THE FLORIDA STATE UNIVERSITY

The Arrows of Time:
The symbiotic relationship of movement and interactive technology resulting in time manipulation

A PROPOSAL PRESENTED TO THE
FSU SCHOOL OF DANCE FACULTY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
MASTER OF FINE ARTS DEGREE
IN DANCE

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TALLAHASSEE, FL
16 NOVEMBER 2015

Abstract

The ever-growing field of digital technology has had an increasing presence in dance productions. I see interactive performance technology incorporated into choreographic works as a prime site of access for younger dance audiences. Multimedia theater pieces tap into the rapidly changing times, keep abreast with new developments, and are an integral part of dance helping to maintain its cultural relevance. Through digital technology, dance thrives.

My thesis project will facilitate an investigation into my own artistic and choreographic relationship to 2-D projection technologies coupled with live dance experience. I plan to explore the effects of customized interactive computer software on the proscenium stage while delving into questions surrounding the fabricated nature of time; especially it's potential to morph in multiple registers. My thesis will create a digital/live environment where performers will manipulate choreographic timing by reversing, looping, accelerating, decelerating, distorting, and compressing phrase work.

To accomplish this, I will collaborate with Florida State University Computer Science faculty and students to establish a software program that has key components of motion tracking capabilities. I will create a thesis project that successfully fuses choreography and projections in tandem with this motion capture software as a live performance on the proscenium stage. In addition, this work will include a weeklong installation component exhibiting interactive projections using the software created for the multimedia work on stage. My research will support a clearer understanding of how to create a balanced, interdependent relationship between dance and new technologies.

Research Questions

I stumbled upon a video via YouTube back in 2008 of Gideon Obarzanek's *Mortal Engine.* My first question was, "Why have I never seen works like this before?" and the second,

"How can I make interactive pieces?" My two passions in life were dance and video games. To see this beautiful work of art that fused qualities of both my interests from the 2-D and 3-D worlds, I knew I wanted to continue my artistic path investigating potential works such as these.

Since then, I have researched many multimedia choreographers in the dance industry such as David Middendorp, Anthony Magliano, Nobuyuki Hanabusa, Gideon Obarzanek, Christian Mio Loclair, Adrien Mondot and Claire Bardainne. Out of these choreographers, Middendorp, Magliano, and Hanabusa produce software effects differently by using pre-rendered[1] projections. Although pre-rendered work has benefits of being a constant and reliable variable, it does not leave much flexibility to change effects easily, since the process of restaging a new effect takes time to edit on the computer, and then requires additional time to rehearse the performers with the projections. This requires extreme accuracy on the part of the dancers, and despite their best efforts, the lack of true interaction is still detectable to a trained audience.

Obarzanek's *Mortal Engine* utilized an infrared video-tracking program that sensed the motion of human bodies which triggered effects. The projected effects created a convincing illusion of dancers appearing as bio-fiction creatures in an organic-like environment. This captivating piece led me to research the motion-tracking program, Eyecon which was created by collaborator and Interactive Software Engineer Frieder Weiss. After discovering this program, I learned other choreographers such as Amy Seiwert and Emily Fernandez had incorporated Eyecon effects into their works *White Noise* and *Innosense*. Unlike *Mortal Engine* which utilized the technology as a main component creating this successful illusion, their use of Eyecon in their pieces tracked the dancers but did not influence the movement invention, making the effects appear more as a digital backdrop, unrelated to the movement on stage.

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[1] Pre-rendered: refers to anything that is not rendered in real-time. Instead, the video is a recording of footage that was previously rendered.

Comparing Seiwert and Fernandez works to Obarzanek's, it appeared as if they had relied purely on the software effects to "decorate" the movement instead of integrating and exploring the potential of the software program on a deeper level. This in turn generated research questions of how can I integrate these digital effects within a choreographed piece where they hold equal importance as the movement onstage? How can I generate movement invention appropriate for the digital effects and illusions at hand supporting the overall concept of the piece? Furthermore, if I have the ability to create an illusory digital environment with dancers completely reliant upon the vast capabilities of a digital program, what could I create visually that would be difficult to choreograph and showcase without the assistance and creation of software interactive effects?

This brainstorming led me to the video game *Braid*. This puzzle game consists of six levels, each utilizing a unique ability of time manipulation. "A defining game element is the player's unlimited ability to reverse time and 'rewind' actions, even after dying."[2] Without the digital assistance of the projected effects, it would be difficult to demonstrate these time manipulation abilities with movement alone. Thus, reversing, looping, accelerating, decelerating, distorting, and compressing time would not only be visually possible live onstage, but this underlying concept would be evident through movement invention and the unique marriage and balance between the choreography and digital effects.

