ELLIPSES

Multi-dimensional filter, fracture, and dilution of a nodalistic body

Robin Renwick
SARC / UK

Abstract

This paper personalises, reflects, and critically analyses *Ellipses*, a project which formed part of an concert of performances named *Tele-Sonorous Body*[1]. The production was created, directed, and performed by Ivani Santana, as she pursued her post-doctoral research at the Sonic Arts Research Centre (SARC). Certain technical and logistical stresses will be the focus; an attempt to conceptualise the imbued sense of relational and interrelational loss. A fragmentation of corporeality and cognition brought about through multi-dimensional filter and dilution. This hypothesis will be framed by nodalism, as developed by Philip Gochenour (Gochenour, 2005; Gochenour, 2006; Gochenour, 2008) and later appropriated into the realms of experimental music practice by Adkins and d'Escrivan (Adkins and d'Escrivan, 2013; Adkins, 2014a; Adkins, 2014b). It will also further the abstract notions of fragmentation and fracture as discussed by Schroeder and Rebelo (Schroeder and Rebelo, 2009). The paper will conclude that the performance consisted of a host of interacting, interceding, and interconnected networks, which agents traversed through, and between. This multi-dimensional network transferral led to project stresses; fracture, filter, dilution and fragmentation.

Keywords:

Network, Nodalism, Network Performance, Networkology

Introduction

Ivani Santana has a mass of experience in the field of technologically mediated dance (Santana, 2006; Santana, 2014). An accumulation of knowledge and wisdom that I might only dream of. Working with her was a thoroughly engaging process, but also brought forth the stark realisation that even after two decades of intense technological evolution in the field of network art, stresses remain steadfast. This realisation stimulated a degree of consideration, from both conceptual and theoretical perspectives: why do stresses remain and what is needed to overcome them so that artistic imaginings might be realised without the persistent narrative interplay of sociological, logistical and technological drama[2]. This paper addresses this investigation, focusing on the creation of *Ellipses*, which was one performance of three that Ivani Santana produced and performed at the *Sonorities Festival, 2013*.

The paper will first introduce the terms nodalism and networkology, outlining their origin and theoretical positioning. The concepts of nodalism and networkology are aligned with network orientated art through certain embedded principles. It will then explain the *Ellipses* project; from both artistic and technological stances. Aspects of nodalism and networkology will afford a framing of certain technological, artistic, motivational, temporal and sociological stresses within *Ellipses*; relating them through my own subjective experience of the production. The paper views *Ellipses* as a reified network, of which fracturing, fragmentation, and dilution of mind and body occurred. For this paper, the concept of mind and body leans on the notion of the 'sensorimotor system', where "the mind is not separate from or independent of the body" (Lakoff and Johnson, apud in Santana, 2014: 5). The paper concludes that the success of the *Ellipses* project lay in the productions teams' ability to manage strain within the network environment, as well as suggesting that multi-dimensional stress may be one of the main allures of network performance.

Nodalism

The nodal discourse is a critical theory centred around the perspective that nodes situated within a network of other nodes govern many facets of contemporary thought. Gochenour has been one of the main proponents of nodalistic thought, developing the critical theory of nodalism from Vilem Flusser's systems theory, among others; appropriating concepts into the realms of digital media, digital culture, and online distributed community (Gochenour, 2005; Gochenour, 2006; Gochenour, 2008). Gochenour has instantiated the nodalistic trope "x is like a node in a network" (Gochenour, 2008: 1) as a central facet of the digital humanities; evolving the view of the "intersubjective" (Flusser, 2005: 325) self. Flusser's relational model, where the subject is defined by the interaction it has with others, is a "concept of the subject as a 'knot'

of relations, as the intersections of various 'channels' of information, out of which the 'net' is formed" (Gochenour, in Flusser, 2005: 321). The core conceptual perspective is that the relations one has to other subjects, defines the subject. The set of prescribed principles associated with nodalism may inform a deeper, more involved comprehension of network art. Understanding networked systems as being nodal in type enables an intersubjective analysis of composers, performers, technologies, audience, and aesthetics to appear.

