360° Dance Film: Reflections on the Making of Tidal Traces

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Abstract

Tidal Traces (2017) is a 360° dance film collaboration between filmmaker/media artist Nancy Lee and choreographer/dance artist Emmalena Fredriksson, with sound design/music composition by Kiran Bhumber. This paper accounts for the creative and technical differences of creating a dance film versus 360° dance film, and the conceptual, practical and ethical challenges the artists encountered throughout their interdisciplinary process where 360° video, film and dance intersect.

Keywords

360 dance film, virtual reality, 360 cinema, contemporary dance, dance improvisation, spatial audio, practice-based research, interdisciplinary approach

Introduction

The caveat for creating content for VR and most interactive media art lies in that we cannot predict how each viewer will interact with such media. The narratives, interpretations, and meaning-making they associate with such work can be broadly attributed to their direct interaction, as well as to their individual phenomenological background. This raises ethical considerations both in production and presentation of work. Through the collaborative interdisciplinary research project that became Tidal *Traces* (2017), we examined some of these issues.

Tidal Traces, a 360° dance film, was developed through a one year long Dancelab Residency at The Dance Centre in Vancouver, Canada from September 2016 to September 2017. We, Emmalena Fredriksson and Nancy Lee, were awarded the residency after shooting a DIY demo version in June 2016, which led us to a deeper inquiry and further exploration of the 360° process. The Dance Centre residency included studio space, public talks, workshops and a technical black box theatre lab. The demo film was also presented at Festival of Recorded Movement in Vancouver, June 2017. Halfway through the residency we pitched the project to the National Film Board of Canada's Digital Studio, who commissioned and produced the final version, filmed in July 2017.

Synopsis: *Tidal Traces (2017)*

> By placing the audience in the centre of the performance in an immersive environment, the artists envision a poetic journey where four characters move through a new and uncertain world through a series of dances. Set offshore in the intertidal mudflats of Boundary Bay, the dance is situated with lapping ocean underfoot, for a visual backdrop of sky, horizon and water. Tranquil at first, the comfort of this new world becomes ominous. The tensions that emerge create imagery between beauty and peril. Entangled in this world, the viewer becomes the fourth character, directly composing the dance through their gaze. (National Film Board of Canada, 2017)

In this paper we will speak collectively (we) as well as individually written in Emmalena's, Nancy's and Kiran's first person voice (I) respectively about the choreographic, film, and audio processes of making *Tidal Traces*.

Research Context

Based on online media and popular marketing language, 360° videos are often portrayed and understood as VR to consumers; therefore it is important to allow some flexibility to let 360° video fall under the VR umbrella. We note that the main differences between true VR and 360° videos lie in the viewer's ability to control their experience and interact with their environment (eg. direct manipulation with virtual objects). In 360° video, the viewer can only control where they look in 360 content that has been prerecorded and not live simulated. (Steinicke 2016, p. Viii; Adams 2016) *Tidal Traces* was created with the intention of being experienced in a Head Mounted Display (HMD) or VR headset.

As we embarked on this project in 2016, we experienced a lack of emphasis on artistic content and exploration in the genre of 360° dance film. Most of the work we came across felt like 360° documentation or compilations of existing stage performances (National Opera & Ballet 2016; Perkovic 2016), rather than choreographies created specifically to be presented as a 360° film. Or, as in the notable Sundance 360° dance film *Through You* (2017) directed by choreographer Lily Baldwin and filmmaker Saschka Unseld, the technical use of cinematographic techniques is prioritized over the artistic content itself. The use of quick edits between scenes and movement phrases

makes the choreographic elements feel secondary to the technical and cinematic use of the 360° medium.

We recognize that 360° video, dance, and film are three separate disciplines which requires different creative approaches and thought processes. Therefore, by bringing the three disciplines together there are limitations from each form and a need for negotiation of methods. In the projects mentioned above, the creative investigations and decision making tend to lean towards either showcasing dance or film, sensationalized through 360° technology. Excited about the creative possibilities in the intersections of these mediums, our intention as we began the research for *Tidal Traces* was to create a piece where dance and film had equal importance in the creative process of serving a 360° medium.

