Rethinking *qi* and Tai Chi through New Media Technologies

by Yutong Zheng

A thesis exhibition presented to OCAD University

in partial fulfillment of the requirements for the degree of

Master of Design in Digital Futures

Toronto, Ontario, Canada, 2021

Abstract

Due to its ambiguous nature, the Chinese cultural concept *qi* (also known as *chi*) can be confusing and misunderstood. By expressing *qi* through sound and haptics with the help of interactive technologies, this thesis project proposes a transcultural design approach based on the postcolonial notions of the "Contact Zone" and "Culture Hybridity", which can potentially rectify some misunderstanding of *qi* and Tai Chi in a sensual "language" with the aid of interactive technologies. Motion tracking, haptic technology, machine learning for gesture recognition and sound design have been used in this translation process to provide real time feedback and enable participants to understand *qi* in an interactive Tai Chi performance. With this work, I hope to open up new opportunities by using new media technologies as a bridge to understanding cultural arts and practices.

Acknowledgements

Throughout the writing of this thesis project, I have received a great deal of support and assistance. I would first like to thank my primary advisor Dr. Ashok Mathur and secondary advisor Professor Michael Poy Lee, whose expertise was invaluable in formulating the research questions and methodology. I have gained an incredible amount of knowledge from both of you and your valuable feedback pushed my thinking to a higher level. Your generous support on every aspect of the thesis has made it what it is today. I would like to express my gratitude to Professor Adam Tindale for enlightening me with the music knowledge used in this thesis and the technical help needed for the creative project. Your insights have added a whole new dimension to this thesis. I would like to thank CFC Media for their generous equipment support. I would also like to acknowledge Tai Chi practitioner Kelvin Ho who was willing to take part in this interactive Tai Chi performance for the thesis. Your performance and knowledge of Tai Chi has allowed me to present the creative project in its full capacity, even during COVID-19. In addition, I would like to thank my parents for their support during my studies and in general; I wouldn't be who I am today without you both. Finally, I could not have completed this thesis without the support of my friends, Masha Shirovoka, Priya Bandodkar, Rittika Basu, Nick Alexander and my boyfriend, Cunlu Zhou, who provided all sorts of help to my thesis project, as well as happy distractions to rest my mind outside of my research.

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Introduction

Qi is a Chinese cultural concept that can be found in Chinese traditional arts, practices, religions and literatures, such as Traditional Chinese Medicine, Tai Chi, Qi Gong, Taoist texts, and certain schools of traditional Chinese painting. Heavily dependent on the context in which it is used, *qi* is a concept without a stable meaning. It is suggested that the English word "energy" is the closest translation for *qi*, yet it does not encompass all the nuances of *qi* (Frank 223). It is perhaps this lack of exact verbal translation that has led to rather different understandings of *qi* overseas. It is not hard to notice from Hollywood movies that the perceptions of *qi* between the West and the East are rather different. The intention of this thesis is then to analyze why this is, and to explore an alternative expression of *qi* that can connect and bridge the understanding of this concept from the East and the West through similarities and familiarities. The use of interactive technologies in Western experimental music for biometric data sonification led me to seek out ways that interactive technologies could be incorporated into my thesis project in order to aid comprehension of *qi* — which carries a similar idea of biometric data — in a Tai Chi performance.

Engaging different senses of the body, interactive technologies in this project have established a transcultural expression of *qi* based not on words but embodied experiences that people of different cultural backgrounds can better relate to. By asking the first question "what are the contributing factors that have led to the misconception of *qi*?" this paper looks into Orientalization and theories of identity formation for answers in the contextual review. The perception of *qi* is a complex one, under layers of constructions by these factors. From this point, I set forth to find case studies related to the translation of *qi*, biometric data sonification in Western Experimental music, and cultural identity design creation to find design patterns that

could be borrowed and employed for the thesis project to use interactive technologies to create an embodied experience of *qi* in a Tai Chi performance that people across cultures can relate to. This exploration addresses the second research question: "how can the postcolonial notions of 'contact zone' and 'cultural hybridity,' deep listening and research-creation be used as design methodologies to create a cross-cultural translation of *qi*?" This question leads to the final and primary research question of the thesis, \ "how can new media technologies be used as a vehicle to reintroduce *qi* and Tai Chi and bridge the gap of understanding between people?" With a prototype that employs motion tracking, haptic technology, machine learning for gesture recognition and sound design to express the meaning of *qi*, this thesis proposes that new media interactive technologies possess the ability to bridge the understanding of *qi* and Tai Chi between people from different cultural backgrounds.

Scope

Firstly, I would like to acknowledge my own limitations of knowledge on the subjects of *qi* as well as Chinese Martial Arts. It would be misleading to present myself as an expert in Chinese concepts, Chinese language, Chinese Martial Arts and Chinese culture in general. Prior to this thesis, my knowledge in all of these subjects came from everyday experience and exposure to Chinese cultural concepts and products. My interest in these subjects arose when I noticed differences in how these concepts are perceived in Chinese and Western societies; I wanted to find out why this happened. Secondly, *qi* in this thesis is used as an access point to engage with perceptions of Chinese concepts, Chinese language, Chinese Martial Arts and Chinese culture in general. Therefore, this thesis is more concerned with the social and cultural constructions around Chinese cultural concepts and practices — including *qi* — than the

meaning of *qi* itself. Also, the complexity and fluidity of the meaning of *qi* makes it difficult to encapsulate all of its nuances within the scope of a graduate student thesis. As a result, this thesis is not a language study, but rather a cultural analysis. Furthermore, I understand using American culture and history to represent the West as a whole and using Chinese culture and history to represent the East is a reductive way of thinking and a gross generalization. However, my argument is that such generalization is a useful shorthand to represent my research findings and keep the findings inside the scope of this thesis. Finally, as someone of Chinese culture descent, I am aware that I am not free of the biases created by identity politics, which this paper will analyze. The process of conducting this thesis is an opportunity for me to recognize and acknowledge these biases.

Contextual Review

Qi, Taoism and Tai Chi

The meaning of *qi* and its relationship to Tai Chi and Taoism should be introduced briefly in service of the cultural analysis taking place afterwards. As an integral concept to Chinese culture, *qi* can often be found in traditional Chinese arts, practices, religions and literatures such as Traditional Chinese Medicine, Tai Chi, Qi Gong, Taoist texts, and certain schools of traditional Chinese painting. However, *qi* is a relative and propositional term that is open to many interpretations depending on context.

On one hand, *qi* can have a spiritual and metaphysical interpretation. The World Health Organization translates *qi* as "the basic element that constitutes the cosmos and, through its movements, changes and transformations, produces everything in the world, including the

human body and life activities." (18) In the Chinese religion Taoism, *qi* "may refer to a hidden spiritual creative force that gives birth to all that is, was, and will be. It is the vital life force gained by the act of breathing, and thereby the breath itself. All of life and existence are manifestations of *qi*" (Voigt). On the other hand, *qi* can have a physical interpretation. In Traditional Chinese Medicine, *qi* refers to the "refined nutritive substance that flows within the human body as well as to its functional activities" (WHO 18). Similarly, in the Chinese Martial Art Tai Chi, *qi* refers to the flow of energy in the body. The Tai Chi Martial Artist and Anthropologist Adam Frank suggests that in Tai Chi, the English word "energy" is closer to the meaning of *qi* than the dictionary definition of "vital force" or "breath," although "energy" doesn't encompass the nuances of *qi* (223). Moreover, this type of Chinese Martial Art is usually thought of having a Taosist origin. *Qi*, Taoism and Tai Chi are three Chinese cultural products that are closely intertwined with each other.

It's worth mentioning that although the meaning of *qi* can both be physical as well as metaphysical, modern usage of the word largely falls under the physical interpretation. I will then focus on this aspect, and take on "energy" as the meaning of *qi* throughout this thesis. Even though this will undoubtedly narrow the meaning of *qi*, it will enable *qi* to have a stable meaning. Not only does this limit the complications of translating a more multifaceted meaning of it, which potentially can cause more unintended problems, but the metaphysical interpretation of *qi* is not completely left out of the picture, as the usage of "energy" can often point to metaphysics. Furthermore, as Walter Benjamin argues, the best translations are transformations, as transformation allows for the renewal of a living thing (155). This transformation will enable a new and more understandable angle on the concept, which I feel positive about.

Western Exposure

Mass Western exposure to *qi*, Taoism and Tai Chi can be traced back to the countercultural movements of the 1960s. With the US government's continuous expansion of the extensive military intervention in Vietnam, in conjunction with civil rights movements, feminism movements, and public rejection of consumerism and capitalism (Hollander 25), anti-establishment countercultural movements formed in the 1960s. Supporters of these countercultural movements criticized American capitalist modernity for being "far too puritanical, joyless, acquisitive, competitive, achievement-oriented, rationalistic, and unspontaneous," and Americans for being "insufficiently in touch with their feelings" (Hollander 26). As a result, they turned to Eastern religions and philosophies to find more organic alternatives to the Western profit-driven and machine-like capitalist institutions and ideologies (Clark 131; Heath and Potter 5). The exotic nature of Eastern religions and philosophies equipped them with more charm during the countercultural movements. For many people, the choice to adopt these regions is in fact a statement made about themselves that consciously placed capitalist industrial establishments outside of these individual choices and acted as a counter force to the industrial establishments.

Later, the countercultural movements of the 1960s spawned " New Age spiritualism, therapeutic self-help movements, and mass consumer marketing of alternative culture in the 1970s" (Greene). It later lost much of its anti-modernist and culture-critical character and became a socially accepted phenomenon (Höllinger 289). It should be noted the main discourse of New Age is self-help, rather than religious conversion (Lee 91; Redden 652). Despite their interest in Eastern religions, New Agers do not necessarily have to stay loyal to given teachings, practices or traditions; rather, Eastern religions are means to achieve self-realization and

individualism (Reeden 656). Hess suggests that beyond religions, New Agers are also interested in alternative science, modern psychology, Eastern culture, therapy, healing, ecology, organics and "all things natural" (4).

