A STUDY OF THE HYPER-LAPSE SYSTEM

By

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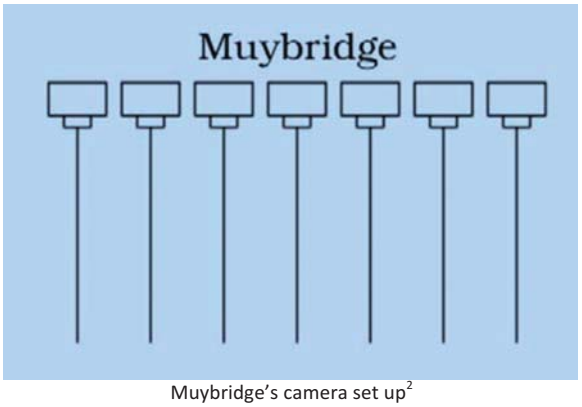
1. INTRODUCTION

A moving image is composed of two fundamental facts: the amount of time over a given period in which movement is recorded, and the spatial variables of distance travelled, notated by either the subject or subjects' movement within the camera frame or by the camera itself. In its purest and most basic form, the still photograph is the single cell that makes up the body of the film. Time and space are the elements that give this body movement, thereby giving form and life to a collection of still photographs. This technique is described by Nariman Skakov in his book *The Cinema of Tarkvosky* as "sculpting in time". These techniques "reveal time respectively as an agent of change, as duration and as an all-encompassing reservoir of being and creativity."[1]

The basic acts of editing and compiling a film are methods of sculpting and manipulating of the time signature of a film. Other methods which filmmakers use to manipulate the concept of time include time-lapses, montages, quick cuts and long single takes.

The concept of the moving image was introduced to the world both as a curio of the Victorian age and a scientific study of locomotion. Eadweard Muybridge is largely credited as one of the innovators and pioneers of motion picture. Muybridge famously used a set of cameras attached to trip wires to capture the movements of a moving horse in 1877, capturing the first sequential photographs of movement.

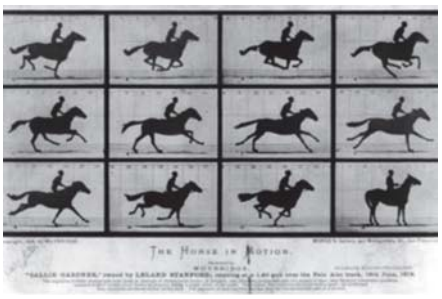


Muybridge's camera set up[2]

As a scientist and photographer, Muybridge created the zoopraxiscope to properly showcase his multiple glass slides of movement. The zoopraxiscope projected multiple images in swift succession that created an "illusion of motion".[3]

[1] Nariman Skakov, *The Cinema of Tarkvosky*, 2012, pp. 2-3
[2] Mark J. P. Wolf, *Space, Time, Frame, Cinema: Exploring the Possibilities of Spatiotemporal Effects. New Review of Film and Television Studies*, 2006, p. 1
[3] Eadweard Muybridge, *The Human Figure in Motion*, 1955, p. 9

Detroit Institute of Arts, 2013[4]



Animals in Motion (Dover Anatomy for Artists) – June 1, 1957[5]

Muybridge was the first to bring the moving picture international attention and to use it as a method of instruction[6] Muybridge's study in motion greatly influenced the development of sequential photography and how we perceive motion in film today. The evolution of manipulating film through the use of spatio-temporal effects have come a long way since Muybridges's zoopraxiscope. A very recent incarnation of motion photography is known as hyper-lapse.

Hyper-lapse photography accelerates time and collapses space, by taking multiple photos while the camera moves. Unlike a motion time-lapse where the camera moves only along the length of the slider, camera movement in a hyper-lapse is spatially unrestrained. This creates the effect of accelerating time and space. Hyper-lapses work by taking multiple pictures of an area, where the camera moves with each shot, while focusing on a central point, for example, a building in the distance. Spatially, each photograph is separated by a pre-determined distance, which could be an inch or as far as ten feet at a time, depending on how quickly the photographer wishes to achieve the effect of compressed space. The length of the final clip ultimately depends on the number of photographs taken by the photographer.

A. Research Goals

This study seeks to explore how far a photographer can push the manipulation of time and space within the confines of a non-narrative film. Gilles Deleuze discusses the "images of time" and how time and montage together constitutes a "principle act of cinema".[7] Skakov defines montage as a "process in which reality is fragmented and then reorganized into a dialectical framework".[8] The hyper-lapse is a montage in essence, one that does not break but bleeds visually from one shot to another. This study investigates how this uninterrupted visual can "bleed" across frames, time and memory.

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[4] photographer unknown, zoopraxiscope exhibit, *Flutter and WOW*, 2013, Web, http://flutterwow.com/zoopraxiscope/

[5] Eadweard Muybridge, *Animals in Motion (Dover Anatomy for Artists)*, June 1, 1957

[6] Eadweard Muybridge, *The Human Figure in Motion*, 1955, p. 9

[7] Gilles Deleuze, *Cinema 2 The Time Image*, 1989, p. 17

[8] Nariman Skakov, *The Cinema of Tarkvosky*, 2012, p. 3

B. Research Context

Christchurch has been an integral part of my family since 2001. My parents are permanent residents of New Zealand and plan to settle in Christchurch in their retirement years. I am from Singapore and I visit Christchurch almost every two years. I stay on average two to four weeks on each visit, and have seen the city change dramatically each time I return, most so after the earthquakes in 2011. The speed of change from my point of view is immense. Every two years I take mental photographs of city during my visit. When I return the next time, I always find that new buildings are constructed, old buildings are torn down, and places of activity like the Cathedral Square become quiet and are replaced by new centers of activity like the ReStart Mall.