As a contemporary choreographer primarily making work for 'live' events, on- and off stage, I was particularly drawn to explore this new way of viewing dance in 360° film. It offers a bridge between live performance and video, emphasizing the embodied experience for the viewer, often less considered in regular dance film. As a somatic based dance practitioner and choreographer invested in the felt sensation rather than shapes of movement in my work, I was curious how this project and new medium could inform my practice. Throughout my career I've had the opportunity to perform in a couple of dance films (4/4 by Asher O'Gorman, Body Place Memory by Jessica Webb). My experience of these film production processes were similar to those of dancing in traditional stage performances. We would first create the movement material and rehearse it in the dance studio, and then - just like moving the work into a theatre - we would bring the dance to the site where it was to be filmed. However, there are significant differences between a live performance and dancing for a recording. For example, the ability to redo a take in the filming process, which we would often do, obviously does not exist in live performance. The precariousness of 'liveness' is therefore taken out of the equation when creating a dance film. The final result would usually be a compilation of the best shots from the day, taking out any flaws in the performance. The 360° process however called for a different method, blurring elements of a live performance with the recorded moment.

As a filmmaker and media artist working with immersive installation environments and gesture-based interactive technology, I was interested in exploring VR and 360° for dance because VR bridges film and media art by offering the audience opportunity to interact with the content and choose their own experiences in an immersive performance environment. I wanted to offer unique experiences for each audience based on their personal viewing preferences. From past experiences directing and producing dance films, I have developed various processes and techniques

Figure 1. Intertidal mudflats of Boundary Bay Regional Park

to incorporate input from choreographers and dancers while maintaining the creative vision of the film. For dance short *Faux Solo* (2015), I collaborated with choreographer and dancer Ralph Escamillan to create a dance film inspired from different garments. Escamillan developed separate dance phrases in the studio using the different garments, which he then performed for me. Based on the quality of movement in each sequence, I planned how to frame each movement phrase using different camera angles and shot types (wide, medium, close-up, etc). Escamillan further refined his choreography based on my cinematographic decisions leading up to the shoot. He developed different versions of the same movement phrases, adapted for different types of shots. During the shoot, we had a shot list which were all the assigned specific movement phrases he was to perform, and this was strictly followed. I would offer verbal direction while he performed for the camera and I then edited the structure and pace of the film in post-production. Once I had the final edit, created in consultation with the choreographer, I sent it to a sound designer to compose the audio for the film. Unlike the 360° process, in filmmaking, we have relatively established and reliable post-production workflows. Therefore, I can generally assume which software and workflows my post-production collaborators are using and thus not spend too much time worrying about software and video codec compatibility issues.

Based on our individual practices in our respective disciplines, we wanted to produce interdisciplinary work instigated by the following questions through our creative process: How do we compose a 3-5 min theatrical/dance composition for a 360° environment rewarding audiences with different viewing habits? How does the 360° environment complicate the notion of seeing and being seen for both viewer and performance and creators (director and choreographer)?

Creative and Technical Process

Importance of Site

Choosing the site for *Tidal Traces* was an artistic decision influenced from a filmmaker's perspective. Given our limited budget and resources we required a location that would optimize the production value of the piece, and maximize the experience for the viewer in a 360° environment. The intertidal mudflats at Boundary Bay Provincial Park offered a unique location with natural lighting that did not require set design. For a three-hour window throughout the day, the tide was low enough for us to walk several kilometres out into the shallows, giving the perception one was standing in the middle of a vast ocean. [Figure 1] The site also justified the use of the 360° medium, offering a visual experience that most people have not previously encountered. In such a novel setting, the environment itself becomes another subject of exploration for the viewer. Further encouraging different viewing behaviors in which the viewer can choose where and with what they engage. Hovering over the constantly moving waters, offering the viewer perpetual movement their eyes can focus on and explore, besides the dance itself. Being surrounded by shallow moving water far from land also cultivates a sense of tranquility and loneliness. The overall aesthetic of the site and its sense of serenity and solitude was crucial in inspiring the mise-en-scene, choreography, and narrative trajectory of this project. The nature of the site, however, created many practical and technical challenges for the dancers and for the production of the film, which we will discuss in the following sections.