Consequently, Taoism, Tai Chi and *qi* quickly gained popularity under the lingering influence of the counterculture movements of the 1960s and the New Age movements from the 1970s. In stark contrast to dominant Western religions, philosophies, ideologies and worldviews, Taoism — a religion and philosophy of the present, the natural, the ecological, and the ethical relation to others — stood out among others as a genuine alternative to Capitalist modernity (Bowman 92). Tai Chi, a Chinese martial art that embodies Taoist philosophies, quickly attracted the attention in the West among other Eastern things. People were drawn to Tai Chi due to the romanticized notion that it is an embodiment of ancient wisdom that is more authentic and holistic in nature, as opposed to the short-term, profit-driven ideologies of capitalism. Frank suggests that many foreigners who travel to China to learn martial arts are in search of not just skills, but of ancient wisdom (207). For them, by practicing Chinese Martial Arts, they can acquire embodied knowledge of, and a sense of intimacy with, otherwise distant wisdom and philosophy from centuries ago (Frank 40). Additionally, *qi* gained popularity through Traditional Chinese Medicine as a type of alternative science. *Healing and the Mind: The Mystery of Chi* in the 1990s was one of the first documentaries to introduce *qi* to many people in the West for the first time. In the documentary, Bill Moyers travels to China to explore what this new word means and witnesses *qi*-related things with the audience, including a brain tumor operation using acupuncture as the primary source of anesthesia while the patient is completely conscious and awake. Compared to its Western counterpart, the traditional Chinese medical system evidently seems more wholesome, natural and organic, with the use of

herbal or acupuncture treatment over the industrial streamline-produced chemical drugs. As a result, *qi*-related traditional Chinese practices, including Tai Chi, Qi Gong, and Traditional Chinese Medicine, gained more relevance in Western societies.

Ironically, although originally intended as a counter force to capitalism in Western societies, mass consumer marketing in fact turned Eastern philosophies and practices as instruments that reinforce capitalist practices. Far from being alternatives to capitalism, philosophers such as Peter Sloterdijk and Slavoj Žižek proposed that "Western Buddhism" and "Western Taoism" are the hegemonic ideologies of Western consumer society (Žižek 12). Bowman suggests that "consumerism and *feng shui* can be brought into alignment quite easily, via ideas like de-cluttering, deep-cleaning, updating, going 'out with the old, in with the new,' and refreshing and reinvigorating by buying new stuff" (97). Marketers packaged up Eastern philosophies and practices and sold them to New Agers as the solution to their modern problems. Even though people are not able to avoid the chaotic work life and financial pressure in modern capitalist societies, through things such as meditation and ancient remedies they can take off on a spiritual journey to be in touch with the "truth" of themselves, obscuring the fact that their work life is, in reality, their "real" life.

In his survey of several health food stores and supermarket health food sections in Austin, Texas, Frank found several products that implicitly or explicitly mentioned *qi* in their name even though the products didn't go into much detail to explain how *qi* worked in the products, but rather used "Americanized ways of talking about the body" or "References abound to 'energy,' 'muscle building,' 'weight loss,' and 'weight gain'"(231). Similarly, during my research, I also stumbled upon an online store named *Qi Natural* in Canada that sells a wide range of personal care products, from supplements to skincare. Despite the use of *qi* in the

name, there is no other mention of *qi* in their products. The marketing strategy makes the brand seem more organic and healthier compared to its competitors. It seems to suggest a different lifestyle to consumers, which in reality is not different. Yet with the use of exotic terms like *qi*, the strategy aims to alter people's perception of reality and seems to promise a healthier lifestyle from their products. Frank suggests that New Age *qi* discourse feeds on this type of romanticization (44).

Hence, the Western discourse of *qi*, Taosim, and Tai Chi under these social movements and marketing practices is an irrational one. Counterculture movements constructed a romanticized idea of Eastern ancient concepts, philosophies and practices as miraculous cures for the wrongdoings of modern capitalism, and this irrationality and romanization was carried forward to New Age. New Age has received criticism for representing a step backwards from modern rationality, towards pre-modern, irrational thinking, and an abandonment of the responsibility of the individual (Höllinger 29, Beit-Hallahmi 97). The irrationality behind these counterculture movements also led to anti-rationalism and the celebration of mental illness as a form of rebellion from the rigidity of the establishments by interpreting psychotic episodes as spiritual journeys (Metller 171). This irrationality and craze towards anything in opposition to the establishment perhaps contributed in part to the misunderstanding of *qi* in Western societies. It can be said that the irrational discourse about *qi* occurred due to the fact that interest in Eastern philosophies and practices arose less from an actual understanding of Eastern philosophies and practices themselves, and more from their perceived opposition to Western capitalist establishments by these movements.

The live action film *Mulan* (2020) provides some evidence for the lack of understanding of *qi* in Western societies. The legend of Mulan is one of the earliest feminist stories in imperial

China that celebrates the bravery of females under a patriarchal society. It is the story of a loving daughter who disguises herself as a man and takes the place of her father, who had been drafted to the army to defeat the invading Rourans. Yet throughout the film, *q*i is presented as a supernatural power used to win the war, which also defines the final victory in the movie. The original text of Mulan barely mentions *qi*, let alone centering it as a defining element for the victory of China in the battle. Secondly, *Mulan* gendera *qi* in the film as something that only men can wield, in order for it to be better suited to a feminist story from a Western point of view. This notion of *qi* hardly exists in Chinese culture, considering Traditional Chinese Medicine regards *qi* as the energy flowing through everyone's body. Moreover, the villain witch character in the movie that takes people's *qi* is also a very Westernized convention - "a woman who can do magic and is ostracized by society because of it" (Zhao). In traditional Chinese culture, women who can supposedly do magic are shamannesses and soothsayers rather than witches, and are usually highly respected due to their service in their community. Finally, from a Chinese perspective, *qi* is cultivated more within oneself through exercises than taken from others. The misuse of *qi* in *Mulan* in a Chinese feminist story that hardly has anything to do with *qi* shows some misunderstanding of *qi* as well as in Chinese culture in general, making the story rather baffling for a Chinese audience while obfuscating the existence of *qi* among the non-Chinese audience. From the above analysis, it can be said that the understanding of *qi* in Western perception has already shifted away from its original meaning.

Identity Politics

In China, a different type of social and cultural construction around traditional Chinese culture makes the comprehension of concepts such as *qi* and other Chinese practices harder to

access by non-Chinese people. Over the past three decades, as the country fervently pursued economic success, traditions often had to give way to modernity in China to meet the country's economic goals. In recent years, the diminishing of certain traditional Chinese arts and practices, paralleled by the lack of interest and awareness in them in the general public brought the side-effects of China's whole-hearted pursuit of modernity to light. This triggered a strong turn by some towards traditional Chinese cultural products that had been long neglected both as an attempt to preserve their unique cultural value, as well as a resistance to the homogenizing effects of modernity on indigenous cultures. Rey Chow suggests that passion towards "primitives" is the effect of a cultural crisis about identity and roots resulting from the traumatizing effects of modernity and post-modernity (22). In an age where Chinese people's culture and lifestyles go through violent transformations, one can easily feel disoriented and out of place. These traditional cultural products therefore become safe shelters that provide people with stability, familiarity and a sense of belonging. While many Chinese people might not have a deep knowledge of these traditional Chinese cultural products, their passion towards them derives from the notion that these products represent what it means to be "Chinese." Thus, people develop a sense of ownership towards these traditional cultural products.

This construction of "Chineseness" around traditional cultural products can lead to an exclusion of people from different cultural backgrounds. In his book *Taijiquan and the Search for the Little Old Chinese Man: Understanding Identity Through Martial Arts,* Adam Frank tells of an incident that provides valuable insight into this phenomenon. He describes the Tai Chi practices he had with his three Chinese Tai Chi teachers as experiences of negotiating identities. As a Caucasian practicing traditional Chinese martial arts, he was constantly reminded of his foreign identity by the friendly smiles or curious looks from strangers due to the uncommon

sight of a foreigner practicing Tai Chi. However, he would also completely forget about his foreign identity as he and his teachers became more deeply involved in practicing the Tai Chi moves, when he assumed his teachers looked beyond his foreign identity. What eventually disrupted this assumption was when he was shown by his second teacher a set of basic exercises which he had never seen before, and the teacher told him these moves were generally not taught to foreigners. He was in shock because he thought his previous teacher looked beyond his whiteness (Frank 78). This incident provides a critical viewpoint of the identity politics that inflect traditional Chinese cultural products in China's current cultural crisis. In the age of modernity, traditional cultural products become instruments with which unique Chinese cultural identities can be constructed, distinguishing Chinese culture from other cultures and Chinese people from people of other culture origins, as these cultural objects are regarded by some people as the last bits of culture that are truly and purely Chinese. Frank's foreign identity evidently disrupts this identity construction process. By refraining from teaching Frank everything about Tai Chi, Frank's former Tai Chi teacher was in fact solidifying Tai Chi, like other traditional cultural products, as a site for the provision of cultural belonging. By rejecting Frank's full involvement in Tai Chi practices, Frank's teacher was attempting to preserve his own unique cultural identity through Tai Chi.

The same type of identity politics through the exclusion of foreign identities also occurs when Chinese people see misinterpretations of Chinese concepts and culture by foreign identities. With Hollywood movies' misrepresentation of *qi* and Chinese culture such as *Mulan (2020)*, Chinese audiences developed the notion that foreigners cannot truly understand Chinese culture and concepts. Interestingly, knowledge and understanding are not necessarily what sets off the inclusion and exclusion processes. From my own experience, a lot of the people

criticizing Hollywood's distortion of Chinese history and culture do not have a comprehensive understanding of Chinese history and culture themselves. Many Chinese people, including myself, make mistakes about certain facts in Chinese culture, yet we often are unable to see them due to our cultural background. By being Chinese, we somehow automatically know everything about being Chinese. Undoubtedly, this type of bias can not only create mistakes in the understanding of Chinese culture, but also deny access to non-Chinese people who wish to understand Chinese culture more.