My mental images of Christchurch are like frozen snapshots of time, with each return to Christchurch bringing about a sense of rapid change and shock. The center of the city seemed to flatten and rise with buildings seemingly springing up overnight. My perspective of the post-earthquake reconstruction of Christchurch is akin to a mental time-lapse of the city.

Having worked in the media industry as a camera operator, my preferred media of expression are naturally through photography and filmography. As I walk around the city of Christchurch, I often “see” the city as if through a lens, with my mind constantly “editing” which photographs get added into my spatial memory of the city. I thus decided to recreate my spatial memory through film, by transferring and digitizing my spatial memory into a visual medium. This hyper-lapse is, in essence, my personal accelerated view of the city of Christchurch.

2. TECHNIQUES OF COMPRESSING TIME

A. Time-Lapse

In a time-lapse the camera remains in one position where it records one picture within a set period. For example, the camera may be set to have a duration of 10 seconds from shot to shot, and is set to record for an hour. The calculation is as follows:

60 seconds / 10 = 6 frames a minute
60minutes x 6 frames = 360 frames taken in the course of the time-lapse
360 frames / frame rate of film 24 = 15 seconds

An hour spent shooting, with 10 seconds between shots will yield 15 seconds of usable footage; the hour of footage compressed into 15 seconds. In a time-lapse, only time is compressed; the space within the photograph remains constant.

B. Motion Time-Lapse

Motion time-lapse is a technique where time and a limited distance are compressed. Most motion time-lapses are shot with a camera slider between 1 to 4 meters long. The number of centimeters the camera will slide after each photograph is taken needs to be calculated. For example, if the slider is 4 meters long and we want to keep the length of the clip at 15

seconds while still keeping the shooting duration to one hour, and with a move after each frame, the calculation is as follows:

400 cm / 360 frames = 1.1 cm of sliding after every photograph

Hyper-lapses not only compress time, but also space. Both are compressed to extremes. The motion time-lapse moves with total set distances of perhaps 1 to 4 meters. A 4 meter move of the camera when shooting a hyper-lapse would short in comparison to a motion time-lapse. Typical hyper-lapses move at around a 40 to 300 meters, usually 1/2 meter after each photograph, depending on the desired length of the final clip. Planning for a hyper-lapse places more importance to the calculation of distance than of time spent recording. For example, if the camera is moved 1 foot after every frame and if the frame rate is the industry standard of 24 fps, the camera will move 12 meters per second.

Hence, if a 4 second clip is intended to be shot, using the equation of 24 fps as above.

12 x 4 = 48 meters moved to achieve 4 seconds
24 x 4 = 96 photographs need to be taken in order to get 4 seconds

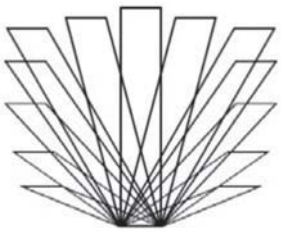
A photographer will require a total distance of 48 meters to achieve 96 frames.

c. Shutter Settings

I previously mentioned a visual “bleed” in the research question above. How does an image bleed across a frame? How is motion captured in a still photograph? A photograph is a snap shot of time and in itself seemingly without temporal quality. Time is frozen and so is whatever lies inside the frame. What if there was a way to capture moments of time within its frame?

The answer is the motion blur.

The motion blur is an effect achieved when the subject moves spatially within the frame of a camera, an effect that “results from the subject’s own movement, and not the camera’s.” [9] The viewer sees the start of the move when the shutter opens. The subject’s spatial and temporal signature is recorded up until the cameras shutter closes. The subject’s movement is hidden in translucent streaks of motion, causing an effect of a seeming “bleed” of the subject into its surroundings, and vice versa.



[9] Mark J. P. Wolf, *Space, Time, Frame, Cinema: Exploring the Possibilities of Spatiotemporal Effects. New Review of Film and Television Studies*, 2006, p. 3

Images of motion "bleeding" into one another[10]

In a time-lapse or hyper-lapse, this "bleeding" of time and space can be exaggerated with multiple photos of motion blur to create a flow of time and movement, where the viewer gets to see the before, during and after of the movement captured.

3. HISTORY OF THE HYPER-LAPSE

A. The First Wave and Guy Roland

Guy Roland has been credited as the first person "to employ a film technique commonly known today as the hyper-lapse"[11] in his short film *Pace.* Shot initially on Super 8 film, *Pace* was his initial complete film, which Roland used as as his entrance application piece for art school. *Pace* was never released to the public beyond Roland's application to art school.[12]

Roland's second film *Pacer* was shot as his art school graduation piece. He says, "This film was "Pacer"; which I consider a sequel to *Pace*. I decided on furthering the ideas and the successes in *Pace* and take the technique as far as I could [*sic*] the time."[13]

Pacer is perhaps the only hyper-lapse film ever shot on film. All known hyper-lapse films since Pacer have been produced digitally. This further emphasizes the difficulty and complexity of the capture and the editing process of *Pacer*. The complexity of editing on film is the reason there are no physical copies of *Pacer.* Roland's self-confessed inexperience with film processing caused him to splice filmstrips that were too short together, resulting in the film negatives disintegrating after printing. Roland only managed to get one positive print of the film, which is what we see today. He waited 19 years to telecine the film in 1080p digital, citing the extreme cost of the telecine process as being the main factor of the delay. This 19-year gap is why Roland has been largely incognito until 2014, and why none of the second wave of hyper-lapse artists were influenced by him.

Pacer was first screened at house parties and released at limited festival circuit viewings. Only in 1995 was *Pacer* brought to a wider audience, when a video magazine called *Channel Zero* featured *Pacer.* After this feature, video jockeys (VJs) who were looking for visually interesting shots to place behind their music started featuring *Pacer* in their music. These VJs played a vital part in the early propagation of hyper-lapses. This point is discussed further below in the Second Wave.