Choreography

From a choreographic perspective, the three dancers; Lexi Vajda, Rianne Svelnis and Zahra Shahab, and I began the process in a fairly traditional way - in the dance studio. However, we approached the initial research knowing that we would film in Boundary Bay and in a 360° space. I was interested in discovering how the VR technology would inform my dance making and looked for differences and meeting points between my choreographic practice and the 360° medium. For example choreographing for the round is uncommon in traditional dance film but a regular occurrence in live performance. In a live setting however, the performer has the ability to track where the viewers looks and adjust the composition accordingly if needed in the moment. Thus knowing you can always offer the audience the experience you want them to have or compose the choreography in response to the audience. In a 360° film situation, this is completely different, you have little or no control over where the viewer will look and when nor the ability to respond to their gaze. We therefore had to consider where the audience might look and choreograph according to those multiple possibilities. I was also curious if the dancers would be able to direct the viewer's gaze and phasing with their activities and movements, making the viewer turn around or follow a specific dancer. For example by crossing through the centre, playing with eye contact or coming in close proximity to the viewer. Our early process consequently included playing tag games and other tasks that activated the circular space. [Figure 2] We took turns to watch from the center and discussed our experiences and viewing choices. During our dance centre residency we also hosted a public Choreography for VR Film Workshop where we explored these ideas further. As the research developed it became apparent that the lack of offstage while filming in 360° and the time gap between the recording of the dancers performance and the viewer watching it, raised questions around control and vulnerability. Who was being seen, and when, and how does it feel not knowing if someone is dancing behind you?

We also explored other interchanging points between the performers and viewers in 360° medium. Compared to traditional film, 360° video offers the possibility to immerse the viewer in the centre of the dance in a different way. We asked ourselves how we could use this immersion to highlight the viewer's experience of his or her own physical body. Thus, the narrative of imposing the viewer as the fourth dancer developed. Another strategy to increase the viewer's experience of their own body was to destabilize our own senses. Based on studies of the 'mirror neurons', scientists have shown that the same part of the brain is active while doing an activity as watching it. (Jola, Ehrenberg and Reynolds 2011). With gaze being the viewer's primary sense, we were curious what would happen with the movement material if the dancers performed with eyes closed, and in turn how that would affect the feeling of watching it. In rehearsal, one dancer would have their eyes closed while being moved around and manipulated by the other dancers for 45 minutes. Then, continuing to keep their eyes closed, they would improvise a solo from the state or felt sensation they were in. The aesthetic quality of

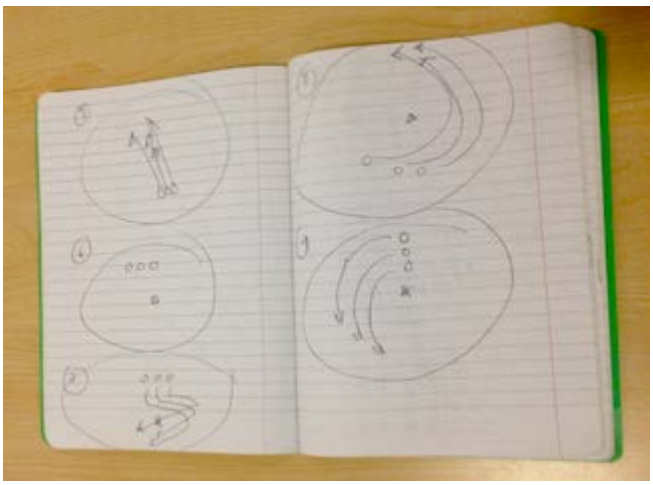

Figure 2. Choreography sketches.