Adkins and d'Escrivan (Adkins and d'Escrivan, 2013) consider their recent music work, Geometries of Flight, as an example of nodalism at work. They utilise theoretical concepts to outline their 'progressive' remix practice, discussing how antiquated notions of 'commercial' remix are inadequate for understanding intricate re-interpretations of source material. They contemplate the implications of this practice with respect to artistic originality, calling into question their role as artists, as well as the "kinship" (Ibidem: 43) of their work. Adkins and d'Escrivan (2013) view the raw materials from which they worked as 'nodes'; re-interpreting and re-framing the nuggets of information through their own imagination and technical aptitude, while also paying heed to the "harmonic fields" (Ibidem: 43) of the original. The resultant nodalistic perspective ensures that the "notion of the remix is extended to include deeper level musical processes and a more experimental approach to listening" (Ibidem: 44). Their understanding of nodalism dissects the meaning of their practice, enabling recognition that it is such nodal connections "that makes the contemporary remix such a rich creative endeavour" (Ibidem).

Networkology

Networkology is seen as a fundamental philosophy of network systems and networked behaviours. Christopher Vitale's network philosophy is based on a postulation that existence is "networked to the core" (Vitale, 2014: 4), from physical, chemical, and biological perspectives. He feels that networked behaviour permeates all of humanity - from neural networks and brain electrode connections, to chemical interactions in the eco-system, to sociological formation and political organisation (Ibidem). Understanding this interconnectedness is key to understanding life, at all levels - from the bottom up emergence of ant colonies, to the intricate synchronisations found in memory allocations in the brain, to the science of DNA formations (Ibidem). Fathoming network theory from this all pervasive and omnipresent perspective will give one the tools to better understand both the miniature and the monumental. It will also enable a conceptual support system to appear. Concepts such as 'reification', 'levels of scale', and the 'principle of relation' afford deeper exploration of certain projects' characteristics.

To Vitale, a network is comprised of a number of other networks.

He describes: "The manner in which parts and wholes of networks contain each other gives rise to layers which are called levels, or levels of scale" (Vitale, 2014: 18). The process of moving, or traversing, between levels of scale for the sake of analysis or understanding Vitale calls "leveling" (Ibidem: 18). He acknowledges that in order to view this multi-dimensional 'leveling', a certain abstract mental process must be completed. This is termed 'reification': "The temporary solidification of processes which gives rise to particular nodes, links, grounds, and levels.....Reification is necessary to produce and maintain networks..." (Ibidem: 19). Reification is seen as the process by which formations appear to be solid and fixed. though they are, in fact, part of a fluid and dynamic system. It is also seen as a necessary process "..essential to the formation, support, change, and development of any and all networks..." (Ibidem).

The final term is perhaps the most important with respect to this paper, as it links the two theories of networkology and nodalism implicitly and directly. This is the "principle of relation" (Ibidem: 50). This principle represents the notion that "..the stuff of the world and all its networks are seen as fundamentally relational in nature, for everything is ultimately the result of the complex networking of its aspects with each other" (Ibidem). Vitale goes on to describe the concept of relation as being the central bind of meaning and sensibility: "...nothing is ever truly isolated from others, and anything is only sensible and valuable in regard to what is related." (Ibidem). This foregrounding of relation is crucial.

A theoretical frame is starting to appear. I have outlined nodalism as being a theory that is concerned fundamentally with how agents interact, interconnect, and interrelate. I have also outlined certain guiding concepts from within the spectrum of networkology. These concepts open up critical avenues of discussion: the idea that a network is comprised of nothing but a set of other networks; the concept of leveling through these multi-dimensional network formations, and the way in which the principle of relation binds the two intricately linked theories. This theoretical support now affords critical reflection and analysis of the *Ellipses* project.