Much emphasis is placed on *Pacer* as it is generally considered the progenitor of the hyper-lapse. However there is a third film in Roland's hyper-lapse series. This third film was initially called *Spacer* but later Roland changed its name to *Kino Citius*. *Kino Citius* was the first hyper-lapse to be shot digitally, in 2004. Whilst technically superior, Roland describes it

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[10] Mark J. P. Wolf, *Space, Time, Frame, Cinema: Exploring the Possibilities of Spatiotemporal Effects. New Review of Film and Television Studies*, 2006, p. 10
[11] Andy Patton, *Gazette Magazine*, April 8, 2015
[12] Guy Roland, personal communication, April 18, 2017
[13] Guy Roland, personal communication, April 18th 2017

having "more technical lean" but less "gripping"[14] than *Pacer*. Still, *Kino Citius* marked the start of the photography of large structures from afar while tracking or moving the camera in from a long distance. This technique was employed by Roland in *Pacer* briefly, but the length of the tracking in distance is rather short. The technique of starting at an extreme wide shot then tracking in is characteristic of the second wave. Roland only starts to utilize this technique in *Kino Citius.*

Pacer: long shot [15]

Kino Citius: extreme long shot[16]

I interviewed Roland about how he developed the technique he employed in his hyper-lapses. Roland explained that he had first experimented with single frame cinematography in 1986, and the result showed the first example of a hyper-lapse.[17] Roland linked together a sequence of single frame photographs by using a common visual focal point. This was an extremely important aspect of his process and fundamental to the creation of hyper-lapse videos. Stabilization cannot occur if there is no common visual point, the focal point acts like a glue to affix or link the photos in a sequence together.

One of *Pacer's* trade marks is how he assembles these photographic linkages. The linking of frames between the 32nd second to 34th second of *Pacer* (pictured below) shows Roland linking four photographs of each pillar, totaling 48 photographs in total over the span of two seconds (calculated on the basis of 24 frames or photographs per second).

[18]

[14] Guy Roland, personal communication, April 18th 2017

[15] Guy Roland, *Pacer*, *NBD creative, vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

[16] Guy Roland, *Pacer*, *NBD creative, vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

[17] Guy Roland, personal communication, April 18, 2017

[18] Guy Roland, *Pacer*, *NBD creative, vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

Roland calls the frantic pace a result of his mistake, which was that he had shot too little of one subject. The 32nd second of *Pacer* features incredibly quick cuts which have become a hallmark of the film. Roland mentioned photographing only 4 frames of each pillar and then needing to switch to a next pillar, making it "the tightest part of his edit".[19]

This constant hectic pace is contrasted by its flowing architectural hyper-lapses of repeated patterns as seen in the pictures below.

[20]

The repeated geometrical patterns and shapes appear to be of particular interest to Roland as three quarters of the 205-second film is made up of the above-mentioned visuals. Roland mentions that this was a result of him wanting to experiment with repeated geometric patterns and shapes moving into each other. The phenomenon of solid things being able to move fascinated him, as did the mathematics behind the hyper-lapse. To date, no other hyper-lapse has emulated this unique perspective, and Roland expressed his surprise that despite the repeated patterns being a hallmark of *Pacer*, no other hyper-lapse to-date (except my work) had emulated it. [21]

Another characteristic of Roland's two hyper-lapse films *Pacer* and *Kino Citius* is where the focal point is placed. When these repeatable patterns are shot, the focal point is generally a close up or the focal point is in the foreground as opposed to the background.

Focal point is the fence rather than the building, at 1:42mins of *Kino Citius.*[22]

The style of placing the focal point on the foreground is largely absent in the second wave of hyper-lapse. Sequences of close in structures, repeated patterns and quick frantic cuts are characteristic of only Guy Roland.

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[19] Guy Roland, personal communication, April 18, 2017

[20] Guy Roland, *Pacer*, *NBD creative*, *vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

[21] Guy Roland, personal communication, April 18, 2017

[22] Guy Roland, *Pacer*, *NBD creative*, *vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

This wide-angle perspective of a large building or structure while dollying the camera from side to side or tracking in the camera will become the hallmark of the second wave of hyper-lapse artists.

Despite being the originator of the hyper-lapse technique, subsequent hyper-lapse artists (as is discussed below) were not influenced by Roland, either thematically or visually.

B. The Second Wave and Shahab Behzumi

The years 2005 to 2012 encompasses the time period in which the second wave of hyper-lapse artists emerged. With the aid of the internet (which Roland did not have), 2012 was the breakout year where the hyper-lapse gained mainstream popularity with Shahab Behzumi's *Berlin Hyper-lapse*.

In my personal correspondence with Behzumi, he mentioned bloggers and publishers taking notice of his work and pushing *Berlin Hyper-lapse* to a wider audience. He comments that "the best thing was…I accidentally uploaded it shortly before the unification holiday in Germany so it fitted and the bloggers and publishers all around the world, at this conjunction".[23]

Eight hyper-lapse artists burst into the hyper-lapse scene during this second wave: Behzumi, Oleg Finger, Kirill Neiesmakhov, Mayeul Akpovi, Mauritius Seeger, TopHerz, Novalapse, Zweizwei. These eight individuals developed the same visual styles completely independent of each other and all coming into the scene post-2005. In fact, Behzumi mentions only discovering Roland's *Pacer* two years ago. [24]

The second wave of hyper-lapse artists seemingly evolved independently of each other. Curiously, however, these artists seem to have followed a similar creative process, which was them wanting to document their walks through cities and environments. Behzumi mentions that during his time in Germany, tens of thousands of pictures were taken with his mind's eye, and *Berlin Hyper-lapse* was a result of him wanting to document and "store [his] path through time and space".[25]

Unlike Roland who edited and shot the sequences to heighten the sense of rapidness, the second wave of hyper-lapse artists seem to adopt slower paces in their works. For example, the early works of Zweizwei and Seeger which were released sometime in 2005 (the start of the second wave) were created from a perspective of the artist who sweeps through a city from afar, passing by its structures and buildings, gradually tracking in closer and closer to each individual structure and building. This technique of a walking view is what the second wave artists will embrace to form their visual signature.