Description of Project

My proposed MFA thesis project consists of two parts: 1) A twenty-five minute multimedia work presented on the proscenium stage in the Nancy Smith Fichter Dance Theatre 2) A weeklong installation in the FSU Museum of Fine Arts exhibiting the interactive projections of the motion tracking software created for the multimedia work on stage.

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[2] "Braid (video game)." Accessed June 30, 2015. https://en.wikipedia.org/wiki/Braid_%28video_game%29.

The performance will be set in the Nancy Smith Fichter Dance Theatre utilizing front and rear projection throughout the entire work. In order for the front projection colors to be effectively visible on the stage floor a white Marley floor will be needed. With both projections on different planes, the overall illusion will be a convincing immersive environment for the performers on stage. The work will consist of four to five sections with a total of six to seven dancers. Incorporating ideas from the video game *Braid* with each section, I will strategically introduce different abilities to manipulate time.

I will collaborate with FSU Computer Science faculty and students to combine multiple visual effects into a single user-friendly program operable from a laptop. In order for me to succeed with my project, my collaborators and I will need ample rehearsal time in the Tech Studio and the Nancy Smith Fichter Dance Theatre, to have access to QLab, cameras, and projectors to test the motion-tracking software on the dancers.

The FSU Museum installation will run for the entirety of the MFA concert week. This will be an opportunity for the public to interact with the same motion-tracking program that will be used in the multimedia piece. A projector, camera, and laptop with the computer software will be set up to track the viewers motion, familiarizing them with the projected real-time effects they will be seeing in the live performance. This installation will create a thought-provoking space providing a unique immersive environment. This exhibit will inspire questions related to the complexity of time, enriching the underlying theme of time manipulation that will be later seen in the performance.

Discussion of Process

The development of this piece relies upon the collaboration between the FSU Computer Science Department (CS) and me. My role as the visionary is to supply ideas for choreography and their appropriate effects, as the Computer Science team researches and develops methods for

interactive technology. While the interactive technology is being developed, I will be exploring movement invention. The movement material will be generated by the influence of the 2-D digital effects and support the underlying theme of time manipulation. Having collaborated with the CS Department faculty and students this fall semester, I have a better idea of the range of limitations and capabilities for effects that can be presented on stage. It is crucial in this process to learn these technical elements in order to interact and most effectively work with the moving body.

I will continue researching other choreographers and multimedia artists in the field who incorporate interactive projection components within their performance pieces. I will also research textual resources such as online articles, reviews, and papers that cover the topic of interactive performance technology as well as time travel and the *Arrow of Time.*[3] I will continue investigating new forms of interactive performance technology and explore how they might be implemented into my creative process.

Anticipated Timeline

Below is an anticipated schedule of the various sections and phases I plan to undertake.

Fall 2015:

- Research conducted: Video game *Braid* ; Creator of *Braid*, Jonathon Blow; Time–based lectures on *Braid*; Time theories and time traveling abilities; Choreographic interactive technology pieces through articles, websites, and videos online; Software programs used from choreographers' pieces such as eMotion, Eyecon, Vezer, and Kandinsky; Books on multimedia choreographic works
- DIS with Tim Glenn creating prototype project
- Contacted, attended meetings, established plan with Computer Science Department collaborators for ongoing process for thesis project
- Invited dancers, discussed, generated and taught phrase material, set costumes, set music for prototype

[3] "The Arrow of Time." Accessed June 28, 2015. http://www.informationphilosopher.com/problems/arrow_of_time/.

- Rehearsed and set half of the DIS prototype piece in NSFDT theatre in December testing first phase of computer software
- Continue choreographing and experimenting with software during holiday break

Spring 2016:

- Continue rehearsing, with dancers and software, set full prototype piece by March, submit to Days of Dance
- Meet with costumer to render
- Enrolled in Video Applications for Dance (for projection and intermedia practice)
- Appoint Concert and Tech Assistants
- Contact FSU Museum of Fine Arts, set plans for week of thesis concert

Summer 2016:

- Meet with Russell Sandifer, discuss lighting and visual design
- Continue researching and experimenting with movement invention for established software program, learn to operate program independently
- Outline rehearsals for subsequent semesters
- Set music for thesis performance

Fall 2016:

- Begin rehearsal process of setting movement and testing software though projections in NSFDT
- Organize costumes for the dancers
- Solidify plans for Museum of Fine Arts exhibit
- Consult with Russell Sandifer to create lighting plot
- Rehearsals with the final effects
- First fitting of costumes

Spring 2017:

- Hand in lighting plot
- Costumes: final fitting
- Prepare and set exhibit in Museum of Fine Arts during week of concert
- Dress/Tech rehearsals
- Determine set up and breakdown for the reception
- Hold performances and reception

Significance

My life-long mission as an artist and choreographer is to create work that resonates with the audience members. My goal is for them to walk out of the theater thinking back to their experience feeling stimulated and inspired. Projections and dance are commonly seen together in

productions, but interactive motion tracking is an expansive and relatively new area with much room to be investigated and explored. Technology will change and develop over time, and this research will enable me to better adapt and embrace the trending technological world and be able to integrate it as an inspirational fuel to create artistic pieces with which the general public will be able to connect.

Conducting this research will enable me to deepen my creative practice, heighten my technological skills, and thereby increase my expertise. These skills will allow me to set work on a professional company or create personal repertoire, opening new doors for my ultimate goal of becoming a university professor of choreography and intermedia technology. By striking a desired balance between technology and movement invention, I can inspire future choreographers, students, and artists to explore these technological techniques that could result in new and innovative works that stimulate and reach multigenerational audiences.

Media Archive of Inspirational Materials

- **Gideon Obarzanek and Frieder Weiss using Eyecon (interactive-tracking software):**
    - *Mortal Engine*

    https://www.youtube.com/watch?v=pS1WALmBqUw

    - *Glow*

    https://www.youtube.com/watch?v=2AautwIOON8

- **Frieder Weiss using Eyecon in installations:**
    - *Flow*

    https://www.youtube.com/watch?v=h0QfH3FXrDg

    - *Sirens*

    https://www.youtube.com/watch?v=g7J6_pp648w

- **Amy Seiwerts' use of Eyecon:**
    - *White Noise*

    https://www.youtube.com/watch?v=q_Z8GViJz7A

- **Emily Fernandez' use of Eyecon:**
    - *Innosense*

    http://www.frieder-weiss.de/works/all/Innosense.php

    - *Reference film for Ratiopharm Campus*

    https://www.youtube.com/watch?v=RNln5EcIzHc

These are examples of pieces created through the incorporation of choreography and Eyecon. As you can see, some dive deeper into the potential of the software in conjunction with the movement, while others use it as a decorative digital backdrop.

Here is an example which utilizes software effects to create a convincing immersive environment. Take notice of this interdependent relationship between the movement generated with the digital effects: one could not be presented without the other, or at least, not conveying the same story.

- **Adrien Mondot and Claire Bardainne utilizing eMotion software:**
    - *Pixel*

    https://vimeo.com/114767889

- *Le mouvement de l'air / The movement of air*

https://vimeo.com/145201272

- **More work from Adrien Mondot and Claire Bardainne utilizing eMotion software:**
  - *Hakanaï*

https://vimeo.com/46045360

  - *Coincidence*

https://vimeo.com/35528568

  - *Cinematique*

https://vimeo.com/9782048

- **Installations from Adrien Mondot and Claire Bardainne utilizing eMotion software:**
  - *XYZT*

https://vimeo.com/130690760

- **Adrien Mondot and Claire Bardainne puppeteering with Leap Motion and eMotion software:**
  - https://vimeo.com/71216887
  - https://vimeo.com/70978302
  - https://vimeo.com/71060637

More Choreographers and softwares:

- **Works from Christian Mio Loclair utilizing Kinect Camera and program Open Framework:**
  - *Flow 1*

https://www.youtube.com/watch?v=ISKV1BeB3pM

  - *POW2045*

https://vimeo.com/130200072

Loclair uses the infrared capabilities of the Kinect camera to track his dancers in real-time and project effects. However there is an 8 to 10 foot proximity restriction for the camera lens to be able to pick up the dancers movement, which leads to issues when it comes to a larger scale production on a stage.

The following choreographers utilize their own programs of animation and effects, however, they are all pre-rendered meaning the dancers have to be perfectly in sync with the effects to create an illusion of synergy.