Ellipses

There was a moment in the rehearsal project that the *Ellipses* project made complete sense. It wasn't the only moment, admittedly, but its lucidity will always remain in my memory. It afforded the perception of the intricate relational, interrelational, and bi-directional communication between body and sound; movement and vibration. At the time the local creative team consisted of: Ivani Santana (production and dance), Robin Renwick (audio technology, network technology, audio effects processing, and technical management), and Graham Booth (sound synthesis). We found ourselves huddled inside, and around, a 12ft diameter octophonic

array[3]; the sound proofed walls cosseting our creativity into a closely knit cauldron of artistic experimentation. Two computers, linked to a motion capture device were mediating an embryonic, yet burgeoning, relationship between dance and music; body and sound.

Ivani stood centre, articulating and signalling gesture through fluctuation and variation; a "proposal process" (Santana, 2006: 164) as transparent as it was lucid, fleeting as it was lasting. We heard her movements - not through the gentle ruffling of her clothes, the rustle of her socks against carpeted floor, or the soft pads of her feet as she positioned her body around the small area she had to work with - but through the veil of the sound system we were communicating through. The sound became a reflection of her embodiment; her body a mirror of the potentiality of encompassed aurality. Her navigation system folded into her sonification. The team's perception narrowed, focusing on to a central agent that coerced and compelled; obliged and restrained. The moment was as pure as it could have been, but was never found again. Lost into the ether. Distant, as a memory. An anthology of distinct interrelation.

For a moment, on a short lived Thursday afternoon during a rehearsal process, we understood the totalistic concept of the piece. In reality, we never found that joyous moment again, though, admittedly, we did get close. In hindsight, I often wondered why that moment remained out of reach - was it really just a moment of improvisation, never to be found again? Perhaps computer software parameters were never again the same; perhaps the speakers, or the room, cast some colour or shadow that afternoon that we could never again replicate; or perhaps it had something to do with the fact that for that short time, it was just Ivani, Graham, and myself; our own performance network, fortified by four padded walls.

Technically the project began as an exploration of the relationship between body and sound, but on reflection it quickly manifested into complex inter-continental subversion: a production apt for the description that Pauline Oliveros uses for the seemingly endless processes that accompany network orientated artworks: "head-banging" (Oliveros, 2009: 433).

There would be two sites: Belfast (SARC)[4] and New York (NYU)[5]. Each would host a performance system - both designed in Belfast, but built in two locations. The two systems would be intricately interconnected; a staple architecture of the network art diet. The bi-directional, bi-modal, communication and performance system incorporated a number of relatively complex softwares and hardwares. Belfast would host a Microsoft Kinect[6], a 32 speaker array (distributed as four vertically layered octophonic arrays[7]), one software-based network audio routing device[8], one computer based sound synthesis device[9], and one computer based audio signal processing device[10]. NYU would host a Microsoft Kinect, an octophonic speaker array, one computer that contained a software based networking audio program[11], as well as an audio spatialisation patch[12].

The overall dramaturgical concept was as follows: a dancer located in SARC would engage in an embodied 'proposal process'. This process