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[23] Shahab Behzumi, personal communication, February 6, 2017
[24] Shahab Behzumi, personal communication, February 6, 2017
[25] Shahab Behzumi, personal communication, January 4th, 2017



Seeger's *Space-lapse*[26]

4. TIME AND MOTION

In discussing the montage, Deleuze talks about how each individual photograph "must…already be a potential montage".[27] The scattered images of a montage compress time and space. Although seemingly unrelated, these images of a montage unify to form one cohesive idea. Eisenstein who is largely noted as the father of the montage is quoted as saying "montage is an idea that arises from the collision of independent shots".[28] The hyper-lapse is in essence a form of montage. Capturing varies points of importance in a city in order to form a perception. I chose to spatially and temporally compress the city of Christchurch in order to showcase more of its people and more of its environments, creating a hyper-montage, a rapid viewing of Christchurch. The over arching theme of the video is how 2011 earthquakes had irrevocably damaged the city and its people. For example the broken cathedral in Cathedral Square is a somber reminder of the damage caused by the earthquake in 2011. Filming a day to night time-lapse of the broken cathedral was my way conveying the sense of foreboding that all residents of Christchurch experience on a daily basis, not knowing when the next earthquake will hit, not knowing if a loved one would be lost, or if they themselves would be the next name on the Memorial Wall. The somberness is brought out by the day rapidly falling into night. Without the use of a time-lapse, I would not have been able to show the day-to-night transition in a film clip suitable for consumption in a single seating, due to the length of time it takes for the sun to set.

As a traveler in Christchurch the pathways and pulses of a city are more evident to me because they are so different from my norm. Accelerated time is a tool that allows me to show and accentuate these pathways of people moving and what the pulse of the city feels like to me. As Jean-Luc Godard said, "there are no more simple images. The whole world is too much for an image, you need several of them; a chain of images."[29]

Time-lapse photography with a slow shutter speed was used to convey the flow and pulse to Christchurch. I wanted to show how the people of the city were part of its landscape, and not people simply inhibiting the cities space. I wanted them to merge with Christchurch itself. As such, I used a slow shutter in all of my shots of people. The spatial and temporal signatures of a motion blur allow me to show a motion frozen in time, creating the

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[26] Mauritius Seeger, *Space Travel*, *Vimeo* n.p. April 4th 2008, Web https://vimeo.com/937486
[27] Gilles Deleuze, *Cinema 2 The Time Image*, 1989, p. 35
[28] Sergei Eisenstein, Film Form: Essays in Film Theory, March 19, 1969
[29] Jean Luc Goddard, *Interviews*: Edited by David Sterritt, 1998

effect of people "bleeding" into their surroundings. This combined with the temporal acceleration of a time-lapse this allows me to show a further range of "bleed" while accentuating the flow of movement.

5. COMPARATIVE ANALYSIS OF OTHER WORKS

The subject of my comparative analysis consists of two seminal works: *Pacer* by Guy Roland and *Berlin Hyper-lapse* by Shahab Behzumi. These two works accelerate time and compress space in order to form a technique called the hyper-lapse. As mentioned above, *Pacer* was the first hyper-lapse film ever made.[30] This two videos produced 15 years apart share many thematic and technical similarities and differences. One video is the progenitor of the technique (*Pacer)* and the other video brought mainstream attention to the hyper-lapse technique (*Berlin Hyper-lapse).*

A. Philosophy

As the father of the modern hyper-lapse, Roland was not intended to create a hyper-lapse when he first shot *Pacer*. Instead, he wanted to experiment and observe the movement of solid geometrical shapes and how they interacted with their environment. The hyper-lapse (as we know it today) is a by-product of this experiment, of "pursuing what happens with those shapes". [31]

Pacer is a video that is frantic, with a loud and rhythmic backing track. Roland called *Pacer* his "controlled scream". It was shot whilst he was going through a bad break up and saw *Pacer* as his distraction and his outlet. "The scream in the middle of the film is how I was feeling".[32] Roland wanted the film to feel intense and angry. He recalls that "[he] was an angry young man. [He] was an Englishman in a French city, and was just basically pouring out whatever emotion [he] was feeling onto the medium."[33] Bricks, tiles and repeated patterns flash pass the viewer in rapid succession akin to sitting in a car and looking out the passenger window. Roland's view of the world in *Pacer* is almost a hyper-focused close-up of shapes and lines.

Another distinct trait of Roland's is that *Pacer* regularly features tightly edited shots, some lasting a mere 4 frames which works out to one-seventh of a second. This creates a flow of images, with each geometrical shape bleeding into each seemingly becoming a single structure. This is in sharp contrast to Shahab Behzumi's *Berlin Hyper-lapse.*

Behzumi's wanted his viewer to fly, to communicate the sense of flying, and to simulate this flight with his camera.[34] To create this effect of flying, Behzumi's camera sweeps fluidly in and out of prominent buildings and places of interest, with long tracking shots laid over calmer music (compared to Roland's), with each shot lasting an average of three seconds or

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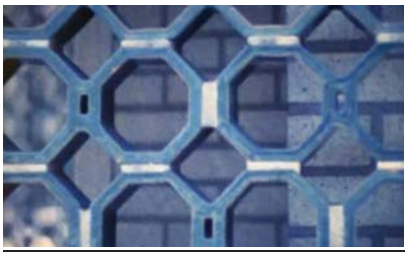
[30] Andy Patton, *Gazette Magazine*, April 8, 2015
[31] Guy Roland, personal communication, April 18, 2017
[32] Guy Roland, personal communication, April 18th 2017
[33] Andy Patton, *Gazette Magazine*, April 8, 2015
[34] Shahab Behzumi Hyperlapse photo Artist, *Euromaxx* interview YouTube, n.p. December 16th 2012 https://www.youtube.com/watch?v=EtVp4QnIYus&t=2s

more. Behzumi's camera moves into each object at a methodical and constant pace, as if Behzumi wanted the viewer to pause, observe and admire the subjects shot.