Qi: An Orientalized Perception

The discourse of Chinese culture, including *qi*, Tai Chi and Taoism, carry with them a certain degree of bias both in the West and in China. The Western romanticization of traditional Chinese philosophies and practices stem from Orientalism. Edward Said argues that Orientalism is a framework that the West established through which the East will be filtered (6) rather than an accurate portrayal of what the East is. *Mulan* presents viewers with an orientalized perception of *qi* and China by presenting *qi* and Chinese culture filtered through Western stereotypes. Historically, the West has positioned the East as the Other, which is the "lifeforce of Western self-identification" (Sardar 13). With Orientalist practices, the East is usually represented as mysterious, exotic, and irrational, in order to reinforce the notion that the West is normative, scientific, and rational (Echtner and Prasad 667; Said 150). It is why *qi* takes on an irrational quality in Western perceptions and why *qi* is portrayed as a supernatural power in *Mulan.*

However, Orientalism is not a one-sided relationship. Arif Dirlik suggests that the East does not only passively accept the power exercised on them by the West, but also actively

engages with Orientalism to form a representation of themselves, a process defined as Self-Orientalization (101). Self-Orientalization reflects the influence of Western perceptions of the East on the East's self-imaging process. Occasionally, the East even constructs an ancient and mysterious image of itself to represent the richness of its history. However, this can lead to myths about Chinese culture to pass off as history. Paul Bowman, a martial arts scholar, argues that much of the ancient history and philosophy about many Asian martial arts is fabricated (923). For example, the legend of Zhang Sanfeng, who is supposedly the inventor of Tai Chi, doesn't have any grounding historical evidence. However, people often permit myths and fantasies about Eastern culture to persist because being exotic, mysterious and irrational is what is expected of Eastern culture. It's as if the more exotic, mysterious and irrational they are, the closer they are to being truly authentic. This can also cause Eastern concepts to seem even more mystifying.

Self-Orientalization also appears when China constructs a unique identity as a country, one where modernity and tradition find ways to coexist (Yan and Santos 306). While modernization is still placed in the center in the society and traditions are made to find spaces around it to exist, traditions are nevertheless essential to represent Chinese identity. Traditional cultural products become the instruments reserved for the natives to represent the uniqueness of their cultural identity through certain degrees of exclusion of other cultural identities. However, this practice not only makes Chinese concepts such as *qi* and Chinese culture more incomprehensible to non-Chinese people by denying their access to the culture, but it also solidifies the gap of understanding between Chinese people and non-Chinese people. Additionally, this practice can lead to essentialism.

The problems of Orientalism and Self-Orientalization lie in the segregation of the West and the East as two separate entities. Orientalism neglects the role that the East that has played in the successful modernization of the West, and the aspects of Western modernity that have been integrated to the East. The East and the West are, in reality, two very connected cultural entities. The irrational thinking derived from Orientalism by both the West and China can lead to misperceptions and misinterpretations about Chinese cultural concepts and practices. Conventional, Orientalized ways of treating Chinese culture and concepts such as *qi* should be discarded, and a new way of viewing Chinese culture and concepts that connects these two cultural entities should be sought, in order to eliminate misconceptions. This thesis will find a new way of talking about the Chinese cultural concept *qi* that connects the two cultural entities, using it as an example that can be adapted to more Chinese cultural concepts and other Chinese cultural products in general.

Case Studies

Yan Fu

Yan Fu, a Chinese scholar that travelled to the West to learn about Western schools of thought, among many others in the last century, provided a valuable answer to this question. Yan attempted to break the ambiguity of Chinese culture by grounding Chinese thought in Western science and logic. In an attempt to adapt Western scientific thought to Chinese concepts, he presented a new explanation of *qi* as basic physical particles with "reverse analogical interpretation" (Zeng 101). Even though his philosophical effort received criticism for losing the "internal spirit of indigenous Chinese philosophical concepts" and overlooking

the differences in the conceptual models of different cultures, his effort connected concepts from different cultures and did manage to give *qi* a stable meaning by "explaining Chinese learning with Western culture" or "speaking Chinese language in a foreign way" (Zeng 113). His effort provides an access point for this thesis to create the desired cross-cultural communication of the Chinese concept of *qi* by creating connections between Western and Chinese scientific systems.

Cerebral Interaction and Painting

Cerebral interaction and painting is an artistic piece by Yiyuan Huang and Alain Lioret that communicates the idea of *qi* by mapping different types of brainwaves to different attributes of Chinese painting on a digital display through human-computer interactions. The artists chose to use brainwaves — a form of energy in the body — to represent *qi*, and used the *qi* of the body to control the *qi* on the painting. The presentation of *qi* in Chinese painting is often demonstrated through the atmospheric environment that represents a place endowed with the fine spirits of the universe. This project allows the user to wear a commercial product called EPOC (Emotiv Inc.) to capture and use the user's brainwave data as a control mechanism for digital Chinese painting creation. After training the mind, the user will be able to cause different elements of Chinese painting to show up on the screen through *qi* their brainwaves. Different elements on the painting add to the overall atmosphere that defines *qi* in the painting. *Cerebral interaction and painting* enables an interesting interaction between the user and the digital Chinese painting, connecting the *qi* of the human body with the *qi* of the universe portrayed in the Chinese painting. This interaction can potentially create an understanding of the human-nature connectivity of *qi* through an embodied experience of *qi*. The use of EEG data to express

qi also carries the spirit of Yan's attempts to integrate Western and Chinese scientific concepts. *Cerebral interaction and painting* pushes Yan's attempt one step forward by using interactive technologies instead of words to express *qi*. The embodied experience can create a more dynamic understanding and break the limitations of translation, allowing people to receive more information about *qi* and creating experiences they can personally relate to. Huang and Lioret's paper also proposes the potential use of wearable technology in future explorations of this topic, which this thesis paper will carry out.

Music for Solo Performer

Alvin Lucier, an American experimental musician and sound installation composer heavily influenced by Western science, dedicated most of his works to the exploration of acoustic phenomena and auditory perception. A lot of his works experiment with the physical properties of sound itself, including the resonance of spaces and the transmission of sound through physical media. Sitting alone in a room of percussive instruments with electrodes attached to his head as the sound control mechanism, *Music for Solo Performer* is an iconic image of artistic biometric data sonification (Straebel and Thoben 17). The electrodes attached to Lucier's head collected the brainwaves, which were natural electromagnetic soundwaves. These natural electromagnetic soundwaves were then amplified through massive speakers, which excited the percussion instruments via sympathetic vibration.

In the history of Western experimental music, *Music for Solo Performer* is one of the first artworks that transmitted natural human body energies into audible musical forms. It explored the translation of inaudible brainwaves into something perceptible to human ears through the use of electrical amplifiers and acoustic musical instruments. This example of the

translation of imperceptible human energy into more concrete forms of energy such as music can be adapted for the translation of *qi* for this thesis project, as *qi* has a similar meaning.

Nami

Nami, designed by Sara Sithi-Amnuai, is a digital instrument based on African American music and gesture repertoires. As "(o)ur bodies internalize learned cultural etiquettes, movements and experiences through sense, sight, and feel affecting the way we relate to our instruments and tools" (Sithi-Amnuai 559). *Nami* is an instrument intended to connect with and extend the designer's cultural body. A cultural body refers to a body-subject that speaks of and to cultural practice and history through embodiment (Ahmed and Thomas 4). By performing gestures that carry cultural significance, cultural identity is created and extended through the musical instrument in *Nami*.

Figure 1. Nami in performance

As an artwork that explores one's cultural identity, *Nami* sheds light on the function of the body as an access point to a culture. Considering the intention of the thesis to establish an access point to Chinese culture and the fact that *qi is* a concept closely related to the body, the cultural body-object proposed by Sithi-Amnuai becomes indispensable for one's entry point to the concept and the culture. This thesis project intends to carry forward the use of the body-object present in *Nami* and furthers its function as means to not only connect with someone's culture, but also to bridge cultures.

Methodology

"Contact Zone" and "Culture Hybridity"

Yan Fu's effort to Westernize Chinese philosophies is in fact what postcolonial theorists call "transculturation." Pratt refers to "transculturation" as a phenomenon that occurs in the "Contact Zone," where subordinate groups create representations of themselves by inventing and selecting from the materials provided to them by the dominant group. The "Contact Zone" suggests an asymmetrical power relationship when the subordinate group meets the dominant group (Pratt 36). This phenomenon also existed in Yan's translation process of *qi*. Yan lived in an era of chaos and warfare in China, during which it was invaded and subjected to unfair treaties by industrialized foreign nations (including Europe, Japan, and the United States) due to the mismanagement of the Manchu Government. It was an era when Chinese scholars realized the advancement of industrialized countries and attempted to learn from their advanced schools of thoughts. Yan's attempt recognized the dominant position of Western science and tried to

make Chinese science more relevant through the integration of Chinese and Western concepts. Through this integration, he directly confined conception of *qi* inside the realm of science.

China today no longer faces the asymmetrical political power relationship as it was facing in Yan Fu's time, yet Chinese culture faces another challenge. Stuart Hall suggests the meaning of "the West" is identical to the word "modern" (142). With China's transition into modernity, many aspects of Chinese culture were replaced by Western ones. Similarly, for many non-Western societies, modern Western lifestyles are an aspiration (Hall 141). A homogenizing effect on local cultures can happen during this globalized transition to modernity. Wang Ning argues that "globalization is essentially global homogenization in terms of American values and standards" (32). While this claim overlooks the resistance behind many non-Western cultures during this process, it does reflect the asymmetrical relationship between non-Western cultures and Western cultures regarding their positions in the world nowadays. Many non-Western concepts are slowly disappearing. Western concepts are placed at the center, and non-Western concepts are less relevant in the world as a result, taking a peripheral position. Furthermore, it is suggested that non-Western people learn and inquire about another non-Western nation and its identity via Western cultural representation (Turan et al 56). The misinterpretation of Chinese concepts such as *qi* in Western media can also lead to a misunderstanding of the concept among other non-Western cultures, causing more problematic situations for such concepts in the modern world.

Because this asymmetrical cultural relationship exists between non-Western culture and Western culture, this project takes on the "Contact Zone" approach as a design methodology and uses *qi* as a cross-cultural translation example, integrating this Chinese concept with Western concepts as Yan did. This way, this attempt can make more non-Western concepts such

as *qi* more relevant in the modern world. Postcolonial theorist Homi Bhbha argues the hybridity of two cultures possesses the potential to subvert the power relationship between the dominant and subordinate groups (62). This methodology can also give culturally marginalized groups some amount of power to rectify the misrepresentations others have made of them. This becomes the essential key with which this thesis will engage with some of the misrepresentations and misconceptions of *qi* discussed in the contextual review section of the paper. By adopting Western "vocabularies," Chinese culture concepts such as *qi* can be explained in a "language" that most people find familiar with and can relate to.