would be mediated by the suite of technology. Firstly, the proposal process would be measured and then relayed as dynamic information to two computers from the Kinect. This data would then be designated to control certain performative sonic elements: The first computer would interpret this information with respect to compositional parameters, primarily through a sound synthesis process. The digital synthesis architecture was programmed by Graham Booth, in SuperCollider[13]. The programme would map dancer movements to synthesis parameters such as pitch, amplitude, LFO depth, LFO rate, etc. This computer would then send its two-channel, stereo audio output to a second computer. The second computer would receive this input; processing it with a suite of custom built effects (see Fig. 1), with parameters being modulating in accordance with the same dynamic movement data obtained from the Kinnect. The movement data would control certain audio processing functions such as grain size, grain pitch, and grain density in a granular delay unit, or certain parameter settings within a distortion unit.
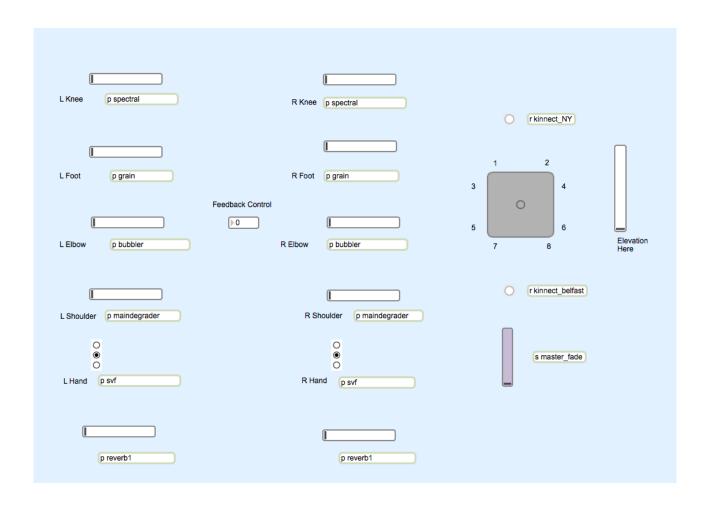
Figure 1. Signal Processing Max/MSP Performance Patch

Concurrently, at NYU, a dancer would engage in a relational proposal process. These movements would be interpreted by the NYU Kinect and then sent over the network to SARC, to be received by the audio effects processing computer (computer two). The second computer in SARC would interpret the information as surround sound positioning data. It would control the positioning of the audio received locally from computer one with respect to the data received from NYU, on the x and y axis at SARC, and on only the x axis in NYU. The audio that was being generated at SARC would be spatialised on a 32 speaker array through a Max/MSP sub-patch (see Fig. 2). SARC would also send an exact copy of the audio feed, now spatialised over eight discrete channels through another sub-patch, to NYU (see Fig. 3). NYU would receive this audio, and send it to their loudspeaker system. There would also be a video projection of the dancer located in NYU projected into the performance space at SARC. The projection would be approximately four times life size, and be displayed central stage, behind, and slightly above the local dancer.
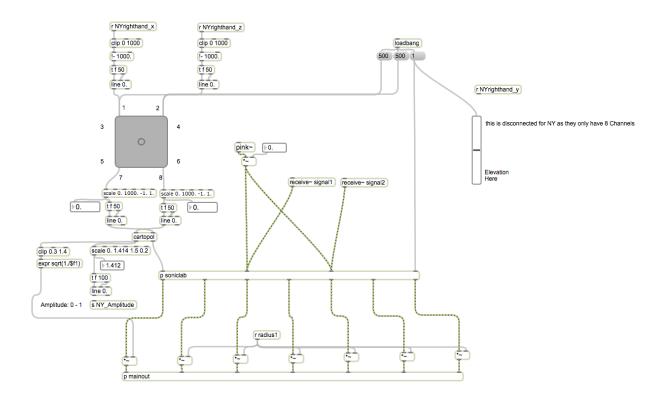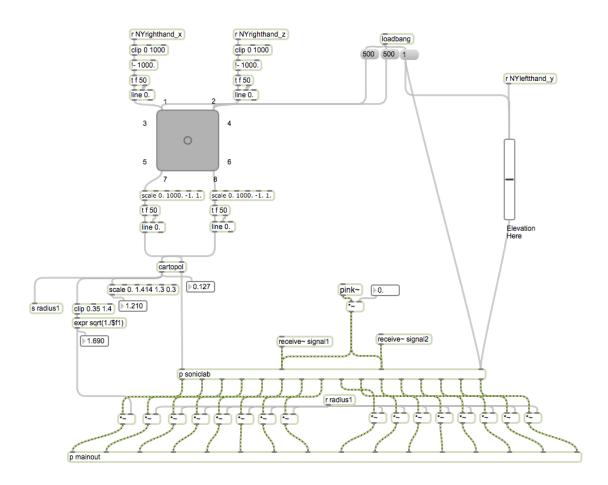
Figure 2. Audio Spatialisation Max/MSP sub-patch - SARC