To give different perspectives of the subjects shot, Behzumi's camera systematically zooms in and holds the focus on the individual subjects. The viewer is given the opportunity to observe the city and how the camera moves.



Pacer's rapidly changing geometric shapes [35]

Berlin Hyper-lapse's emphasis on prominent structures in the city where the viewer is given multiple views of the same structure[36]

B. Production Processes and Technqiues

While *Pacer* was frantic and *Berlin Hyper-lapse* methodical in how they each represented subjects in the video individually, both Roland and Behzumi share similar technical skills (but different work flows and processes employed) and went through similar processes in producing the videos.

One of the similarities between the two artists was the lack of stabilization in both their works. All the stabilization was done on-site while they were filming their sequences. This was because post-production stabilization (in modern editing software such as *After Effects, Lightroom, Final* Cut) was not available or invented at the time of *Pacer* and *Berlin Hyper-lapse*. Without post-production stabilization software as an aid, Roland and Behzumi had to possess in their technical arsenal undeniable amounts of precision and patience, in addition to creativity in capturing their photographs.

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[35] Guy Roland, *Pacer*, *NBD creative*, *vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

[36] Shahab Behzumi ,Berlin Hyper-lapse , b-zOOmi, vimeo, n.p.. September 26th 2012 Web https://vimeo.com/50238512

Behzumi with this wheeled tripod set-up[37]

Roland with his homemade body rig[38]

Roland created a homemade body rig to stabilize himself and his camera. Because of this setup, Roland had no set height and no way to keep the rotational axis constant. There are points in *Pacer* where the images appear to be slightly shaky, for example, at 2:06 minutes of Pacer, likely attributable to Roland not being able to keep any measurements constant while framing his shots.

In contrast, Behzumi used a tripod with wheels, giving him both the much-needed stability and the fluidity of motion as he moved from shot to shot. Further, Behzumi pioneered the hyper-lapse zoom, a method which Roland did not employ but instead had to physically walk his camera forward. I have experimented with the hyper-lapse zoom technique in my hyper-lapse film and can attest to this technique allowing for the creation of the look and feel of flight (which Behzumi wanted).

When viewed side-by-side, *Berlin Hyper-lapse* is clearly the more stable of the two hyper-lapse films. However, with his free form style of hyper-lapse capture, Roland was free of the constraints restricting Behzumi. Roland constantly broke the visual focal points in his shots of the same subject. He even ascends and descends staircases. At 1:05 minutes of *Pacer*, the focal point shifts from the left side of the stairs to the right side.

[39]

Focal points in *Pacer* shift from left to right

[37] Shahab Behzumi Hyperlapse photo Artist, *Euromaxx* interview YouTube, n.p. December 16th 2012 https://www.youtube.com/watch?v=EtVp4QnIYus&t=2s

[38] Andy Patton, *Gazette Magazine*, April 8, 2015

[39] Guy Roland, *Pacer*, *NBD creative*, *vimeo*, n.p. March 29th 2015, Web https://vimeo.com/123553635

Roland's ability to break visual focal points without the safety net of post-production stabilization software highlights his technical superiority, even by today's modern standards.

The breaking of the visual focal point never made an appearance in Behzumi's work. Because Behzumi always had to adhere to a set visual focal point, his camera movements in *Berlin* are restricted. For example, if Behzumi's visual focal point is at the top of a building, he cannot in one shot change this focal point to capture another building near by. If he wanted to capture another building, Behzumi would have to separate that into another sequence. I believe that this rigidness in Behzumi's movement is caused by his setup, which locks him into a fixed height and a set axis of motion by the tripod.

6. DESIGN AND PRODUCTION OF MY FILM

A. Production Process

I started off my production process by way of online research about the city of Christchurch, such as yearly events, markets, places of importance, and popular hangouts. This is followed by a physical scout of the location to assess terrain, amount of people and the quality of light. I find the hour between 4 to 5 pm having the best quality of light, and thus picked this time of the day for my scouting and actual shoots (because scouting should always be done at the same time of the intended shoot to ensure maximum temporal similarities).

At important aspect of the scouting procedure is walking the terrain. Walking the length of which you will travel on the actual shoot will provide you with the following information. Firstly, the condition of the terrain – whether it is flat ground with no obstructions. Secondly, the number of shots needed and the displacement forward or sideways per shot. Thirdly, where to plant the opening and ending shots.

B. Important Locations and Techniques Employed

There are a few key buildings and sculptures that I Felt were essential to the film: the Christchurch Cathedral, the the Memorial Wall and the *Passing Time* sculpture.

i. The Christchurch Cathedral

Christchurch Cathedral

I knew from the outset that the cathedral had to be a time-lapse for a few practical and thematic reasons. My choice of shots were severely limited by the barriers surrounding Christchurch Cathedral, so had to include some of the barriers in my photographs. I was pleasantly surprised when the barriers aided thematically to how much the cathedral had degraded from what it once was. The thematic reason was the importance of the location; with a lingering shot of the cathedral, I would be able to allow viewers to fully absorb the scene shown to them.