- **David Middendorp using software program Kandinsky:**
    - *Blue Journey*

    https://www.youtube.com/watch?v=8rLDCjxTyb8

    - *Flyland*

    https://www.youtube.com/watch?v=2KaLafpq-AI

    - *15 Minute Universe*

    https://www.youtube.com/watch?v=TiFFreVWxmA

- **Nobuyuki Hanabusa's works:**
    - *Black Sun*

    https://www.youtube.com/watch?v=HyWkB1SYDMs

    - *Pleides*

    https://www.youtube.com/watch?v=Lyp97ELRJq0&list=PLTAoVjo-avXbe10m1Lho-HpfUb6g9GcA3

    - *Primitive*

    https://www.youtube.com/watch?v=IALr6M2NXsE

    - *Torque Starter*

    https://www.youtube.com/watch?v=3JdT4fDi4iI

    - *Hora*

    https://www.youtube.com/watch?v=vQAYVN8j2fg

- **Anthony Magliano's works:**

    - *Illumination*

    https://vimeo.com/86744962

    - *Spectrum*

    https://vimeo.com/66925669

- *Aquarium*

https://vimeo.com/27979889

- Stimulus

https://vimeo.com/27951109

This is a video trailer of the video game *Braid*:

https://www.youtube.com/watch?v=uqtSKkyJgFM

After viewing the video, I still continue thinking about the questions it asked. I feel connected to the questions and quite curious to play the game, and it makes me wonder if I did have the option to travel back in time, would I?

These are the types of underlying questions I want to convey through my installation, to evoke a connection through my work that entices the viewers enough to experience the installation more than once, adding an enriching component when they finally view the live performance.

Incorporating the idea of time manipulation from *Braid* within choreographic structure, here is a perfect summary from Wikipedia of the gameplay of each level and a video to accompany:

Braid is played by solving physical puzzles in a standard platform game environment. The player controls the protagonist Tim as he runs, jumps, and climbs across the game's levels. Tim jumps and stomps on enemies to defeat them, and can collect keys to unlock doors or operate levers to trigger platforms. A defining game element is the player's unlimited ability to reverse time and "rewind" actions, even after dying. The game is divided into six worlds, which are experienced sequentially and can be entered from different rooms of Tim's house; the player can return to any world previously visited to attempt to solve puzzles they missed.
Each world has its own time-based game mechanic:

- *2. Time and Forgiveness* plays as an ordinary platform game, except that the player may rewind time to undo their actions. The section includes several challenges that would be unplayable or unfair in an ordinary platform game, but become feasible when the rewind mechanic is available.
  https://www.youtube.com/watch?v=M6BT5iqPxfg

- *3. Time and Mystery* introduces objects surrounded by a green glow that are unaffected by time manipulation; for example, switches will remain flipped even if time is rewound to before the action occurred. Rewinding can thus be used to change the synchronization between objects that can and cannot be rewound, the basis of many puzzles in this section. This theme is also used in later worlds to denote objects unaffected by the player's time manipulation.
  https://www.youtube.com/watch?v=pcjbil1TM0o

- *4. Time and Place* links the passage of time to the player character's location on the horizontal axis. As the player moves toward the right, time flows forward, while moving toward the left reverses the flow; standing still or moving vertically will pause time. The player's location must be carefully managed in relation to enemies and objects. https://www.youtube.com/watch?v=QMiLCbGl8ng

- *5. Time and Decision* involves a "shadow" of the player character appearing after the player rewinds time and performing the actions that the real player character rewound; if the timeline expires, the shadow will complete any initiated falls and jumps but will otherwise stand still before disappearing. Things colored in violet can interact both with the main character and its shadow at the same time. Puzzles in this section revolve around using this mechanic to carry out multiple actions at once. https://www.youtube.com/watch?v=EYCmacqcGWI

- *6. Hesitance* provides the player with a magic ring which, when dropped, warps the flow of time around itself; the closer moving objects (including Tim) are to it, the slower time passes for them. The regular rewind control remains available. https://www.youtube.com/watch?v=chd4ijoaxVk

- The final world is labeled simply as "*1.*" In this world, time flows in reverse. Rewinding time returns the flow of time to its normal state. https://www.youtube.com/watch?v=OiGU0GXQdKA

The game has many rich metaphors within it. The game is designed knowing that you have the ability to go back in time to complete tasks, with that, some levels require you to die on purpose and sacrifice your past self to continue on with the present. This is another concept of time I will be exploring within my staged work.

Here is a webpage that shares links of multiple time manipulations that have been used for super powers:
http://powerlisting.wikia.com/wiki/Time_Manipulation

This source will be a reference for time turning abilities for the dancers movement with the addition of projected effects.