Figure 3. Audio Spatilisation Max/MSP sub-patch - NYU

The architecture of the performance system (see Fig. 4) was intricate and delicate. It was also wholly dependent on numerous technologies; any of which could break at any moment. The goal of the performance, from an artistic perspective, was to produce an interactive, interrelational, and intra-active (see Moore and Place, qtd by Follmer, 2005: 186) transcontinental performance system in which two dancers involved themselves in a web of movement and dependency. The overall conceptual outlook may also be framed theoretically by nodalism; affording a conceptual lens to appear - opening up apertures of reflection from a number of perspectives.
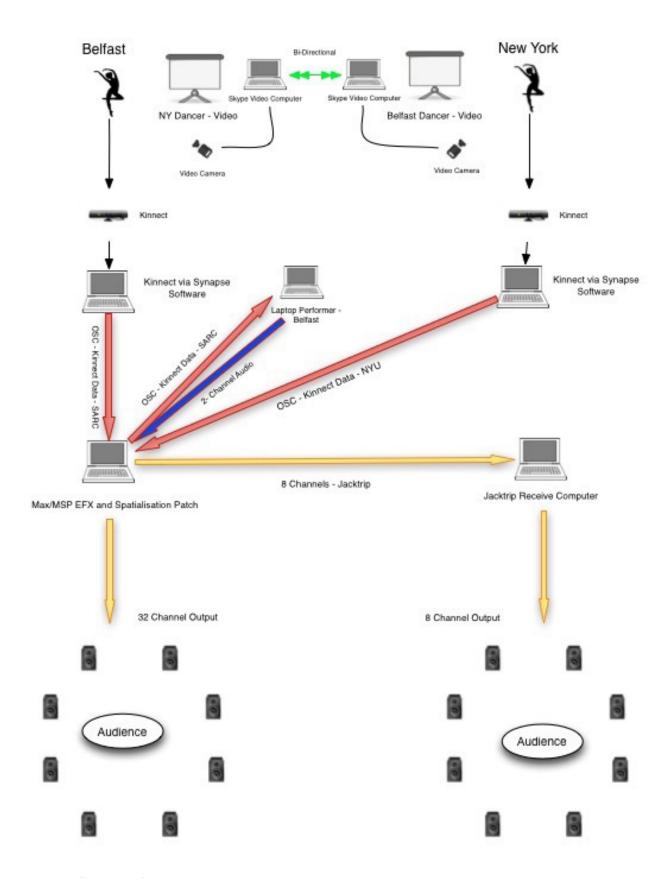
Figure 4. Ellipses Topology

Multi-dimensional fracture, filter, and dilution

Having explained nodalism and certain concepts of networkology - it is now left to consider how these terms afford deeper reflection on *Ellipses*. Firstly, the analysis will be completed from the perspective of myself: technical manager, and performing agent. My role, working closely with Ivani Santana, afforded me a detailed view of the inner workings of the process; its stresses, complications, and of course, successes. It will be a completely subjective view of the project and its outcomes. Secondly, the project must be held in stasis - reified - so it can be analysed. Lastly, we must recognise that the performance architecture of *Ellipses* implies that it is actually made up of a number of networks; at differing levels of scale - all interconnected and interlinked.

Locally, the performers for *Ellipses* represented a network: Ivani Santana, myself, and Graham Booth. This network would also have been a sub-network; part of a larger network of agents comprising the whole local production team - technical support members of SARC, members of the rehearsal team, etc. On yet another level of scale, there would have been an even greater network of agents: those involved in the whole local production of Telesonorous Body. This multi-dimensional characteristic, ensured that agents were always spread across, and through, a number of networks - most notably Ivani herself - who may be seen as a central agent within each sub-network. Agent's, myself included, were drawn across a number of dimensions. This dilution is seen as being the conceptual reflection of the project: agents being diluted and fragmented as they traverse levels and frames of reference; causing stresses to manifest throughout the network system.