I felt a sense of sadness when looking at how broken the Christchurch Cathedral was and wanted to convey that emotion to the viewer. I felt that a day-to-night transition helped to further enhance the sense of despair I wanted to bring across. Notably, is also the only sequence of my film that features “normal” time as opposed to the accelerated time in all the other sequences. The intended effect was to create a sense of lingering that would be transmitted to the viewer.

Because of the importance of this sequence in my film, I needed a safeguard to ensure that viewers understood what I was trying to convey to them. As such, I overlaid sound bites of news reports covering the earthquake from various years throughout this sequence. Some might find that I had included too many sound clips and was too heavy-handed in my conveying of the sense of sadness and loss, but to me, I feel that the nature of the sequence dictates my mode of presentation.

ii. The Memorial Wall

It took a few scouting trips for me to understand how to photograph the Memorial Wall. The plainness and nondescript nature of the wall did not leave me with many options. I sat at the Memorial Wall for some time, watching the people and their reactions trying to get a sense of how they felt about the Memorial Wall.

When I spoke to people who came to pay their respects and have a moment of silence to grief, they conveyed to me a sense of dread, that deadly earthquakes could again, at some unexpected time strike. That sense of dread was exactly what I found I needed to convey in my film.

To do so, I incorporated heavy rhythmic tones in the backing track to blended with the visuals of the sun setting over the marble wall. I feel that this is perhaps the most symbolic sequence in the film. I did not want it to feel clam and serene; I needed it to feel strong.

iii. Passing Time

Anton Parsons's *Passing Time*

As I walked around the city of Christchurch scouting possible locations for my shoots, I stumbled upon Anton Parson's sculpture titled *Passing Time.* It was perfect for me; it was a physical example of time-manipulation. When I saw it, I thought it would be perfect as my opening shot. However, this did not work out the way I planned it to. There was not much space around the sculpture to work with, which meant I could not take very many photographs of the sculpture. The sculpture is bordered by a busy intersection which did not give me such room to dolly the camera from side to side.

I knew that this sculpture had to be a hyper-lapse sequence, as a time-lapse sequence of this sculpture would not have brought out what I needed to convey. The fluid curves of the sculpture gave me the impression of a movement paused in time. I wanted to give the sculpture the impression of it in motion.
To show the warping of time, I employed the visually interesting zolly effect in the first two seconds of the clip. The aim was to convey the sense of a perspective warp, a warp of the structure of time.

The zolly effect is one where the camera moves in one direction but at the same time, zooms the opposite direction of the track. This zolly effect is illustrated at the 7th second mark of my hyper-lapse film, with my camera tracking in while the lens is being zoomed out. When focal lengths are changed, several things begin to happen to the image. The background starts to compress or decompress while the central image (in this case, the *Passing Time* sculpture) remains constant. As the lens reaches a wider focal point, the straight lines of the image starts to warp and bend slightly (otherwise known as pin cushioning), creating a sense of tension in the sequence.

However, having looked at the end-product, I find that the zolly effect did not last long enough. I tried to make use of the space around the sculpture instead of just moving towards it, but the sequence was over before the viewer can fully understand its meaning. The entire sequence only lasted four seconds, out of which two seconds were the zolly track in. On hindsight, I find that an additional two to three seconds would have been ideal to really let the ideal of warping time sink in.

On a technical and visual level, I feel that this was one of my best shots, but on a larger thematic scale, this grand idea seems to have fallen slightly short.

C. Other Technqiues Employed

When a day of good weather is found the actual shoot can begin. Most of my hyper-lapses and time lapses are done in the time of day to ensure consistency and to lessen the need for color correction in post-production software.

i. Reducing Shake

During the photographing of the hyper-lapses, I try to follow set lines on the ground, for example, tiles on the ground arranged in a straight line, or raised sidewalks. These straight lines allow for more stabilization; all that must be done is to follow the straight line, assuming of course that the tiles or sidewalks are built properly and are undamaged by earthquakes.

The leveling bubble on the camera must to be kept at its center point, and this is crucial in eliminating rotational wobbles on the hyper-lapse sequence.

ii. Ensuring Proper Color-grading and Detail

The exposure is kept to 0 on the exposure meter, or as close to proper exposure as possible to ensure proper color and detail.

Photographs are taken in RAW format, which enables me to increase resolution and to give me more latitude with color-grading in post-production.

iii. In-camera Effects

An in-camera effect is an effect that is done manually as you take your photographs and not created in post-production. A very basic in-camera effect is the manual zoom, where the photographer slowly zooms the camera into a subject as the image is being recorded. The technique of manual zooming in and out is frequently employed by Behzumi to create a sense of speed and to draw the viewer's attention to a specific point in the frame.

My first manual zoom-in featured a mural of a face painted on to a side of a building damaged by an earthquake. I first did a step-count, followed by a calculation of when the zoom should start and end. The mathematics is as follows:

5 second clip at 30 frames per second = 150 photographs
1 second of moving before the zoom starts = 30 photographs

2 seconds of zoom in = 60 photographs
2 seconds of zoomed-in image = 60 photographs

This zooming in effect adds a level of complexity to the already busy shoot. The complete steps are as follows:

1. Shift camera
2. Adjust leveling bubble
3. Zooming in (based on mathematics above)
4. Focus
5. Capture photograph
6. Repeat steps 1 through 5

Due to the lenses being non-parfocal (meaning that focus changes as the focal length is increased or decreased), every zoom (however minor) has to be checked for accurate focus. This creates additional time and complexity to the hyper-lapse shoot process.

Similar to the manual zoom in, the zolly effect follows the same planning and execution process, except that the zoom operates in the opposing direction from the camera's tracking.