There will be sections within the piece that have projections of hourglasses or sand dropping, to symbolize time passing. The manner in which time is manipulated dictates what happens visually with the sand:

Examples:

https://www.youtube.com/watch?v=kNyNItJNbbo

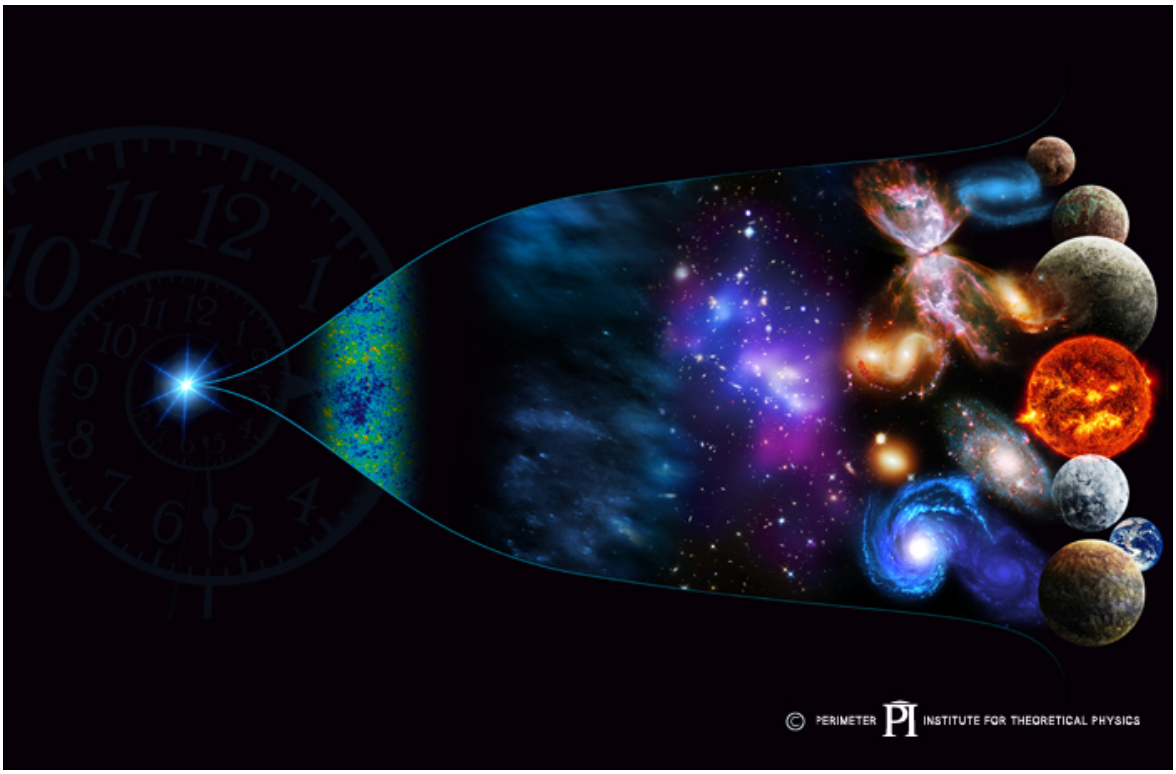
https://www.youtube.com/watch?v=CWW0-YNT5SI

https://www.youtube.com/watch?v=xIrAx362sWI

https://www.youtube.com/watch?v=pO6dm43mEwg

Inspirational artwork:

http://web.archive.org/web/20090302011716/http://www.davidhellman.net//braid/hourglasscastle-big.jpg



https://perimeterinstitute.ca/sites/perimeter-www.pi.local/files/articles/attachements/BigBang_700px.jpg

http://www.sciencedump.com/sites/default/files/field/teaserimage/arrow-of-time.jpg

http://www.reasonablefaith.org/images/podcasts/rf_detail/rf_detail_318_0.jpg

http://blog.expositionchicago.com/wp-content/uploads/2015/02/Photo-Joshua_White-8440.jpg

Choreographic Work Samples

1. *when the time is right*

https://vimeo.com/140878037
Director/ Videographer/Editor: Jennifer Petuch
Dancer: Ircamar Garcia
Music: Brian Petuch
Choreography Created in Collaboration with Dancer
Running time: 5:58
2015

Reflecting nature, we witness profound life-change through a personal metamorphosis. *when the time is right* captures the transformational moment of an individual breaking free from the years of her past culminating into something beautiful and passionate.