Reflecting on the way in which agents were spread across networks leads me to classify the dilution process as some form of multi-dimensional entanglement. Personally, at times, it felt as if my own corporeality and cognition were being drawn across a number of domains as I worked; attentions navigating issues concurrently: technologies, logistics, softwares, hardwares, rehearsal timings, equipment availabilities, audio networking issues, etc; all competing for my attention as one of the "inner agents"[14] (Santana, 2006: 165). I use the term entanglement, as I feel that as an agent working in a network system my "embodied mind" (Lakoff and Johnson, qtd in Santana, 2014: p. 4) was stretched across many sub-networks, often crossing geographical and temporal spans. When I was asked to complete a process within one sub-network, it immediately effected my embodiment in another network. This type of behaviour, to a degree, has been termed 'fracturing' by Schroeder and Rebelo, as they discuss the process that we, as humans, involve ourselves in and within network spaces (Schroeder and Rebelo, 2009). Agents involve fragments of their whole into and inside digital network spaces, never offering total embodiment (Schroeder and Rebelo, 2009).

As a first example: *Ellipses* was one of three projects due for the evenings concert. Each would each have had their own agent network,

as explained above. The three networks would have contained similar agent roles and performance objects, but there would have been key differences with respect to the actual agents involved, the degree of their involvement, and the way in which certain technologies were appropriated into the performance system. Primarily, this led to stresses between the three performances with respect to rehearsal times, agent involvement timings, and rehearsal schedules. A dancer involved in NYU, as part of *Ellipses*, might have only been available at a certain time or on certain day - this meant that in order to ensure the rehearsal process went ahead, the rest of the rehearsal schedule would have to be arranged around that determining factor. This might have also been the case for a dancer involved in another project; with the *Ellipses* project then being rearranged to suit. At times, it seemed that every network was being shifted and arranged, in a some form of logistical, temporal, multi-dimensional dance. This characteristic is of course not new, as rehearsal scheduling is something that most complex performances will have to endure. What is interesting to think about, theoretically, is that sub-networks seem to compensate and counterbalance; counteract and relate. As one network shifts, repercussions disperse through the whole network system. Each sub-network rearranging; adjusting to the stimulus.

Another example lay with the production team in NYU, led by Prof. Tom Beyer. He was the production and technical manager at NYU. If we look at his role from a nodalistic perspective, we might say he was the governing agent in a hierarchical network formation; managing a group of undergraduate and graduate students as they moved through a complex production, rehearsal, and performance process. It must be stated that the job was done admirably. However, the specific organisational formation caused certain affective communicational stresses. Certain tasks would have been delegated by Beyer; video, audio, networking technologies, etc, but at times, he faced difficulties in co-ordinating the NYU team, or difficulties in finding students with necessary expertise in the given area. At times, it also felt as if the NYU team were not as emotionally, or artistically, attached to the project as himself; leading to a reduction in cohesion between the two teams. The overall effect of this was that any stress encountered by Beyer passed through to our network - filtered through the haze of hierarchy. Most of these were relatively simple: late rehearsals, lack of technological understanding, lack of involvement and dedication to the project, etc, but as we had no direct control of the production team in NYU - communicating primarily through Beyer - he, unfortunately, bore the brunt of the frustrations felt on our side. This seemed to me to be a funnelling, or filtering, of communication through a multi-dimensional interrelational process.