Figure 3. Rianne Svelnis and Zahra Shahab rehearsing on site.

Figure 4. Nancy Lee lying prone in sand during the demo film shoot.

the solo's were often heavy and fluid, with the ground as the clearest reference point of space. The solos were filmed and then developed further into phrases. Our aim was to create a physical counter sensation for the viewer allowing their bodies to become heavy and fluid too.

Moving in water and sand also brings a very specific quality to the dance. Besides the studio research we went out to Boundary Bay to source movement material from the site. The variability of the sand and water levels, as well as wind and temperature strongly affected the type of movements that were possible to perform. For instance, it was hard to jump, turn and accelerate. We still attempted to build a dynamic unison sequence from these findings but leading up to the shoot the result was still too unpredictable. We returned to structured improvisation scores, in which the dancers had more freedom to respond to the changing ground and elements around them. The cold and the wind also affected their muscle tone and ability to execute certain movements. This combined with the short tidal window and the technical set up, made the filming process more similar to that of a live performance than the multiple takes of a traditional film process. [Figure 3]

Film

From a filmmaking perspective, the main difference between directing a 360° dance film and a traditional dance film at a site like Boundary Bay was the inability to provide direction for the dancers while they were performing. There was also a lack of cinematic techniques I could employ (which I usually rely on to support the narrative) and post-production process was much slower and difficult. Furthermore, the site itself also imposed many limitations - we had to work with the changing nature of the ocean (tides, winds and moving sand). It was a challenge to set up the camera, an expensive GoPro Odyssey, 16 GoPro stereoscopic 360° camera rig, in this environment while also keeping the crew out of shot when filming. Due to the vastness of the location, our production crew did not have anywhere to easily hide from the camera's 360° view. While shooting, the production crew retreated 20 metres into the horizon and layed prone in the sand to camouflage into the scene. [Figure 4]. This made it electronically difficult to set up a live feed from the camera with a voice intercom, so instead we had to trust the dancers to perform without much verbal direction. They were also the closest to the camera and had to take on the responsibility of ensuring the safety of the equipment, in case of unpredictable water currents. Therefore the dancers controlled the length of their takes and decided whether they wanted to do retakes or not. These messages were communicated to the rest of the crew through sign language: one arm up signaling re-take, and two arms up - next take. Shooting in 360° video, we realized it was much more of a performers' medium. We had to trust the dancers to judge their own performance, as we were unable to see what they were doing. As a director, I no longer had control over the caption of their performance in front of the camera.

Most video cameras nowadays are small and have underwater housing, however preparing our 360° rig and setting up in the ocean was more challenging. There is no underwater housing for the GoPro Odessey and its Hypercine battery pack. Due to the size and weight of the battery pack, it had to sit under the tripod in the sand, submerged in water. [Figure 5] A Rubbermaid plastic container and a dry bag was used to house the battery pack underneath the tripod to prevent water damage; this was weighed down by a sandbag to prevent the rig from floating.

We used an online tide chart, Windsurfer, to help us determine the height of the tides and the rate in which the tides are moving in or out. We shot the performance while the tide was retreating to reduce stress for the dancers in ensuring the safety of the equipment and execution of the movements. The ideal water depth of for the dancers to

dance in was in between 5-10 cm, which offered enough water for splashing to achieve our aesthetic desires. Besides the short time frame in which the tide was right and the dancers remained warm, the short battery life and limited memory card space (32GB memory cards in each of the 16 GoPros) also restricted the number of takes we could capture.