Since "Contact Zone" and "Culture Hybridity" design methodologies have the potential to rectify the misrepresentations about *qi* by adopting Western "vocabularies," what becomes essential in order to tackle the intended cross-cultural communication is to find the Western "vocabulary" that best captures the meaning of *qi*. Consequently, the cases studied above can provide valuable insights on the use of interactive technologies to communicate the idea of *qi* or other forms of body energy through more embodied experiences such as digital painting or sound. Compared to language, interactive technologies have the advantage of creating dynamic and embodied experiences, and as such are the Western "vocabularies" that this creative project will borrow from. These embodied learning experiences may allow a more personal understanding of these concepts to emerge.

Deep Listening

Deep Listening is a practice developed by the American Experimental Music Composer Pauline Oliveros "intended to heighten and expand consciousness of sound in as many dimensions of awareness and attentional dynamics as humanly possible" (Oliveros xxiii)

"Deep" in Deep Listening refers to breaking the boundary of habitual listening behaviors. As urban living is oversaturated with sounds, most people have developed a habit of discarding the sounds that are not deemed of value. Oliveros proposes that sounds carry intelligence which can trigger ideas, emotions and memories (xxv). If one becomes too narrow in the awareness of sound, disconnection from the environment can happen. Deep Listening practice aims to develop a listening behavior that captures as much of this neglected information as possible. *Music for Solo Performer* is in fact a deep listening practice within Western experimental music. The sonification of human energy enables people to see the neglected fact that brainwaves, which are natural electromagnetic soundwaves, are in fact a form of natural music.

As an impartial listening practice, Deep Listening is not only intended to expand the awareness of neglected sound, but also the awareness of neglected information, leading to deepened understanding. As it is the intention of this thesis to create understanding in Chinese culture, Deep Listening becomes a methodology worth exploring. For this thesis project, this methodology can be adapted and applied to bring forward some of the neglected philosophies behind *qi*, using sound as an aid to understanding. Interestingly, to create a heightened awareness of sound, Oliveros in fact integrated *qi* cultivation practices such as Tai Chi and Qi Gong as well as some Taoist exercises for the expansion of consciousness.

Moreover, Oliveros suggests that to create deep listening, one should engage the whole body to receive as much information as possible (15). Ceraso also argues solely relying on auditory perception to listen is in fact an adopted phenomenon, and that multi-sensory listening is a more natural way of listening (102). The percussionist Evelyn Glennie is one of the most famous practitioners of multi-sensory listening. She has been profoundly deaf since the age of twelve. During her performances she usually plays barefoot to feel the music better. Feeling the

sound with her body enables Glennie to develop a deeper understanding of how the force of sound is hitting and transforming her body, allowing her to create a connection with the environment (Ceraso 108). In deep listening, receiving information with the whole body can increase understanding. What's interesting is that Adam Frank also mentioned that during his push-hand practices with Tai Chi masters in China, he would feel a slight vibration through the skin of his hand when he was in contact with the Tai Chi master's hand (82). The experience was regarded as the flow of *qi*, which he referred to as "sensing a sound without actually hearing it" (Frank 82). By listening to *qi* with his body, Frank gained a deeper comprehension of this foreign concept.

From the analysis from *Nami,* we understand that the body can be an entry point to an unfamiliar culture. Engaging the whole body to listen to *qi* can create an even more impactful cross-cultural learning experience. This understanding led haptic technology to be explored to express the idea of *qi* in this thesis project. Studies have shown the use of haptic technology in learning-based virtual reality games can enhance understanding through the engagement of different senses (Moreno and Mayer 310; Guo and Guo 307; Deng et al 20). Moreover, it is suggested this type of multimodal experience can eliminate ambiguities about the subject in learning experiences (Sundar 81; Sun and Cheng 664; Wang et al 497). Even though these studies were undertaken for virtual reality games that were designed to teach certain skills rather than to translate cultural concepts, it is sufficient to argue that employing haptic technology through vibration to translate *qi* onto the body can allow people to gain a deeper comprehension of *qi*, disambiguating it through direct body experiences. The participant receives and listens to information about *qi* through feeling the vibration on their body.

Research-Creation

Because the creative process holds as much weight as the literature review in the creation of a complete study of the attempt at a cross-cultural translation of *qi*, the last methodology this project employs to investigate the proposed research questions is research-creation. It is suggested that "research-creation projects typically integrate a creative process, experimental aesthetic component, or an artistic work as an integral part of the study" (Chapman and Sawchuk 6). While the literature research provided Orientalization and identity politics as answers to the research question, "what are the contributing factors that have led to the mystification and misconception of *qi*?" the creative project becomes the vehicle to investigate solutions for creating a translation of *qi* that bridges different cultures. As suggested earlier, interactive technologies may create a better understanding of *qi* through embodied experiences people of different cultural backgrounds can relate more to compared to words. As a result, a prototype will be designed using interactive technologies to translate *qi* with sound and haptics. The creative project is integral to this thesis, examining how successful new media technologies can achieve cross-cultural understanding. Tai Chi, a *qi* cultivating exercise, was chosen as a carrier of the cross-cultural communication of the meaning and philosophy of *qi*. By performing Tai Chi, the idea of *qi* will be translated with interactive technologies. This leads to the final and the primary research question, "how can new media technologies be used as a vehicle to reintroduce *qi* and Tai Chi and bridge the gap of understanding between people?"

Methods

To answer the primary research question, a number of methods have been developed to be conducted in sequence. A prototype based on the aforementioned design methodologies is developed which possesses the potential to create a clear and cross-cultural translation of *qi*. Originally, a user testing session was planned for participants to test out the prototype and examine the effectiveness of cross-cultural communication before the final exhibition of the performance. A questionnaire was designed that included questions about participants' perceptions of *qi* before and after engaging with the prototype, and how they might improve on the prototype to help communicate *qi* even better. The questionnaire was intended to gather feedback about the prototype from participants for improvement before the final performance exhibition. Unfortunately, with the pandemic restrictions and constantly changing lockdown rules in Toronto in 2021, I was unable to officially conduct user testing for this thesis.

Despite this limitation, I was still able to gather valuable feedback by showing video demonstrations of this project to people, which will replace the user testing and questionnaire discussed above. One Tai Chi practitioner that showed interest in my project and agreed to be in the performance of this project shared insightful comments on it, too. His feedback, together with a few others, will be evaluated below to discuss the potentials and limitations of the project.

Prototyping

As suggested in the methodology section, the design of the prototype adopts new media interactive technologies as the "vocabulary" to present *qi* in a new light through sound and

haptics. The project takes the form of a Tai Chi performance, involving a Tai Chi practitioner to express *qi*, and a participant to feel *qi*. One Tai Chi learner suggested to me during my research that *qi* in Tai Chi is knowing how to use force smartly in motion and movement, so experienced Tai Chi practitioners can use one ounce of strength to combat something of ten times more. Tai Chi practitioners would spend hours every day training the coordination of the body to be able to balance the forces in their gestures. As *qi* in Tai Chi is often manifested through force and motion, the project chooses to use the force and motion in Tai Chi gestures to express the idea of *qi*. The flow of the project can be visualized in *Figure 2*. A Tai Chi practitioner performs Tai Chi in front of a motion capture device. Their motion data is analyzed and transformed into sound and haptic feedback through computation in real time. A participant wears a haptic vest to sense the haptic feedback and hears the sound back through speakers to receive these innovative expressions of *qi*.

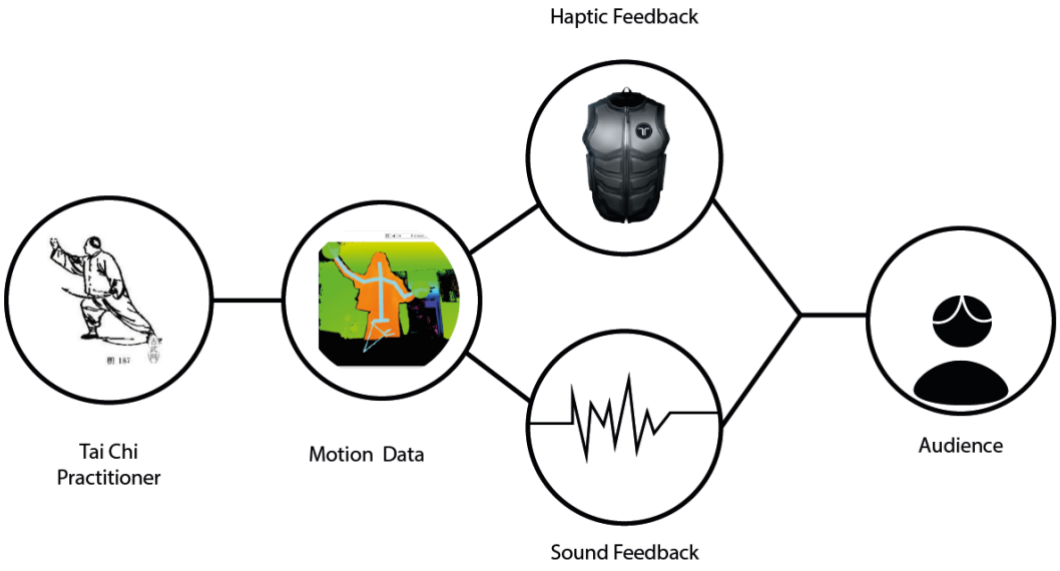


Figure 2. Transforming motion into sound and haptic feedback

Figure 3. Performance Demonstration

The aim of this thesis is not to create a complete art project that captures all the gestures of Tai Chi for the translation of *qi*, but rather to employ the proposed design methodologies through a handful of Tai Chi gestures and test whether these methodologies can actually achieve the cross-cultural communication they are said to be able to create. If the results are positive, this project will provide valuable insight to artists who attempt to create similar cross-cultural designs. Only three Tai Chi gestures have been selected for demonstration purposes. The three chosen Tai Chi gestures are named *"青龙出水" (Figure 4)*, *"白鹤亮翅" (Figure 5)* and *"野马分鬃" (Figure 6)*. For the clarity of this thesis, I will translate them as "*Dragon Out of Water,"* "*White crane spreading wings," and "Wild horse parting hair,"* respectively.