2. *Skin Deep (Excerpt)*

https://vimeo.com/145756389
Choreographer: Jennifer Petuch
Dancers: Brooke Bissell, Esophia Higgins, Amanda Roa
Music: Ed Harrison
Full piece running time: 7:45
Excerpt running time: 3:28
Shoes at the Door Dance, Inc.
"Impulse"
2013

Skin Deep was created in collaboration with lighting and sound designer, Anthony Vito. This group piece utilized sound-activated electroluminescent light wire on costumes as an intricate technical component. This piece is a metaphor on the idea of influence; that as a species, we are easily influenced mentally and physically by each other, regardless of how much we struggle to reject it.

3. *2[Parts]*

https://vimeo.com/145756120
Choreographer: Jennifer Petuch
Dancers: Jennifer Petuch and Sadie Lehmker
Music: Brian Petuch
Running time: 5:20
Shoes at the Door Dance, Inc.
"In Modo Di..."
2013

2[Parts] is a duet I choreographed and performed. It was made in collaboration with New York City-based composer, Brian Petuch, who writes chamber, orchestral, and electronic music. The

main theme of this piece was based on honesty; the notion that some feel the need to conceal a fact or belief and pass one another in life without even knowing they share something in common. The main idea I was following was “Honesty can create connection”.

4. *Parallel Spectrum (Excerpt)*

https://vimeo.com/145756542
Choreographer: Jennifer Petuch
Dancers: Laurel Frye, Esophia Higgins, Sadie Lehmker, Amanda Roa, Brooke Willis
Music: Solar Fields, Klaus Obermaier
Lighting Design: Anthony Vito
Trialog Patch: Joey Bargsten
Full piece running time: 10:17
Excerpt running time: 3:41
Shoes at the Door Dance, Inc.
"Echoes"
2012

Parallel Spectrum was created in collaboration with lighting designer Anthony Vito and Florida Atlantic University Professor and Programmer Joey Bargsten. This multimedia group piece utilized an infrared sensory light camera on stage with computer software called Quartz Composer. The program note read: “What if in an alternate reality it was normal to be able to see radiant and kinetic energy wavelengths in everyday motion? This parallel universe will finally be revealed to you and you will be able to view how our “parallel selves” experience every day motion… but in a new light. You are a part of this piece; we are all in this reality together and will always remain connected.”

Annotated Bibliography

Alyssa Schoeneman, December 17, 2010(2:52pm), "Technology and Dance Essay, written Spring 2010,"*HASTAC blog,* https://www.hastac.org/blogs/aschoen2/2010/12/17/technology-and-dance-essay-written-spring-2010.

This blog was written by student Alyssa Schoeneman, who attends University of Illinois at Urbana-Champaign earning her Bachelor's degree in dance and is currently earning her Masters of Science in News-Editorial Journalism degree. Within this entry, Schoeneman discusses the pros and cons of technology within the dance space, how it is incorporated, and if it is beneficial for the art form as a whole. She lists personal interviews conducted by programmers who are in the process of creating interaction using their sophisticated software within dance choreography. Schoeneman includes interviews from the choreographers themselves, and how they agree or disagree with this technology use. Schoeneman discusses the relationship between the choreography and technology and the difficulty of finding the balance where the technological component won't appear like a gimmick or "glitz." This blog will serve as one of my main sources for this research project with its discussions addressing precisely what I am trying to tackle within my own investigation.

Another Kind of Blue. "kandinsky." Accessed October 14, 2014. http://www.davidmiddendorp.nl/.

This is the website of David Middendorp; a choreographer and producer of Blue Technology. This webpage leads to the software Kandinsky, that he and his software artist Marcus Graf, collaborated to create. It's an app that can be used on the iPad that captures shapes, rhythm, and tempo in lines with the dancers' movement and creates animation. Middendorp has links of workshops and YouTube videos on the website to assist others who are interested in

using his app. This will be one of the programs my collaborators and I will consider for effects within our software library.

Beckwith, Megan, and Professor Kim Vincs, "Parallax: Dancing the Digital Space." ISEA2015: Proceedings of the 21st International Symposium of Electronic Art, Burwood, Australia, 2013. Accessed September 30, 2015. http://isea2015.org/proceeding/submissions/ISEA2015_submission_260.pdf.

This is a paper written by Megan Beckwith and Professor Kim Vincs of Deakin University for the Proceedings of the 21st International Symposium of Electronic Art. This paper discusses the contemporary piece *Parallax* that integrates live performance and stereoscopic illusions. Beckwith and Vincs write about their process of experimenting with technology and movement to create these 3-D illusions for the audience, and in turn, create a performance work that is made to change the traditional theatrical space into a stereoscopic space, opening new creative possibilities. Similar to their idea of achieving this immersive environment, I will also be exploring methods to create my own immersive environment with digital effects and could observe how they approached these ideas and what steps they took to achieve them.