When shooting a traditional dance film, I rely heavily on framing, lighting, and creative editing techniques to convey the vision and to hide mistakes or cheat production shortcomings. When we shot *Tidal Traces*, the only cinematography choice I had was the height of the camera on the tripod. I shot at two heights, one at approximately 1m from the ground and one at approximately 1.6m from the ground to convey different relationships a viewer could have with the dancers (the latter being more intimate because it's closer to standing height of the dancers). I wanted to minimize number of edits in the film so viewers could feel more grounded in the new virtual environment in hopes of reducing the risk of cybersickness (Rebenitsch & Owen 2016) and also showcase more of the dancers' performance. In traditional dance filmmaking, editing is a tool used to compress time and alter the perspective of choreography to support the cinematography. Dancers are often not performing dance phrases for the camera in its entirety - it is usually performed in smaller sections adapted for the specific shots required. For example, I would often ask a dancer to perform the same phrase three times so I could capture it for a wide shot focusing on the whole body, a medium shot focusing on the torso, and a close-up focusing on their hand movements. For our static 360° camera setup, there was no way to change or manipulate the perspective of the same choreography without revealing a change in the environment. The editing process became a tool to facilitate pacing and narrative progression of the dance film rather than a tool to manipulate the perspective in which the viewer would experience the dance.

The post-production workflow was much slower and cumbersome than traditional film post-production because of the extremely large project file sizes and lack of available softwares to facilitate smooth workflows. The total project size was 16TB. We had our original 8K footages stitched from the Google Jump cloud, 2K proxy footages for editing in Adobe Premiere, 8K footages where the bottom and top zenith holes are patched, and 8K footages where we removed the visible sand bars from the horizons by rotoscoping using the clone brush in After Effects. Most of our post-production process was wrapped up in troubleshooting bugs in video codecs, softwares, finding workarounds and waiting for file transfers and renders. Because our computers would crash frequently during renders, we decided to render every step of our post-production workflow as EXR images, frame by frame, instead of whole Apple ProRes video clips. This way we would not lose our entire

Figure 5. Production team setting up the rig with the blue Rubbermaid battery container.

renders in case it failed - at least we would still have the rendered EXR images up until the failed render. Unlike traditional filmmaking where usually a theatre-ready and web-ready version would suffice, we had to export our film into 30 different codecs to present in different VR platforms, video players and HMDs. Working in 360° also opened up the possibility of having spatialized audio composition to tie in the choreography with the photography of the film.

Audio

The inquiries into interactive immersive 360° environment also assisted in shaping the process of designing the aural component of *Tidal Traces*. I intended to influence the gaze of the viewer through two overlapping-independent sound spheres, which occupied the 3D space: 1) Environmental Sound 2) Action Sound. The former relates to the overall ambience of the film, and the latter to active moments in the choreography, which I wanted to emphasize in order to gain the viewer's attention. The film score and sound design was composed, mixed and spatialized using Facebook's 360 Spatial Workstation (Version 1.3) within the Reaper DAW.

The Environmental Sound resulted in the introductory ambient backdrop. A sound mass of found sounds (field recordings) and digitally created sounds representing the

elemental sounds of the water, wind and land acted as an aural primer for the viewer to habituate to, and be able shift their attention to differing timbres presented throughout. I wanted the viewer to feel as though they were present at the location without it being an exact representation of what it would sound like. This sound sphere gradually transformed by applying micro pitch and filtering effects which kept the sense of temporality of the work.

The Action Sound sphere was influenced by the choreography and scene changes. During the beginning of the work, a violin melody entered in order to produce a sensation in response to the expansiveness of the environment, and to the distance and motion of the dancers. Violin plucks and other percussive sounds acted as moving trajectories, which acted as aural cues for the viewer to follow and shift their gaze. In specific, when two different choreographic scenes were located in opposite angles of the 360° environment concurrently, these sounds emerged towards them in order to guide the movement of the participant. Additionally, water splashes were designed and accompanied the movements of the dancers with changing attenuation based on how close they were to the viewer. The addition of this organic sound constructed a more authentic experience, which coalesced with the musical score.