Figure 4. “陈氏太极拳青龙出水” “Chen Style Dragon Out of Water”

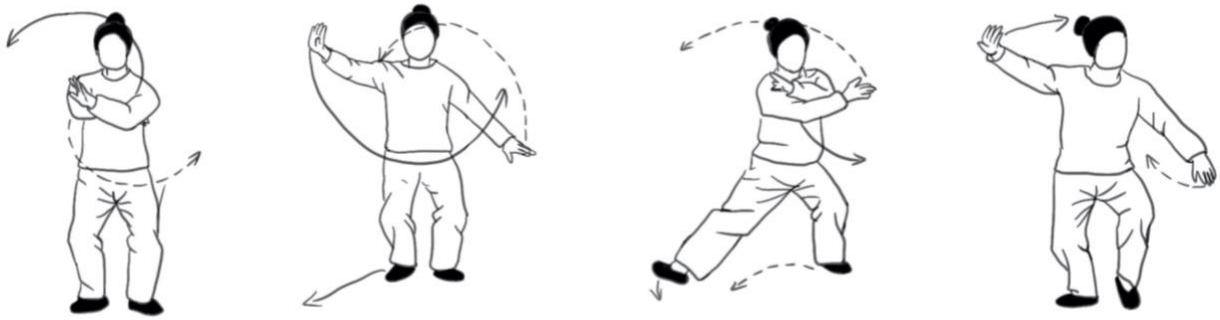


Figure 5. “陈氏太极拳白鹤亮翅” “Chen Style White Crane Opening Wings”

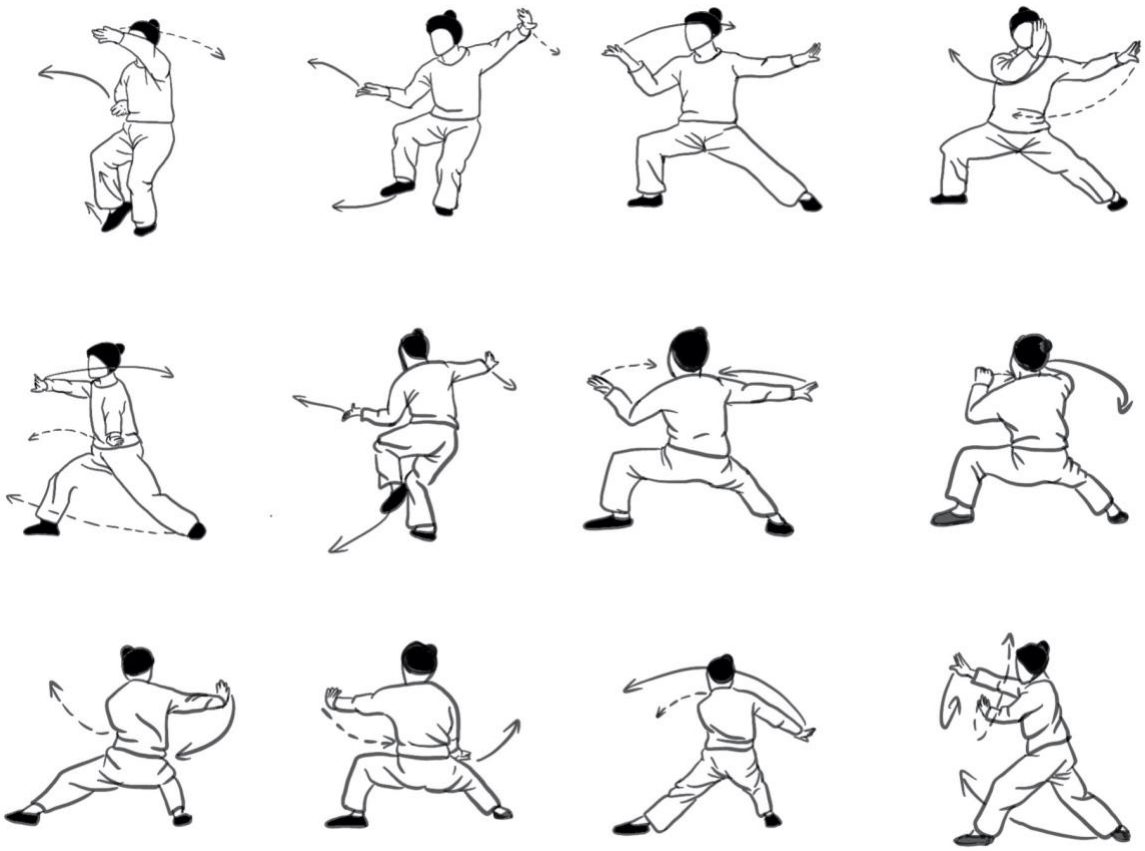


Figure 6. “陈氏太极拳野马分鬃” “Chen Style Wild Horse Parting Hair”

Sound Design

The philosophy of *qi* indicates that through its movements, changes and transformations, *qi* connects all the life activities in the world, suggesting a connection between human and nature. This philosophy can also be found in these Tai Chi gestures through the imitation of activities in nature. Tai Chi poses often symbolically mimic activities in nature to reflect the connectivity of humans and their environment, as one can see explicitly from the translation of the three selected Tai Chi poses. Vilem Flusser suggests that to understand gestures, we must

understand their significance (2), and the significance of the gestures in Tai Chi lies in the inspiration from nature.

With the Deep Listening methodology, the sound design intends to bring forward the sometimes-neglected philosophy behind *qi* and Tai Chi to aid the understanding of them. Sound effects of oceans, cranes, and horses have been mapped to "*Dragon Out of Water,"* "*White crane spreading wings" and "Wild horse parting hair"* respectively, using a machine learning gesture recognition system. The gesture-sound mapping allows the connections between these Tai Chi gestures and the natural activities they were inspired by to become clearer to the listeners. Flusser believes that listening to music is essentially a gesture where the body adapts itself to the message and where the listener's mind meets the mind of the messenger (115). The prototype aims to introduce the minds of the participants to the philosophy behind Tai Chi while listening to the sound design.

Haptic Feedback Design

Since the project chooses to use the force and motion of Tai Chi gestures to express the idea of *qi*, haptic technology is used to translate the gestures of a Tai Chi practitioner onto someone's body based on the deep listening methodology of engaging the whole body to listen to *qi* for a deeper understanding. As *qi* in Tai Chi is knowing how to use force smartly in motion and movement, haptic feedback should closely mimic the force and motion in Tai Chi gestures to reflect the idea of *qi* through gestures to be felt on someone's body. bHaptics TactSuit x40, a commercial haptic vest usually used for VR games to give real-time feedback based on the actions in the game, has been adapted for the purposes of this project. The front and the back of the vest each have 40 haptic points that can deliver varying degrees of vibration. These 80

haptic points are used to deliver haptic patterns that mimic the motion and force of the Tai Chi gestures for people wearing the vest to feel through their body.

bHaptics Designer *(Figure 7)* is a website where people can create customizable haptic designs for bHaptics TactSuits by creating a haptic pattern through the connection of dots, each of which visually represents a haptic point on the vest. The intensity of the vibration of the haptic points can be adjusted. This functionality allows the haptic feedback to imitate Tai Chi gestures more closely. If the Tai Chi performance gesture is a soft and slow one, the intensity of these haptic points can be designed to be lower. If the performance gesture is a fast and sharp one, the intensity of these haptic points in the design can be raised. Options to fade the intensity in and out to layer the design patterns are also available, which can be utilized to more closely mimic the force and the motion of Tai Chi gestures. This allows the haptic feedback to further materialize the abstraction of *qi*.

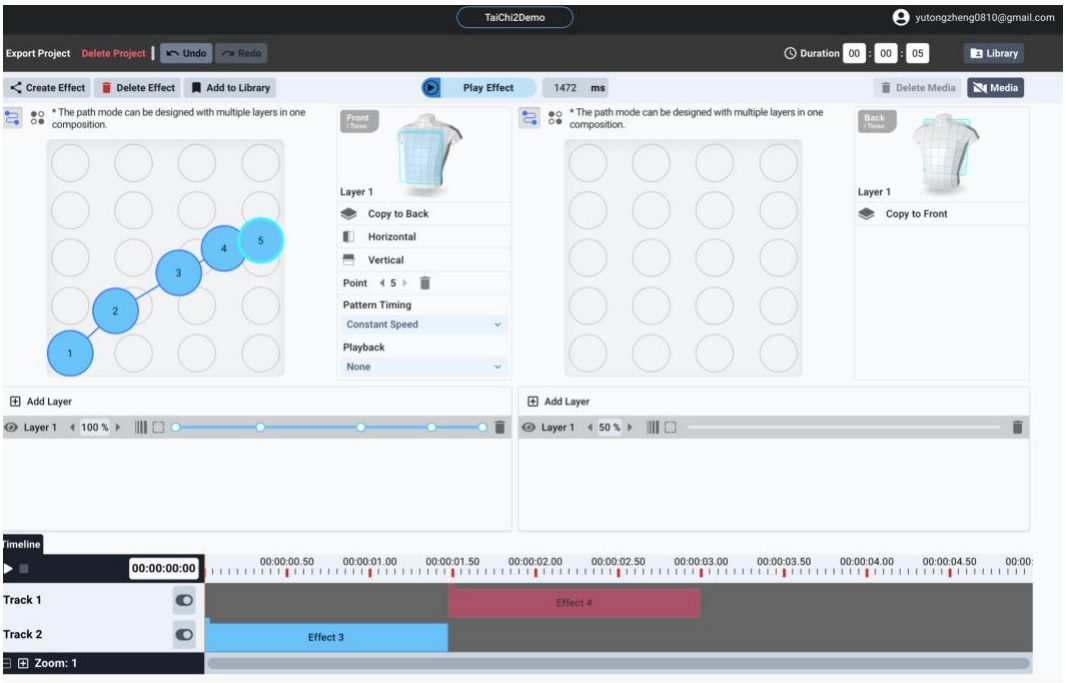
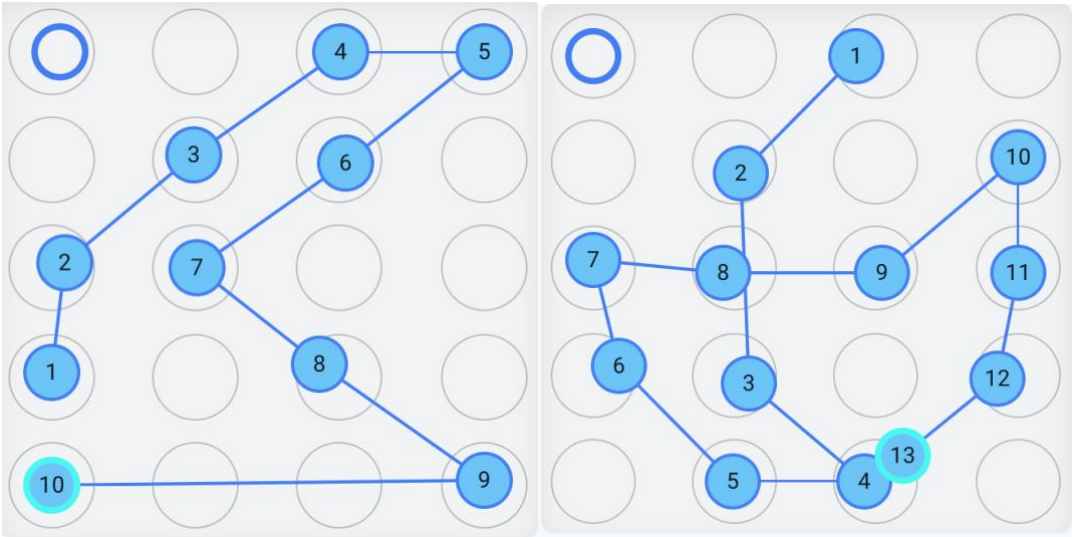