The filtering did not happen all the time; in moments we communicated directly with a counterpart. For example, rehearsals included Ivani talking directly to dancers in NYU; or I, talking directly to those in charge of audio and networking technologies. The equilibrium between

filtered and unfiltered communication always seemed to be a delicate balancing act. There was no doubt that the team in NYU needed a strong leadership figure; but at times, I felt that our own team in SARC was being diluted and fractured by the stresses passing through, and from, their production team, in an intercedence of emotional turmoil. Often we would blame them, or they would blame us - a core exemplification of what Oliveros has deemed the reason for her perpetual sore head (see Oliveros, 2009). This type of fracture is also explained by Schroeder and Rebelo, as they describe how it is bodies, or human agents, that interrupt the smooth flow of networks. The "human body is an interrupter, a disturber of the network. The human body inhabits the stitch" (Schroeder and Rebelo, 2009: p. 4).

The third example is perhaps the most important to consider, as well as being one in which the framing from a nodalistic and networkological perspective may be most apt. Ivani Santana took on so many roles in the project; she was performer, choreographer, artistic director, producer, and stage manager - simultaneously - not to mention that she was also concurrently engaging in a research and documentation process as part of her post-doctoral studies at SARC. Of course, this is merely an exemplification of her as both person and artist; one whose determination and excellence is plain to see for those that have had the pleasure of working with her. However, the overall effect was that her 'embodied mind' was fractured, diluted and fragmented as she navigated sub-networks; traversing roles consecutively and/or concurrently. From my own perspective, I could see how this dilution was in detriment to the project as a whole - if roles could have been filled by others, Ivani would surely have had more time to envelop herself completely in performative aspects of the production, perhaps leading to more moments like we experienced in that rehearsal room that one Thursday afternoon. Yet, it was also interesting to watch her traverse from role to role, filling each one with as much expertise she could. One might argue that Ivani even enjoyed the multi-dimensional traversing - perhaps one characteristic of the allure of network art that is less explored and under-discussed.

The medium of the network provides an unrivalled venue for sub-networks to be formed; opening up an avenue of discussion related, yet distinct, from Schroeder and Rebelo's. They view the body as 'disturbant' in the network: "the network flows uninterruptedly in the absence of bodily presence" (Schroeder and Rebelo, 2009: 4). From another perspective, one framed by nodalism and networkology, the body is seen as the stitch. The body becomes the link, the bind, the node - traversing through dimensions, engaging, interacting, and communicating - as and when needed. However, it must be said that playing the role of the stitch is draining; the agent is forced to fill so many roles, within so many interconnected and interrelating networks. The agent is fragmented, yes, diluted, surely. But without it, the sub-networks would have struggled to communicate inter-dimensionally, causing concrete fracture to appear in the spaces in, and between.

Conclusion

This paper has reflected on certain project specific aspects of *Ellipses*; framing characteristics within the conceptual and theoretical outlook of two core concepts: nodalism and networkology. It has briefly described nodalism, as well as networkology; outlining the guiding principles through which the frame of reference appears. It then discussed certain stresses that were felt during the production process; attempting to relate them to concepts of fracture, fragmentation and dilution. Three examples were outlined; personal observations of what was a complex production process. It is felt that the concept of multi-dimensionality within networks - sub-networks, levels, interdependent relations, interrelations, connections, and interconnections are simultaneously cause, effect, and allure of network performance. In one instance, it was outlined how sub-networks interrelate and relate with respect to internal stimulus. In the second example, it was outlined how network formations affect communication between sub-networks; filtering and diluting information as it traverses through dimensionality. In the third example, the fragmentation and dilution of agency through multi-dimensional network formations was elucidated as both stress and allure.

Notes

1 Tele-Sonorous Body was the opening concert of Sonorities 2013: Beyond Sound-scape, held at Queen's University Belfast. More information may be found at http://www.sonorities.org.uk/old/2013/

2 In my time as PhD student, I have been involved in a number of network performances. Each have had a degree of stress that seemed unique to the genre; as if the characteristics of the medium were embodied in the narrative drama that relentlessly played out, time and time again.