360° Video Informs Our Choreography and Film Practice

What stands out to us as we reflect upon the process of *Tidal Traces* is the new dynamics between us, as creators, performers and viewers. Choreographing and directing for 360° film for the first time, Michael Klien's (2008) definition of choreography as a way of seeing the world became even more relevant. We knew from the beginning of the project that we wanted to create something different than what we had experienced watching other 360° dance films. We wanted to invite the viewer into the immersive world and give them an experience in which they would feel relaxed and comfortable to take in and be with the dance and the virtual environment simultaneously. However, we didn't expect the shifts in power structure throughout our process to be se prevalent, nor the conversations around vulnerability and control that surfaced during our research.

In my choreographic processes there's often a lot of space for the dancers to interpret tasks in different ways and bring their own artistic ideas to the project, striving to work in a more horizontal power hierarchy than top down choreography. I also like to work with improvisation scores, which choreographs the content by order of events and quality of movements rather than specific steps. The 360° camera technology and Boundary Bay as a site took these aspects of my practice one step further. The unpredictability of the site made the improvisations even more variable despite defining the tasks, leaving the dancers to make more detailed decisions on the spot. During the shoot, the dancers also had full agency and responsibility to interpret the result of their performance for the camera as we were hiding in the sand dunes with the film crew. My role as a choreographer became more about facilitating the process, holding space and communicating, rather than controlling the final outcome. Entering the process with a curiosity of how to choreograph for a 360° dance film, I do feel I learnt a lot and that the progress can be seen in how it was made, not just in the product it became.

Working in the 360° medium has been a synthesis between my practice as a filmmaker and media artist. In filmmaking there are defined roles, industry standards, and widely understood structures and hierarchies in the way people are directed and organized in the process, which media art does not. As a filmmaker, I bring different people with different skill sets together to create the vision. The execution of the vision is done through a series of decisions made based on a familiar film process: Who to cast and who to hire for crew; what narrative or performance; how to convey a message using cinematic techniques; when to shoot and cut, where to shoot; why is this film relevant and why should people see this? We can assume that film technology exists and is stable so we can spend more time focused on the creative execution of the project rather than the technological execution. Since media art has no defined presentation medium, I have to be prepared to problem solve technological issues and spend more time investigating how I am able to execute a idea utilizing different type of technologies, interfaces, and mediums. On *Tidal Traces*' set, my role as a director also became more like a facilitator to offer support for the dancers to perform their best takes without my influence. My role as a director/editor in post-production also took on new meanings - researching and discovering new workflows to workaround technological difficulties. The production process of *Tidal Traces* took on qualities of what I would expect in my media arts practice - managing the uncertainties of performances, technologies and medium.

Ethical Reflections

As VR technology is evolving fast and VR softwares, 360° cameras and HMDs are becoming more accessible to consumers, more attention needs to be devoted to ethical discussions on the widespread use of VR. Frank Steincke states (2016), "The immersive nature of VR raises questions regarding risks and adverse effects that go beyond those aspects in existing media technology such as smartphones or the Internet." We believe that this ethical discussion should not only address the relationship between the VR user and the content producer, it should also address the process in which VR content is produced. Ethi-

cal considerations regarding the production process of our 360° film emerged organically throughout our research.
During our public engagements, demo screenings and workshops, vulnerability was a recurring conversation topic. Vulnerability experienced performing for the 360° camera where the dancers cannot predict where the viewer's gaze is; feeling vulnerable from losing control as creators/director/choreographer; a sense of vulnerability from wearing the HMD and engaging with the content in both a virtual and physical space as a viewer.
From the dancer's perspective, in the precariousness of not knowing what part of their performance is being seen, there was a supportive empathetic relationship developed between the three, separate from the rest of the crew. Checking in emotionally and physically with one another to negotiate takes, wrestling the desire for artistic perfection versus what the bodies could perform in the difficult conditions. Both the physical exposure of the site and the 360° medium added pressure on their performances and expectation to be "on" at all times. Their ability to take care of themselves and each other as the camera was recording became the foundation for the performance of the dance. From our perspectives as director/choreographer, unable to direct and support the dancers the way we are used to also meant navigating new roles and relationships to one another. Giving up control and instilling trust, both emotionally and creatively in order to empower the dancers to make the right decisions for the project became a process in itself. More emphasis was placed on developing relationship qualities, such as warmth, humor and intimacy with each other, which blurred personal and social interactions with the practical and artistic encounters of the work.