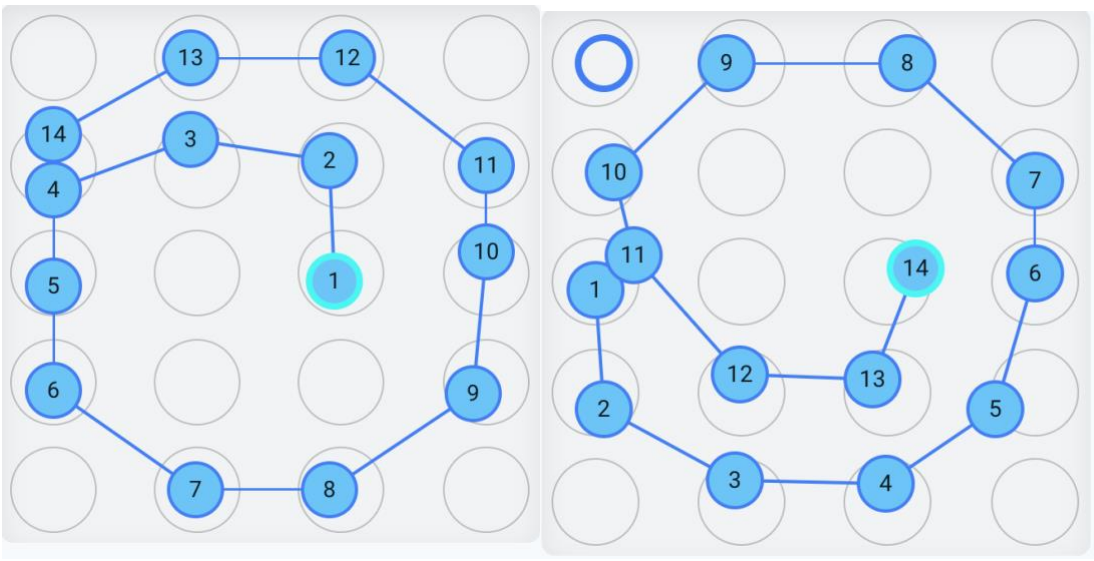
Figure 7. bHaptics Designer

Three haptic patterns on the TactSuit were designed in bHaptics Designer to mimic the hand movements of the three gesture types, respectively. As the bHaptics TactSuit has motors both on the front and back side of the vest, it provides design opportunities for haptic feedback on both sides. The left-hand gesture is manifested on the front of the vest and the right hand on the back. It is mapped to the corresponding gesture in the same way as the sound design. Through this close imitation of Tai Chi gestures using haptic feedback, it can also facilitate the acquisition of Tai Chi skills by encouraging the participant to move in the same way as the haptic pattern they feel on their body. As stated by Pigrem and McPherson, embodied experiences can enhance the understanding of a subject further (382).



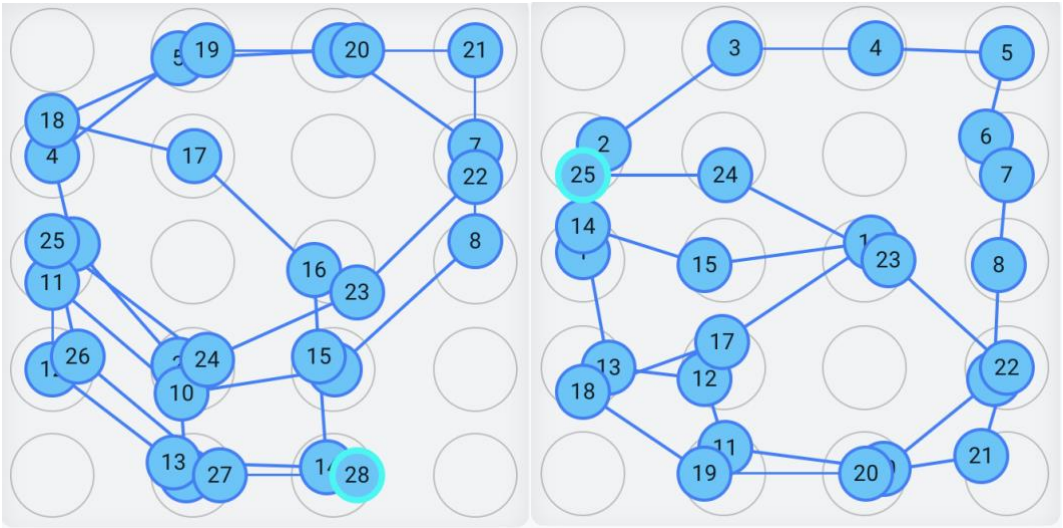
Front (Left Hand) *Back (Right Hand)*

Figure 8. "Dragon Out of Water" haptic design



Front (Left Hand) *Back (Right Hand)*

Figure 9. "Wild horse parting hair" haptic design



Front (Left Hand) *Back (Right Hand)*

Figure 10. "White crane spreading wings" haptic design

Gesture Recognition

The performance workflow can be seen in *Figure 11*, in which a Tai Chi practitioner performs Tai Chi gestures in front of a gesture recognition system on a computer. The system recognizes which gesture is being performed and triggers the corresponding haptic and sound design. The gesture recognition system (*Figure 11a*) is first trained by recording each of the three Tai Chi gestures in action 3 times. Afterwards, the system is able to recognize these three gestures with a certain degree of accuracy. The system then determines which of the trained gestures is most likely being performed, which triggers the corresponding sound and haptic patterns previously mapped to this gestures.