De Oliveira, Nicolas, Nicola Oxley, and Michael Petry. *installation art in the new millennium: the empire of the senses.* London: Thames & Hudson, Ltd., 2003.

This book discusses the means in which contemporary art has shifted within marginal cultural relevance for installations. Accompanied with pictures of many exhibits some of the chapters introduce concepts on immersive installation, time, and narrative. Time and immersion will be the two ideas on which I will mainly focus, as well as a few ideas from the other chapters, guiding me to set the second half of my thesis project for the final installation in the FSU Museum of Fine Arts.

Elizabeth Howell, June 21, 2013(3:07pm), "Time Travel: Theories, Paradoxes & Possibilities," *Space.com Contributor*, http://www.space.com/21675-time-travel.html.

Elizabeth Howell, a SPACE.com contributor, discusses the space-time phenomenon through theories such as Einstein's Theory of Relativity, wormholes, black holes, cosmic strings, time machines, and the Grandfather paradox. This page also lists a video which assists viewers' understanding of the complex nature of time travel. This resource will serve as one of the many articles and books that I will be referencing to physically portray the time manipulations abilities through an interdependent relationship between dance and projections on stage.

Filip Visnjic, July 31, 2013, "Recent work by Adrien M / Claire B + 'eMotion' – Tool for interactive visual performance," *Creative Applications Network*, http://www.creativeapplications.net/profile/recent-work-by-adrien-m-claire-b-emotion-tool-for-interactive-visual-performance/.

This blog was written by the editor-in-chief of CreativeApplications.net and co-founder and editorial director at HOLO Magazine, Filip Visnjic. Visnjic discusses Adrien M. and Claire B.'s recent choreographic pieces that used their new software eMotion. This page includes a description of development for eMotion and links to install a free version of the software onto a Mac computer. The page also lists details of past works, since 2011, of Adrien M. and Claire B. using the software accompanied with Vimeo links that show the final products. This served as one my main sources of inspiration for viewing Adrien M. and Claire B.'s immersive pieces. Their works are perfect examples of creating an interdependent relationship between the movement and the projection/live effects. In addition to viewing these links to watch the videos as guides, I will download, learn, and experiment with the program eMotion on my personal laptop.

Frieder Weiss. "Eyecon." Last modified April 15, 2008. http://frieder-weiss.de/eyecon/index.html.

This web page is part of Frieder Weiss' site. It explains how Weiss developed the intermedia software program, Eyecon, which is triggered from tracking the motion of human bodies. It lists videos and links to tutorials to operate the program as well as a description that can only function on a PC server. This website serves as one of my main sources to upload the software on a PC and compile the effects into my developing software's library.

Gideon Obarzaneks Digital Moves, **YouTube video, 17:09, posted by poptech, March 12, 2010, https://www.youtube.com/watch?v=qaT64TYsVgA.**

In this video link, Artistic Director Gideon Obarzanek of the Australian dance company Chunky Move, speaks at a Pop!Tech conference about his works *Mortal Engine* and *Glow*. Obarzanek discusses his process of including video projections to his pieces to reveal his dancers in a unique light. He discusses details of what led him to collaborate with Frieder Weiss who incorporated computer software programs with the choreography. This conference mentions the challenges that will be important to consider once I begin interacting with the software. This video also includes other ideas, such as weightlessness on the horizontal plane, that Obarzanek experimented within *Glow*.

Gideon Obarzanek on Glow and Mortal Engine**, YouTube video, 9:42, posted by dancetechtv, July 1, 2010, https://www.youtube.com/watch?v=Iv6GwByrzDE.**

This video is a Dance-tech.net interview with Artistic Director, Gideon Obarzanek of the Australian dance company, Chunky Move. He describes his experience collaborating with Interactive Software Engineer, Frieder Weiss, on two particular pieces produced, *Glow* and *Mortal Engine* and their creative work produced visually and kinetically. Obarzanek explains his

process for the 30-minute work, *Glow*, utilizing a video tracking program and a projector hung from the ceiling cast downward onto the soloist on stage. This video provides details of the resources and tools, collaborative processes, and sources used to create this successful work. This piece will help aid in my own artistic endeavor. These new tools introduced into my work will support the balanced interaction between choreography and projection and will be a key component in understanding how to efficiently integrate software effects similar to Weiss' program.