D. Post-Production Processes

Post-production work is a three-step process involving three different programs: Lightroom, Adobe *After Effects* and Apple's *Final Cut Pro*. The photographs are first imported into *Lightroom* where they are color-balanced and undergo a change in naming convention. The photographs are then brought into *After Effects* where they are stabilized, and finally, they are exported to *Final Cut Pro* for final assembly.

i. Lightroom

Lightroom is the first stage of the post production process. Raw images are colour graded and a naming convention is used in order to organize the footage and to change their respect formats for the *After effects* program. As After effects requires a sequential naming convention in order to set the photographs in the right order. *Lightroom* is excellent for its colour grading and balancing functions and is primary used to balance out the colour and exposure amounts of the photographs.

ii. Stabilization in After Effects

Apart from the initial photography, the stabilization in *After Effects* will determine whether or not the hyper-lapse film comes together without shakes or rotational wobbles.

Warp stabilization

Warp stabilizer reduces image shakes and visual vibration between frames. The images are stabilized from frame to frame. When used correctly and in the right amount, warp stabilization can greatly reduce the amount of work and time needed to stabilize the photographs. I generally used this as a clean-up tool after much of the stabilization was done manually which I will discuss below. However, if the photography was extremely

stable and visual focal points accurately pinpointed, warp stabilization can also be used as an initial stabilization tool.

A tip I learned from Behzumi was to lower the percentage of the warp stabilizer to 2% instead of the default 50%. This technique allowed me to use the computer to automatically remove small shakes more efficiently as opposed to the default 50% which at time caused unnecessary and excessive cropping of the images.

Manual stabilization

Manual stabilization is a way of telling the computer where the central point is in each photograph. After learning this, the computer starts to link the photographs together to form a sequence. An additional step is required to further stabilize the footage if there are rotational issues where the combined photographs seem to wobble. An additional focal point is needed when correcting rotational wobbles and has to be placed manually into the series of photos.

iii. Final Correction in Final Cut Pro

Final Cut Pro is where the clip goes through one final round of color correction and is placed in assembly with the other clips. Saturation, hue and white balance all need to be constant throughout the films color palette. *Final Cut Pro* was also where the assembly of the sequences would happen. How the sequences flowed into each other and how it flowed with the soundtrack. All of the soundtrack over lay was done in *Final Cut Pro*; from the chopping up of the verses and choruses to the cross fading in order to blend the chopped up bits together. *Final Cut Pro* is the last stop of the post production work flow.

E. OUTCOMES, ISSUES, CHALLENGES, SOLUTIONS

Learning how to create hyper-lapses was a multifaceted experience with steep learning curves. Due to how recent the development of the hyper-lapse is, research material in the form of academic documentation is practically non-existent. Tutorials on YouTube offer some help with basic knowledge but lack the finer details of how to execute the technique.

Learning how to stabilize my camera and my body was the first challenge. I found out that a tripod was absolutely necessary for me, perhaps the most time consuming way of capturing my images but it was the most stable. I had experimented with handheld shooting but found that the images suffered greatly from rotational wobbles (where images would seem to move from side to side).

A tripod, when used correctly, eliminates the problem of the rotational wobble. I had first used the electronic leveler on my DSLR camera. However, the electronic version is quite inaccurate and created plenty of rotational wobbles and shakes. By way of trial and error, I found that using the leveling bubble on the tripod effectively eliminated rotational wobbles exceptionally well. This was production break through in terms of stabilizing.

Tripod legs have to be properly positioned with every shot with the legs moving as little as possiblel between shots. To ensure this, I again used the tiles on the road or sidewalks to anchor at least two legs of my tripod to create a straight line.

Using the edge of the fence at the peacock fountain as an anchor

Using the side of the rock wall for the shot of Brighton beach pier

The rock wall above came with its own set of problems. Firstly the wall's bottom edge was not a constant straight line. As such I had to move the camera some distance from the wall as a buffer. The unevenness of the rock wall caused a slight zoom in and out as I traveled along the rock wall, as the estimated distance from the wall was not always accurate. Without a measuring tool with me, I had to use the length of my shoe as a gauge of distance.

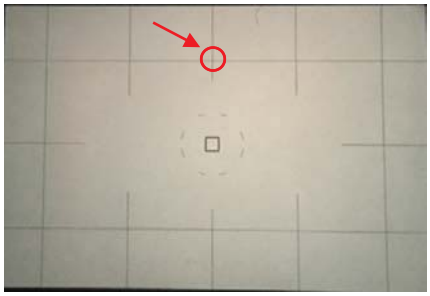
Another challenge encountered when capturing the Brighton pier sequence was the large sand dune that had accumulated at the area I intended to shoot. If the dune was left there, the uneven ground would cause rotational and height differences that would be impossible to remove in post-production processes.

Clearing sand in order to even out the ground

A steady cam vest and arm could have been used to ensure an even motion, but my solution was simpler: a big shovel. I shoveled away the main bulk of the sand dune. However, a thin layer of sand remained which did throw the camera off somewhat, and due to inexperience, I neglected to zero or center my leveling bubble through the entirety of the shoot. This led to a few shakes and wobbles in the final image even after post-production stabilization. If you look at the legs of the pier they seem to move from left to right ever so slightly.

This incident forced me to look much closer at the terrain and the structural lines (such as tiles or walls) of every subsequent location I chose. I also paid extra attention to the first and last image of the sequence from here on out.

Another inconsistency I had to learn to remove parallax error if the angle of my eye changed. My solution was to use the cross-hair just above the circle (pictured below), which allowed me to sync my camera's cross-hair to a visual point in the frame, thereby setting a point of reference on the camera.