From the viewer's perspective, there is no preset 360° cinema language or behavioural codes of conduct when it comes to watching 360° film in a HMD in the same way there is in traditional cinema or during a theatre performance. Therefore, there are more risks for discomfort triggered from the audio-visual content (eg. cybersickness, or invasion of perceived virtual personal space) and risks for injury when a viewer is wearing a HMD and moving around in the physical space. Throughout the process we wanted to consider this both in the composition itself, as well as in the presentation of the work. For example by starting the film with the dancers standing at a far distance gazing away, giving the viewer more space compositionally to get used to the new environment and gradually build the interaction with the performers as they come closer to the 360° camera/viewer. Rather than using an immersive environment to create a sensational experience where the audience may feel shocked, scared, surprised, or uncomfortable, we wanted to find a way to gradually invite the audience into this world and make them apart of the dance. After multiple screenings and public engagements we learnt that the framing of the physical space in which the viewer wears the HMD also contributes to their viewing experience. Creating a 'safe' space sheltered from too much audience traffic and offering different viewing options, such as seated or standing, enhances the comfort of the viewing experience.

It is not uncommon for directors and choreographers to have an authoritarian relationship to their performers and their audiences, dictating both working and viewing protocols. As art practitioners invested in and sensitive to the impact of our work processes and its effects on our collaborators, ourselves and our viewers, we intentionally shaped our creative process so that we could minimize potential for feelings of vulnerability as mentioned above.
Questioning what kind of director/choreographer relationship we wanted to nurture with our performers and what kind of experience we wanted to choreograph for the viewer became central to our process.

Conclusion

In this paper, we discussed the context of our 360° dance film research, the importance of the site in 360° video, and the difference between traditional dance filmmaking and 360° dance filmmaking from choreographic and filmmaking perspectives. We also reflected on how *Tidal Traces* has informed our individual practices, and our ethical considerations while we created this piece. The intertidal mudflat shallows of Boundary Bay served as a site that could optimize production value of the piece and maximize the experience for the viewer, but it caused many practical and technical challenges for production. The main differences choreographing for a 360° dance film versus a traditional dance film is that the viewer's gaze is unpredictable and the filming process is more similar to a live performance than film. As a filmmaker the technological limitations of the bulky camera/battery rig, lack of useable cinematic techniques (can only move the camera up or down on the tripod), slow and unstable post-production workflow also presented a very different process. It became more like a media art practice, with new technology being unreliable and requiring more attention for problem solving and troubleshooting. Similarly, the lack of a 'behind the scenes' and nature of our site create a different production process. Unable to verbally direct our dancers during the shoot, we as director and choreographer had less control of the final outcome than in a traditional dance film. With the dancers having more agency to interpret the result of their performance, the role of the director and choreographer became more facilitative than directive.

Vulnerability experienced by dancers, creators and viewers was a recurring theme during our research process. As art practitioners concerned with ethics, we attempted to address vulnerability by nurturing a collaborative relationship with our performers and created a slow and gradual

360°experience for *Tidal Traces* viewers. As VR technology develops, the technological infrastructures that support the medium such as 360° cameras, VR softwares, computers and HMDs will become faster and more comfortable to use. The technical hindrances we experienced in 360° dance filmmaking will diminish with time. Nevertheless, we believe that our interdisciplinary approach in creating *Tidal Traces* emphasizing nuanced power shifts in the creative process, and ethical considerations that emerged will be relevant in the future of VR discourse.

