Wendell Berry that appeared in *Feminism, the Body and the Machine* from his slim volume *Why I Am Not Going to Buy a Computer* (2018, p. 44-5):

> *The body characterizes everything it touches. What it makes it traces over with the marks of its pulses and breathings, its excitements, hesitations, flaws, and mistakes. On its good work, it leaves the marks of skill, care and love persisting through hesitations, flaws, and mistakes. And to those of us who love and honour the life of the body in this world, these marks are precious things, necessities of life.*
>
> *I know that there are some people, perhaps many to whom you cannot appeal on behalf of the body. To them disembodiment is a goal and they long for the realm of pure mind or pure machine; the difference is negligible.*

However, at the experimental stage of this work, almost all of the above, the flaws, mistakes, hesitations, excitements and so on are fully present. We are quite distant from the pure machine of which Berry spoke. It makes sense, out of interest's sake, to navigate between extreme or pure positions. At the very least, we might consider the assertion of computer scientist and philosopher Jaron Lanier who does not share the zeolotry of those who anticipate the singularity, when machines will to be able to reproduce themselves and take over the world. (Lanier, 2011, p. 33)

> When my friends and I built the first virtual reality machines, the whole point was to make this world more creative, expressive, empathic, and interesting. It was not to escape it.
>
> Will trendy cloud-based economics, science, or cultural processes outpace old-fashioned approaches that demand human understanding? No, because it is only encounters with human understanding that allow the contents of the cloud to exist.

Lanier is a polymath, a musician and a scientist, whose own life exemplifies transdisciplinarity. He sees improvements in VR as a way to hone our perception in the real world. The interesting part of a VR experience is when we remove the headset. (Lanier, 2017, pp. 49-50)

> There will always be circumstances in which an illusion rendered by a layer of media technology, no matter how refined, will be revealed to be a little clumsy in comparison to unmediated reality. The forgery will be a little courser and slower; a trace less graceful. […] When confronted with high quality VR, we become more discriminating. VR trains us to perceive better, until that latest fancy VR setup doesn't seem so high quality anymore. […] Through VR, we learn to sense what makes physical reality real. We learn to perform new probing experiments with our bodies and our thoughts, moment to moment, mostly unconsciously. Encountering top quality VR refines our abilities to discern and enjoy physicality.

Therefore, the question is not whether an AR experience is close to and therefore might replace reality, but how AR and reality together might enhance our social lives.

7 Conclusion and Directions for Future Work

In this chapter we describe *haptic* HONGI, an interactive piece designed to explore intercultural relationships in Aotearoa New Zealand. Within a transdisciplinary discursive design framework we have generated discourse *about* our design, outlining discourse *for* our design and, most importantly perhaps, discourse *through* our design that uses a conversational form to provoke discussion about overcoming intercultural discomfort. A more particular focus with this work is the potential for a playful interaction with Indigenous Māori in Aotearoa New Zealand. Since successful commoning practices rest on productive conversations, the outcome was gratifying.

Although the piece was successful, there are a number of improvements that could be made in the future. The development of the ability to automatically lock the gaze of the viewer to that of the avatar would be a major improvement. This will enable visitors to have the feeling that they are easily able to make direct eye-contract with the virtual avatar, and so reliably increase connection.

There have been suggestions about using machine learning to facilitate life-like conversations between the visitors and the volumetric video avatar of the host. This might be useful if ever such an experience is introduced into airports, museums or other public venues for short cultural exchanges. However, further layers of artificiality might run counter to a desire for an authentic experience of connection.

There is a an issue with the current haptic element, in its prototypical form, in that it does not offer a uniformly successful follow-through. This means that visitor experiences are somewhat haphazard. So there is an opportunity to explore future designs for the haptic elements. This is challenging though, and other researchers in the field drew our attention to failed attempts by other XR researchers to develop a haptic hongi experience.

Figure 13: Variable headset placement

The placement of the HoloLens 2 headset could also be improved. Currently it is quite variable as it can be tilted forward or back, or rotated left or right. The angle of the transparent visor and the position of the actuator can vary on different shaped and sized heads (see Figure 13). Since the latter is beyond the control of the developers, this will always create a range of audience experiences. This could be addressed by exploring different AR display options. The anticipated release of the Magic Leap 2 display, for example, could be a step in the right direction because it would make exhibition of *haptic* HONGI more flexible by masking backgrounds, therefore avoiding Tania appearing as a semi-transparent ghost. However, the high cost (USD $3,299) and the restricted potential to embed an actuator might be limiting factors.

Considering future research, we wonder when AR will become more user-friendly. What will newly developed headsets offer the experience? When will we be able to edit the volumetric data? When will it be more straight forward to synchronize the picture with the audio? What about the number of people excluded from the experience and the expensive and rare equipment and expertise required to develop such experiences as *haptic* HONGI. How can access to this technology become more democratic and widely available?

Taking into account responses from the visitors to *haptic* HONGI at Ars Electronica Garden Aotearoa, there seems to be a future for this technology in intercultural settings. This could include training diplomats seeking information about people they might encounter when they are posted to foreign countries, introducing visitors to a new people in place, and providing a safe interface between cultural opposites who need to find unity. Therefore, it has universal appeal because disparity between ages, genders, and worldviews has never been so great.

Maybe in this sense, the COVID-19 pandemic, while depriving us of human contact, helped us to define what sociability, conviviality and commensalism affords us, and how intercultural relationships can immeasurably enrich our lives.

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