Cross-hair on camera

For example, in the Queen Victoria sequence, I used the top of Queen Victoria's crown (pictured below) as a visual reference point. I set my camera's cross-hairs against the tip of the crown. While the cross-hair are excellent for syncing the camera and the visual focal point, it is not a perfect solution. The cross-hairs sit on the camera's glass viewfinder and

not on the actual image itself. Positioning the eye on exactly the same point ensured that the cross hairs and images were synced up. Any variances of my eye postion on my view finder would cause variances which would lead to camera shake. I had to make sure my body and eye were exactly in the same position each time I moved and took a photograph.

I paid a great deal of attention to capturing each photograph as a good hyper-lapse capture equates to an easier time in post-production editing. I learnt that despite the current technology available today the following stabilization mistakes cannot be corrected in software such as *After Effects*:

- Severely missing the visual focal point (4 feet and above)
- Out of focus subject (not a stabilization mistake, but once done cannot be fixed)
- Severe rotational wobbles (a tilt of 45 degrees and more. This is more prevalent when the lens is zoomed in as variances in tilt are accentuated)
- Unplanned breaking of the focal point or you have no focal point.

An unplanned break of the visual focal point is normally due to inexperience on the photographer's part or an obstruction in their path. For example, this could happen when a car moves in front of the camera, blocking the visual focal point. If the photographer decides to move and shoot around the car, the original visual focus point will be abandoned, causing some shake and rotational wobbles that cannot be fixed in any post-production software currently available on the market.

However, following in Roland's footsteps, I experimented with a planned breaking of the visual focal point. This was done with some success at the 1:16 minute of my hyper-lapse film. To break the visual focal point, I intentionally tilted my camera down. I was able to stabilize my camera because I moved only in very small steps, made sure my leveling bubble was centered in every shot, and all visual guidelines (in this case, the vertical lines running down the building) were aligned with the guidelines in my viewfinder. When a break of the focal point happens, you can't manually stabilize which is why you need to be as precise as you can in the initial capture. Warp stabilizer at 2% can remove minor shakes but that is the extend of what it can do, any other shake would be permanent and not removable. The precision required is difficult and time consuming. If this technique can be mastered, the camera will be completely free and unrestrained by a single subject or structure.

Vertical lines of the building

The mistakes and problems that arose during the creation of my film were vital in my understanding of how to efficiently shoot an edit a hyper-lapse sequence.

F. REFLECTION and CONCLUSION

Learning how to be a hyper-lapse artist was a steep learning curve. When I embarked on this project, all I knew about a hyper-lapse was that it was a set of photographs taken while the photographer moved forward. I knew the look I wanted to achieve and what the works of other artists looked like but that was the extent of my knowledge. I knew that I wanted a chance to capture Christchurch in its beauty and its ugliness and I knew that I had a unique perspective of the city in my mind.

Trying to shoot and edit a hyper-lapse is like a photographer and videographer in one, or more accurately, a hybrid at the midway point of the two disciplines. My first shoots lacked much of the basics such as having no visual focal point, no clear vision of what the outcome was going to be and I had no post production programs, which I have since learnt to overcome by way of experimenting, and trial and error.

Recreating my spatial and temporal memory of Christchurch was important to me. As described above, the way I have been seeing Christchurch as a traveler who visited every two years was a sort of hyper-lapse in itself. With capturing the city itself, my goal was to show the broken side of Christchurch, and to some extent, the hope and strength of the people despite their circumstances.

The soundtrack was chosen for its rhythmic nature and its darker tone. I needed the soundtrack to overlay a sense of strength and at times feel ominous. I felt that the mood and feel of the last image of the white chairs had to lighten slightly as I imagined the chairs symbolized grave stones and a strong pulse would have been inappropriate. I feel that the sound track works well with the visuals and gives the film a unified feel.

I felt that the transitions from shot to shot has room for further improvement. Some of the transitions feel abrupt, and do not necessary merge into each other visually or thematically. Much of sequences was me experimenting and shooting concepts in my head for the first

time. With more forethought and planning, I believe my sequences could link together better. Given that this was an experimental film where I learnt most things from scratch, I was quite elated with just being able to stabilize the footage, and had neglected the importance of transitions between my shots.

The color balance of those sequences was another challenge. The more I tried to balance one set of sequences, the others would be thrown off in terms of color and saturation. I tried to mitigate this as much as I could with proper balancing when capturing the images, but this success was somewhat limited.

Of the two waves of hyper-lapse artists, I feel that my style has elements of both. The intention and influence always came from both *Pacer* and *Berlin Hyper-Lapse.* The sometimes frantic pace of the sequences where repeated patterns like *Pacer*, while the zoom ins and zollys of structures were very similar to *Berlin Hyper-lapse.*

My ode to *Pacer* – flowing repeated patterns

The time-lapses helped to slow down the pace at important points of the film. I feel that this was an important part of my film as certain scenes needed to linger in order to convey an emotion. I did not quite want the viewer to be overwhelmed with constantly changing visuals. Some rest between the chaos was needed.

My journey of living in a foreign country trying to find a deeper connection with the people of Christchurch and the city itself has been rewarding, frustrating and deeply satisfying all at once. Trying to create a physical piece of my memory on film was a scary and daunting endeavor. To a large extent I feel that “A Ruckus” conveys the many thoughts and feelings I had over the years about Christchurch city. The feeling of wonder as I walked around the city looking at the buildings and structures for the first time and the sadness I felt looking at the city after the earthquakes in 2011. My study and implementation of the hyper-lapse has really only just begun. The 4 months of my study into the hyper-lapse system gave me the tools and know how. The work now is in refinement and the maturing of the concepts that begun in Christchurch. This film really thought me how to think of my concepts and themes, how I was approaching my film and how it pieced together thematically. My personal journey with the hyper-lapse system has really only just begun, I look forward to my future growth and understanding of this unique visual style.

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