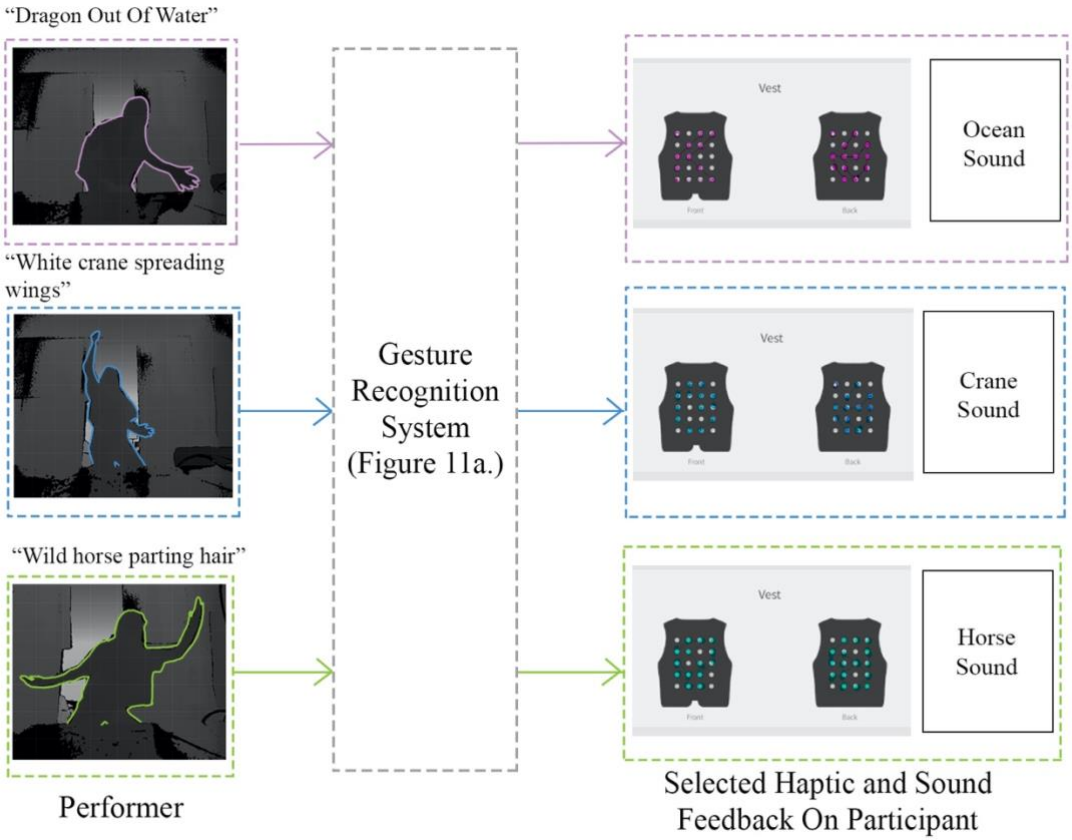


Figure 11. Performance Workflow

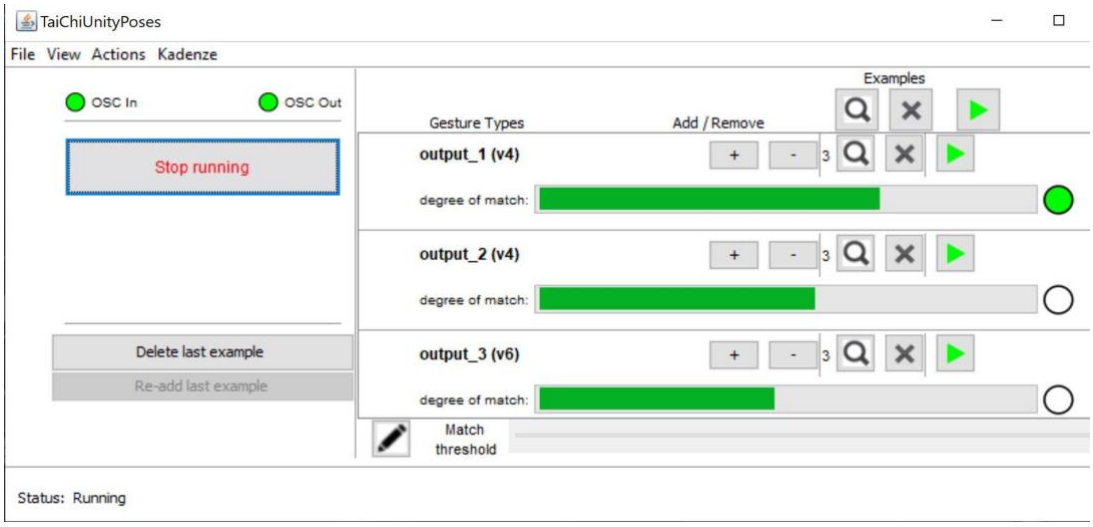


Figure 11a. Gesture Recognition System

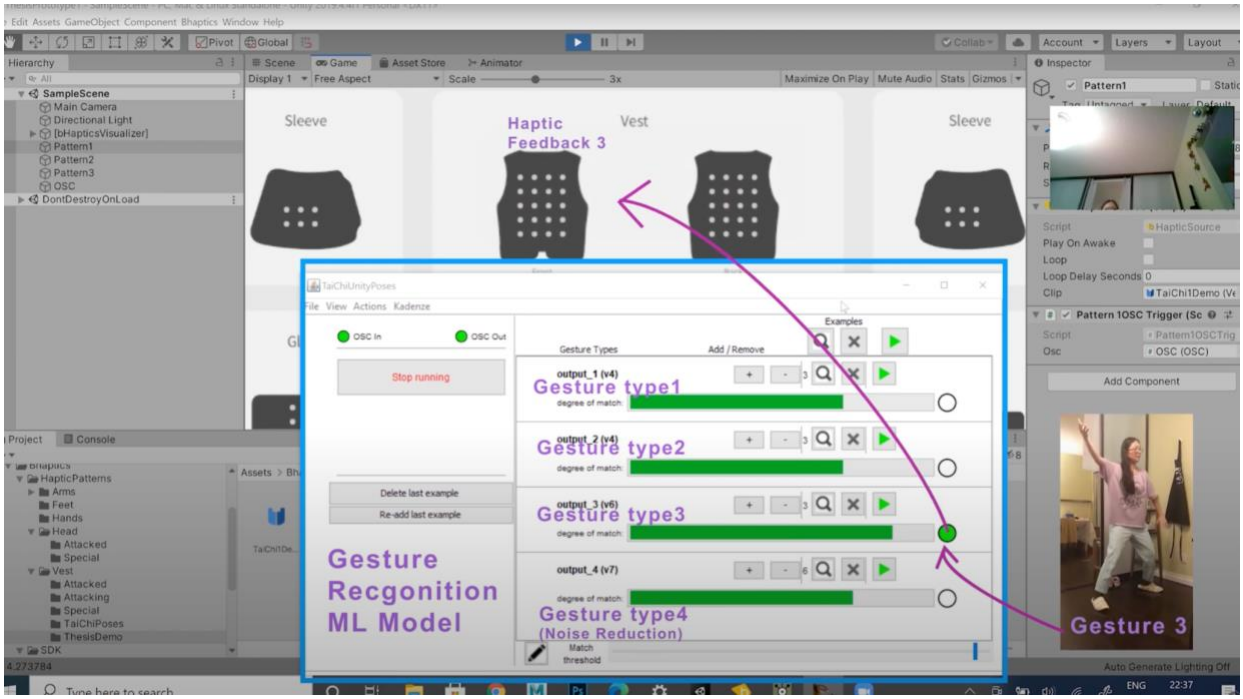


Figure 12. Using the System

Participant as Performer

Having the participant feel the *qi* of the Tai Chi performer on their body requires only passive engagement from the participant, potentially rendering this performance one-dimensional, or risking quick loss of interest by the participant. However, the acquisition of Tai Chi skills through learning from haptic feedback can enable another dimension to this interactive performance. Once the participant feels the haptic pattern on their body and moves along with it for practice, they can also take the position of the Tai Chi practitioner and perform the gestures that they have learned in front of the interactive system. The importance of parameter mapping in electronic instrument design lies in its ability to engage beginners as well as experts (Hunt et al 435). The dimension of permanence also allows the participant who was not familiar with Tai Chi prior to the performance to actively engage with the experience. After learning Tai Chi gestures from the experience, they engage the idea of *qi* through their own Tai Chi gestures to let other people feel it. After all, *qi* is not exclusive to experienced Tai Chi practitioners. It is inside of everyone's body. This playful learning experience enables people who are unfamiliar with Tai Chi to get a chance to interact with the idea of *qi*. It adds a new dimension to the classifications of performance models of system, performer and audience outlined by Jon Drummond (126), rendering a dynamic and fluid relationship between the performer and the participant. It can allow everyone, experienced Tai Chi practitioner or not, to rotate their positions as the performer, performing *qi* together. The understanding of *qi* as the energy that lives inside everybody will be enhanced through the embodied experience of the co-performance. By performing and interacting together, it can also cultivate an appreciation for the Tai Chi among people who don't know it well.

System Description

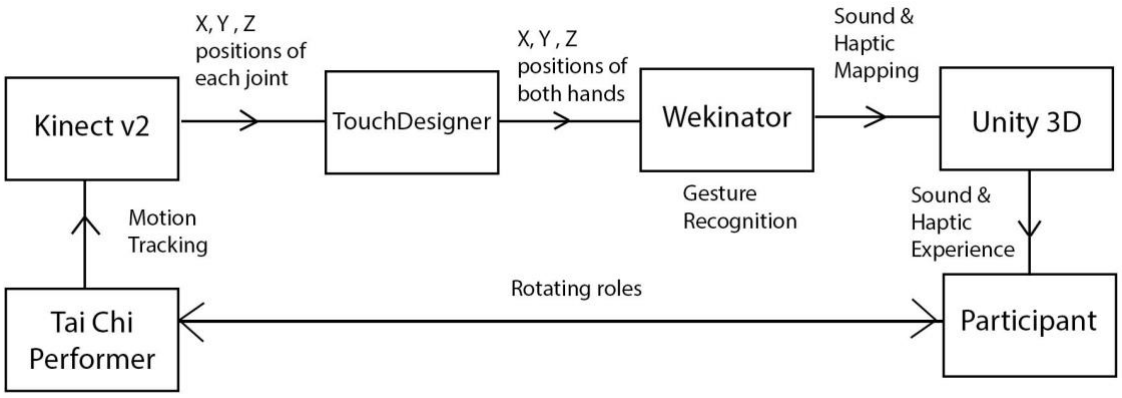


Figure 13. System Workflow Visualization

In *Figure 11* and *Figure 12*, a Tai Chi practitioner performs in front of the gesture recognition system. The gesture recognition system includes two parts, which are motion tracking and machine learning respectively. Kinect v2 is a motion tracking device that uses infrared cameras and computation to detect people's joint positions in a 3D space. It is used to detect the 3-dimensional coordinates of the performer's joint positions. TouchDesigner is a node-based visual programming environment that is used to receive the motion data from Kinect v2 and send data to the machine learning software Wekinator. Wekinator is the machine learning software used to train the gesture recognition model and map different gestures to their corresponding haptic and sound feedback. When the gesture recognition model is running, Wekinator sends OSC messages to the game engine Unity 3D to select the corresponding sound and haptic feedback to be played. The sound and haptic feedback is then experienced by the participant.

Wekinator is quite popular among the art and music communities with its ability to train a machine learning model easily and efficiently, with several algorithms to choose from (Rhodes et al 4). This allows the freedom to build fast prototypes of the gesture machine learning model for the project. The dynamic time warping algorithmic system in Wekinator is used for the prototype, as it "is computationally efficient, multidimensional, real-time and makes use of a simplified learning process," making it a versatile algorithm for performances (Caramiaux et al 330). Compared to the traditional training processes of machine learning models where a massive amount of data is required, Wekinator requires only a couple of training examples to be given in order to build a gesture recognition model. It also allows flexibility to make quick changes to the gesture recognition model if it turns out to be less accurate by deleting examples from the dataset or training it from scratch. It makes the training process of the gesture recognition model rather easy for this project, requiring only a few minutes on training the gesture recognition model before the performance starts.

Each gesture type in the machine learning model in Wekinator is mapped to a specific sound and a specific haptic pattern in Unity 3D. When one of the pre-trained gestures is detected by the gesture recognition model in Wekinator, Wekinator sends OSC messages to Unity to indicate that the specific gesture is recognized and plays the sound and haptic pattern that have been mapped to that gesture with the Unity bHaptics SDK and C# scripting. The sound plays through speakers and the bHaptics TactSuit x40 connected to the system via Bluetooth executes the haptic pattern on the motors inside the vest.

Feedback

Due to COVID-19, the intended user testing is replaced by feedback from some people who haven't tried the prototype physically but saw the project through online video presentations. A couple of people gave positive feedback about repurposing the haptic technology bHaptics TactSuit for a more dynamic experience of Tai Chi. One person asked whether the haptic feedback was generated in real-time based on what gesture was currently being displayed. After telling her that the haptic feedback was designed manually before the performance rather than generated by the computer on the fly, she said it would be interesting if the computer can self-generate the haptic feedback so she could try the haptic feedback of more gestures on her body and have a more complete Tai Chi experience. Another person presented a more critical view to haptic design of the prototype. He commented that the design of the haptic patterns was not as elaborate as the Tai Chi gestures he saw me doing in the demonstration video. The specific placement and number of the motors on the vest limited the expression of the hand gestures of Tai Chi. He suggested that I make my own customized vest. He also commented that the pre-designed haptic feedback does not entirely follow the hand movements. Sometimes the haptic feedback played faster than the way my hands moved. Right now, the pre-designed haptic patterns do not accurately reflect where the gestures express force, or *qi,* because they don't track the real-time performance. One person commented that the prototype allows only one person to experience the haptic part of the work at a time; however, normally he saw a group of elderly people practicing Tai Chi together in a park. In response, I believe the one-to-one haptic experience is a more personal and intimate one that creates a special bond between the participants and the performer. Engaging with the experience with more people may create a sense of community, adding a different dimension to the interactive Tai Chi

performance. He suggested exploring ways that can involve more than one participant in this experience, for example: put the system on a server where multiple people can access it at the same time. One of my thesis course instructors also commented that when she saw the visualization of the haptic pattern light up based on my gestures in the video, her instincts were to move her hands along with it. Her comment confirmed my assumption about the learning potential of this embodied experience. However, what's interesting is that sound design seems to come off as secondary to the haptic design to most people for the project.