Kevin Karsch. "Pixel: Interactive Projected Effects for Performance," *Projection Mapping Central*, Accessed September 30, 2015. http://projection-mapping.org/pixel-interactive-projected-effects-performance/.

This article was written by Kevin Karsch on Projection Mapping Central. It includes a Vimeo link of Adrien Mondot and Claire Bardainne's piece *Pixel*. The article discusses software programs such as eMotion, Qlab, and Vezer which were used to create this immersive work of art. This article provides important information about the software that is being created for my thesis and guides my collaborators and me into brainstorming different methods to create a possible outcome that simulates an interactive software for movement on stage.

Nikolais, Alwin, and Murray Louis. *The Nikolais/ Louis Dance Technique: A Philosophy and Method of Modern Dance*. New York: Routledge, 2005.

This book serves as the manual for the Nikolais/Louis technique combining information that is both practical and philosophical for creating movement. Each section is filled with useful information to create movement composition, with the third section including a unit on "time" which will be the part most referenced to help visually show time travel through movement. Each chapter of this book will serve as the main reference for creating and approaching

movement invention when influenced by a digitally projected atmosphere, which will be present in my thesis.

Portanova, Stamatia. ***Moving without a Body: Digital Philosophy and Choreographic Thoughts*****. Cambridge: Massachusetts Institute of Technology, 2013.**

This book discusses the coupling of choreography and digital technology in contemporary dance. Beyond this, the book includes discussions on the philosophy between the body and mind and the complexity of software being integrated into our artistic realm. There are chapters and sections that include important key figures in digital dance such as William Forsythe and his *Improvisation Technologies*, and major artists such as Open Ended Group. This resource supports my argument for creating choreography with the changing times to interest and inspire the current technologically inclined generation.

TEDxArms Blogsquad. "**David Middendorps Journey of Dance.**" ***TedxAmersterdam.*** **Accessed October 8, 2014. http://tedx.amsterdam/2012/11/david-middendorps-journey-of-dance/**

The TedxAmsterdam site, describes the new up-and-coming dancer, choreographer, and creator, David Middendorp. A three-minute clip of Middendorp's piece, *Black Journey*, is posted on this site as well as this talented choreographer's biography. Middendorp's creative process of finding a synergy between mixing multimedia and dance within his pieces is explained as well as his view on this matter; "He mixes dance and multimedia animations because he believes that it can help to submerge the viewer into the world he is creating." Inspired by this idea, I will incorporate that philosophy as a prime example to my own belief on "creating for the audience." Observing and learning his creative process of how he successfully achieved a symbiotic

relationship between the technology and choreography onstage, will assist in producing my own product.

The Information Philosopher: dedicated to the new information philosophy. "The Arrow of Time." Accessed June 28, 2015. http://www.informationphilosopher.com/problems/arrow_of_time/.

This webpage from the Information Philosopher discusses the theory of the *Arrow of Time*. It includes background information on the man who coined the term, Arthur Eddington, and his theories of time being a "cosmological arrow," with only a linear direction in which the universe is expanding. Exploring this concept will enrich my background research in my creative process of visually conveying time traveling and time manipulation through movement and 2-dimensional effects on stage.

Waltz Binaire. "flow no. 1: kinect projector dance."Accessed July 30, 2015. http://waltzbinaire.com/portfolio/flow-1-kinect-projector-dance/.

This is the webpage of choreographer and dancer Christian Mio Loclair's process to create his installation *Flow*. It begins with a YouTube video of an excerpt from the interactive media project. Loclair walks the readers step-by-step through the method of creating this piece beginning with stages of inspiration, generation for choreography, and the software used. There is even insight listed on the technical component he utilized with the Kinect camera and a software called Open Frameworks. This will be another source used to assist my collaborators and me into developing a software that contains a diverse library of effects.

Wikipedia: the Free Encyclopedia. "Braid (video game)." Accessed June 30, 2015. https://en.wikipedia.org/wiki/Braid_%28video_game%29.

This is the Wikipedia page on the video game *Braid*. It's a compilation of information on the game developer Jonathon Blow, gameplay, plot, development of the artwork, sound score, time traveling, as well as awards received and external links to many game theory websites. This page serves as a key component in creating my thesis project. The idea of time traveling and having new abilities of time manipulation within each level of *Braid* will be an inspiring objective that will be explored choreographically and digitally as the underlying concept of my research.