3 An octophonic array is a loud speaker arrangement, consisting of eight speakers. In the majority of cases, all speakers are placed on the perimeter of the circle, facing inward. It is a common surround sound format within experimental music. More information may be found at https://en.wikipedia.org/wiki/Octophonic_sound

4 Located at the Sonic Arts Research Centre at Queen's University Belfast.

5 Located at New York University.

6 A motion sensing device built by Microsoft, intended for use with their XBox home gaming system. The device may also be used outside of the realm of gaming, in more experimental formats. More information may be found at https://en.wikipedia.org/wiki/Kinect

7 For more information about the SARC 32 speaker array, please see http://www.sarc.qub.ac.uk/sites/sarc/AboutUs/TheSARCBuildingandFacilities/TheSonicLab/

8 A combination of Jack OSX (http://www.jackosx.com) and JackTrip (https://github.com/jcacerec/jacktrip)

9 Supercollider was used for the Sound Synthesis (http://supercollider.github.io)

10 A custom built Max/MSP software patch was used.

11 An Apple OSX machine with Jacktrip Audio installed.

12 A custom built Max/MSP software patch was used.

13 SuperCollider is a programming language for real time audio synthesis and algorithmic composition (http://supercollider.github.io)

14 An "inner agent" is described by Santana as a dancer classified as being on the 'inside' - as they "knew about the work's concepts". I have used the term inclusively so as to comprise the agents that would have been part of the performance process. At SARC this would have been Ivani Santana, Robin Renwick, and Graham Booth. For explanation of the term 'inner agent', please see Santana, 2006.

References

ADKINS, M. "A Manifesto of Nodalism". *CITAR Journal,* Volume 6. No.1 - Special Issue: xCoAx 2014, p. 51-60. 2014a

ADKINS, M. *Nodalism and Creative Practice. In proceedings of Computation, Communication, Aesthetics and X*. Porto, Portugal, p. 289-319. 2014b. Available at http://2014.xcoax.org/pdf/xcoax2014-Adkins.pdf

ADKINS, M., D'ESCRIVAN, J. *Geometries of Flight:Remix as Nodal Practice - In proceedings of Computation, Communication, Aesthetics and X*, Bergamo, Italy, p. 39-50. 2013

ALARCON, X. "Networked Migrations: Listening to and performing the in-between space". *Liminalities: A Journal of Performance Studies*, Vol. 10, No.1, May 2014

FOLLMER, G. *Electronic, aesthetic and social factors in net music*. Organised Sound 10(3): 185-191 © Cambridge University Press. 2005

GOCHENOUR, P. H. "Masks and Dances: Cybernetics and Systems Theory in Relation to Flusser's Concepts of the Subject and Society". *Flusser Studies*, 1, 1. 2005

GOCHENOUR P. H. *Distributed communities and nodal subjects*. New Media & Society, 8(1), 33-51. 2006

GOCHENOUR, P. H. *Nodalism. Digital Humanities Quarterly*, Volume 5, Number 3, 2008

OLIVEROS, P. *Networked Music: Low and High Tech. Contemporary Music Review*, 28:4-5, 433-435. 2009

SANTANA, I. "Networked Dance Performance: a new temporality". *Liminalities: A Journal of Performance Studies*, Vol. 10, No. 1, p. 2-19. May 2014

SANTANA, I. *Ambiguous zones: The intertwining of dance and world in the technological era. International Journal of Performance Arts and Digital Media*, 2:2, 153-169. 2006. Available at http://dx.doi.org/10.1386/padm.2.2.153_1

SCHROEDER, F., REBELO, P. "Sounding the Network: The Body as Disturbant". Leonardo Electronic Almanac, 2009.

VITALE, C. *Networkologies: A Philosophy of Networks for a Hyperconnected Age* - A Manifesto. Zero Books, Winchester, United Kingdom, 2014.

Biography

Robin Renwick is actively pursuing a PhD at the Sonic Arts Research Centre, Queen's University Belfast. His research is focused on network orientated artworks; primarily understanding how nodalism may be appropriated as theoretical frame, conceptual outline, and critical and reflective tool for the analysis and creation of network music. He is also currently a node.