The Tai Chi practitioner who used this system for a Tai Chi performance in the exhibition video *Techo Tai Chi (2021)* gave particularly valuable feedback for this project. Before the performance, in a few discussions I had with him, he wondered whether the use of technology could capture the internal movement of the body that is difficult to see with eyes. He said "to learn this stuff, we actually needed to touch the teacher. Just looking at it often didn't help." Unfortunately, when I asked if by internal movement he was referring to *qi*, he answered no. His school of Tai Chi doesn't necessarily focus on *qi* in their teaching because it's such an abstract concept and overused term that it may lead to confusion. This made me aware of my own bias in the design. Not all schools of Tai Chi talk about *qi* in their teaching. This helped me realize this project in fact will benefit greatly from infusing the knowledge of Tai Chi practitioners into the design process and seeing how they adapt the technologies to their own means. As a result, I invited him to design haptic patterns and feel the vibrations from the vest on his body that he feels capture the essence of the gestures.

Figure 14. Explaining the Interactive System

Figure 15. Tai Chi Practitioner Experimenting with the System

On the day of the performance, after designing the haptic feedback and trying on the haptic vest himself, he commented that the haptic pattern did mimic how the internal energy would flow in that gesture. The haptic technology therefore is rather effective in expressing the force and energy in the gestures. It may actually help students gain faster progression in their learning journey by feeling the gestures directly through their body.

Figure 16. Teaching Tai Chi with Haptic Vest

On top of using haptic technology to teach Tai Chi movements, he was quite interested in the prototype as a teaching tool to compare the differences between the gestures of the students and gestures of the teacher. He suggested that the most important thing about Tai Chi training is how closely the students can imitate the exact movements of their teacher, and that students would practice for years to get closer to the movements of their teacher. In the past, he would use videos to compare the differences between his movements and his teacher's. The machine learning system could be adapted differently to tell how different the students' gestures are from those of their teacher's. This could be achieved by using the motion data from the teacher to train the gesture recognition model. The students can perform in front of it, and the gesture recognition model will give a score of how accurately the current gesture is matching the data in the trained gestures.

Discussion

Overall, despite the challenges posed by COVID-19, I was still able to get helpful comments, suggestions and insights on the prototype which will allow me to evaluate how effective interactive technologies are at bridging the gap of understanding of the Chinese concepts of *qi* and Tai Chi. The notion of manually pre-designed haptic feedback is not favored by many as it does not capture the nuances of the real gestures being performed. If the computer can analyze the current gesture and output haptic feedback that matches the gesture automatically, the haptic feedback may mimic the gesture better. Some commenters shared similar concerns about the limitations of the haptic vest, which did not entirely reflect the elaborate Tai Chi gestures. Customized wearables have been brought up a few times during my conversations with different people. These improvements can potentially make the prototype a better tool to communicate the ideas behind *qi* and Tai Chi. From the Tai Chi practitioner's engagement with the project, I became aware of my own unconscious biases and misconceptions in the design. Further expertise will be sought out in order to eliminate these biases and misconceptions. The project would also benefit greatly from different perspectives about Tai Chi by engaging practitioners from different schools of Tai Chi, since they all have different philosophies and teachings. The majority of these schools of Tai Chi do engage with the idea of *qi* in their teachings. Seeing how different practitioners would adapt their teachings according to this project will provide further guidance to the evaluation of this project.

Even though at this stage it is insufficient to conclude that the interactive technologies can efficiently express *qi* in Tai Chi in this project, the project still has value as a learning tool for Tai Chi teachers to teach Tai Chi gestures. It can be adapted accordingly by practitioners from different schools of Tai Chi in a way that best captures their philosophy and teachings

about Tai Chi based on the practitioner's knowledge, whether it is about *qi* or close imitation of gestures of the teacher. In this case, the project can still use technologies to bridge the understanding not just of *qi*, but of Tai Chi in general, by enabling Tai Chi teachers to share their knowledge to people who don't know much about it through the interactive experiences they design. It allows misunderstandings caused by Orientalized perceptions of Tai Chi and *qi* to be corrected, by learning from and engaging in discussion with a Tai Chi teacher directly. It also allows an experience of *qi* and Tai Chi to be shared to people of different cultural backgrounds, and invites discussions from them about these subjects, avoiding the essentialist way of thinking about Chinese cultural concepts and practices discussed previously.

Future Work

Based on feedback and my own experience of making the project, the following versions of the work will be explored in the future. Firstly, considering some wishes to engage with the Tai Chi performance in a group and the current COVID situation, a remote and networked version of the work can be developed. The prototype can be divided into two parts -— the gesture classification end and the receiving end — which can take place in different physical locations. The gesture end contains Kinect connected to TouchDesigner to get the 3-dimensional position of the performer's joints and send the data to Wekinator for gesture classification. Wekinator then outputs the classified gesture type through OSC messages to the recipient. The receiving end contains Unity which can receive incoming OSC messages and select the associated sound effect and haptic feedback on the haptic vest. Networking can not only create a sense of community by enabling multiple participants to experience the project at the same time, but also it can amplify the idea of cross-cultural communication by allowing

people to experience this project together halfway across the globe from each other. As a matter of fact, I intended to network the project for the second version of the prototype. However, as the prototype relies on the transmission of OSC messages to connect the gesture classification end and the receiving end, the only networking method I was only able to find currently is creating a Virtual Private Network on different machines and opening a portal on the firewall, which involves the complication of bypassing the router and the firewall. As this method can pose risks to internet security, it was not pursued further. I invite more innovative solutions to this problem.

Secondly, if the remote version is developed, one problem will occur. As this project mainly focused on the non-visual output of the performance, a way to incorporate the visual element is essential. Without seeing the Tai Chi performer, the sound and haptic feedback will be out of context and seem arbitrary to whoever receives them. Only by seeing the Tai Chi performer perform Tai Chi while hearing the sound and feeling the haptic feedback will make this translation of *qi* understandable. To tackle this problem, I suggest using video conference software such as Zoom while running the project so the performance is visible to participants. Moreover, while the real-time participation of the performance is exciting, each gesture type can also be video recorded for participants to enjoy in their own time. This process can largely simplify the technicalities of the project as it no longer requires the real-time gesture classification system built for a live performance. Sounds and haptic feedback can be mapped to the video recordings respectively.

Thirdly, alternative gesture detection tools can be explored. If a remote version is to be developed, the current prototype of the project requires the participants to own a Kinect or bHpatics TactSuit to be able to participate in the performance. This can create obstacles for

some people to participate. Those who do not own these two pieces of equipment will ultimately be excluded from the experience. Alternative approaches that reduce the need of these accessories should be explored. Computer vision, with its ability to detect and classify gestures with only a webcam, should be considered to replace the current gesture recognition system using Kinect. While it's impossible to completely get rid of the haptic vest used in the project, perhaps handmade wearables can replace the commercial bHaptics TactSuit. This system will adapt accordingly to incorporate handmade wearables. Online instructions and tutorials can be provided to people to make their own wearables which they can use to participate in the performance. This has the potential of making this experience even more engaging and provides people the freedom to make their own design if they wish.

Conclusion

In summary, I set off to compare the differences between Western and Chinese perceptions of *qi* and Tai Chi and realized both of these perceptions carry with them certain degrees of misunderstanding and biases. I found Orientalization and identity politics are effective ways to address the first question, "what are the contributing factors that have led to the misconception of *qi*?" Inspired by the case studies in the thesis, I found ways to engage with multiple methodologies through sound and haptics for creative expressions of *qi* cross-culturally in an interactive Tai Chi performance. In this case, I addressed the second research question, "how can the postcolonial notions of 'contact zone,' and 'cultural hybridity,' as well as Deep Listening and research-creation, be used as design methodologies to create a cross-cultural translation of *qi*?" From there, I intended to use interactive technologies to design a Tai Chi performance experience that can bridge the understanding of *qi* of people from different

cultures, and tried to answer the primary research question, "how can new media technologies be used as a vehicle to reintroduce *qi* and Tai Chi and bridge the gap of understanding?" Having talked to the Tai Chi practitioner who was involved in the final performance, I realized my unconscious biases in the design. The project will benefit greatly from seeking further expertise to express ideas of *qi* and Tai Chi through interactive technologies and eliminate my own unconscious bias that occurred in the design process. The practitioners should have more freedom in determining how the interactive technologies are used rather than being given a predetermined purpose. Though how well interactive technologies can express ideas of *qi* in Tai Chi still needs further investigation, the creative project was to answer the primary research questions from a different angle: the prototype can be adapted accordingly by Tai Chi practitioners to share their knowledge of Tai Chi by engaging them in the design process. By engaging in an interactive experience designed by Tai Chi practitioners, and having discussions with them, this learning process from experts is what can reduce preconceived misunderstanding about *qi* and Tai Chi caused by Orientalized perceptions. It can give people of different cultural backgrounds access to the concepts and philosophies behind Tai Chi and *qi* through interactive technologies and invite discussion from them about these subjects. As a result, the prototype may still bridge the understanding of *qi* and Tai Chi by allowing Tai Chi practitioners to directly express their ideas about these things to people through an embodied experience of learning Tai Chi gestures.

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Figure 1. Nami in performance

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Appendix: Accompanying Media

Techno Tai Chi Project Trailer.mp4

Title: Techno Tai Chi Project Trailer

Description: A video trailer demonstrating the Tai Chi performance that uses the interactive system designed in the paper.

Date: 3 May 2021