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References

Adams, Eric (2016, July 16) "Most Virtual Reality Is Not Virtual Reality. Here's Why." *Gear Portal.* Retrieved from https://gearpatrol.com/2016/07/18/virtual-reality-vs-360-video/

Escamillan, Ralph. (producer) & Lee, Nancy (director) (2015). *Faux Solo.* [short film] Retrived from https://vimeo.com/187928607.

Ganguly, Shruti & Whitton, Elliot (producers) & Baldwin, Lily and Unseld, Saschka (directors)(2017). *Through You.* [360 film] USA: Fictionless.

Jola, Corinne, Ehrenberg, Shantel, and Reynolds, Dee (2012) *The experience of watching dance: phenomenological-neuroscience duets.* Phenomenology and the Cognitive Sciences, 11 (1). pp. 17-37. https://doi.org/10.1007/s11097-010-9191-x

Klien, Michael, Valk, Steve, and Gormly, Jeffrey. (2008) *Book of recommendations Choreography as an aesthetics of Change.* Limerick, Ireland: Daghdha Dance Company Ltd.

National Film Board of Canada. (2017, Dec 19) *Projects in production and development.* Retrieved from http://onf-nfb.gc.ca/en/produce-with-the-nfb/english-program/projects-in-production-and-development-at-the-nfbs-english-program/

National Opera & Ballet, Netherlands (2016, Aug 26). "NIGHT FALL - First Virtual Reality Ballet in the World (360°)." *YouTube.* Retrieved from www.youtube.com/watch?v=xCp4at6LE0A.

Perkovic, Jana (2016, Mar 7) "Audience takes centre stage in pioneering virtual reality dance film". *The Guardian.* Retrived from https://www.theguardian.com/stage/2016/mar/07/audience-takes-centre-stage-in-pioneering-virtual-reality-dance-film.

Rebenitsch, L., & Owen, C. (2016). Review on cybersickness in applications and visual displays. *Virtual Reality*, *20*(2), 101–125. https://doi.org/10.1007/s10055-016-0285-9

Steinicke, Frank. (2016) *Being Really Virtual.* Cham, Switzerland : Springer, 2016.

Authors Biographies

Nancy Lee is an interdisciplinary media artist, filmmaker, and cultural producer based in Vancouver, Canada. The notion of staging is a constant in Nancy's work and underpins her projects from a more traditional filmmaker into the realms of VR and new media performance and installation. Nancy has performed and presented her work in festivals and conferences around North America, Asia, Europe and Australia. Last summer, Nancy co-produced CURRENT: Feminist Electronic Art Symposium, a multidisciplinary and intersectional music and electronic art symposium working with women and non-binary artists. She is a 2018 YWCA Women of Distinction Nominee for Art, Cultural & Design and is named one of BC's Most Influential Women in STEM.

Emmalena Fredriksson is a dance artist based in Vancouver, Canada since 2013. Born in Sweden, she received her training at Balettakademien in Umeå and at SEAD (Salzburg Experimental Academy of Dance) in Austria. Emmalena holds an MFA degree from Simon Fraser University and has presented choreographic work, performed and taught internationally with Daghdha Dance Company (IE), Canaldanse (FR), Pact Zollverein (DE), and Falmouth University (UK) among others. Continuing her research into choreography as a relational practice in the expanded fields of dance, upcoming work includes collaborations with filmmaker Nancy Lee and lighting designer Kyla Gardiner.

Kiran Bhumber is a media artist, composer, musician and educator based in Vancouver, Canada. She constructs interactive installations and performance systems that allow performers and audiences to engage with themes relating to cultural memory, embodiment and nostalgia. She has performed and presented her works in North America, Asia, Europe and Australia including conferences and festivals. She is currently a Graduate Student Research Assistant at the University of Michigan's Performing Arts Technology Department and a Graduate Fellow at the Centre for World Performance Studies. Kiran holds an MA in Media Arts and a Certificate in World Performance Studies from University of Michigan, Bachelor of Music degree in Secondary Music Education from the University of British Columbia.