Special – *peer-reviewed*
Edited by Rossella Catanese, Adelheid Heftberger and Christian Gosvig Olesen
https://doi.org/10.6092/issn.2280-9481/13055

Cinergie – Il cinema e le altre arti. N.20 (2021)
ISSN 2280-9481
https://cinergie.unibo.it/

Indeterminable Frames: Exploring Digital Humanities Approaches and Applications for the Moving Image

Patricia Ledesma Villon*

University of California - Los Angeles (United States)

Submitted: June 15, 2021 – Revised version: December 1, 2021
Accepted: December 1, 2021 – Published: December 20, 2021

Abstract

This project continues ongoing conversations about recontextualizing and expanding our understanding of how we engage with film using avant-garde and experimental works originating as celluloid media as case studies. Digitization of celluloid media provides greater points of access to works on analog formats yet should not be considered a means to an end as there is more to explore within this relationship. Using the computational tools FFmpeg, Image Macroanalysis in JavaScript, and ImagePlot for ImageJ, we can approach a different visual understanding of cinema that allows us to challenge the traditional concept of time and its relation to film. Can we encounter new meanings from moving image works when we view the frames concurrently? How do digital humanities applications contribute to an alternative method of engagement with moving images? Are the resulting revisualizations an alternative form of film analysis, and thus, a form of cinematic consciousness? Key frameworks for analysis include critical approaches to digitality, the history of the moving image, re-investigating the terms in which commentary is drawn and undertaken, data as capta, and revisualizations as a continuation of aura within a domain of tradition.

Keywords: Film and Media Studies; Digital Humanities; FFmpeg; Image Macroanalysis in JavaScript; ImagePlot for ImageJ.

* pvillon@g.ucla.edu

1 Introduction: Framing the Approach

Experimental and avant-garde[1] filmmaking is often situated in opposition to narrative filmmaking due to the limitations of the latter practice. The products of experimental and avant-garde practices result in various forms of physical or visual representations, whether it be brought about by mechanical, chemical, abstract, or structural methods. While a significant number of artists in this field approach the creation of their works through traditional camera exposure methods, films of this genre may also be created by distinct, unconventional apparatuses, such as through the act of scratching, burning, gluing, and unorthodox printing and laboratory techniques. One of the most notable movements of this work is the American avant-garde as championed by scholar and historian P. Adams Sitney, and it remains one of the most recognizable bodies of cinematic artwork of the post-war era. The earliest works of this tradition were created on celluloid media with many works from this movement digitized in recent decades with the aim of making them accessible in digital formats to reach broader audiences. With the act of digitization comes the complications brought about by rendering physical media into digital translations and a rising body of questions worth exploring within this gap.

The practices honed by cinema's experimental and avant-garde movement make it a rich site for the analyses conducted within this project. *Indeterminable Frames* explores a method of re-examining the moving image using the field of digital humanities and its intersection with film and media studies. Similar and notable studies utilizing celluloid media, such as the work conducted by FilmColors, have made clear there are further affective qualities worth investigating within the moving image and intersections of technology, perception, and aesthetics with foundations in the humanities provide approaches worth considering (Flueckiger 2018). This project seeks to engage in conversation with prior research by expanding our understanding of moving image works, providing alternative directions for exploring the visual qualities of what lies within the ubiquitous rectangular frames, and interrogating our understanding of frames and their relationship to temporality.

Related scholarship and projects such as Kevin L. Ferguson's *Volumetric Cinema* claimed we should no longer be bound to cinema as truth existing within the fleeting 24 frames per second (2015). Rather, we should be able to hold and grasp frames as long as we want and challenge the classic account of André Bazin's screen of cinema as a window onto the world (1965: 111). Dave Rodriguez's film and digital humanities projects *Particles in Space*[2] and *Colors of Ozu*[3] built upon ideas within Ferguson's work and raised additional important and relevant questions, particularly advocating for the avenues opened by advancements in visual processing technology to extend beyond traditional notions of access to audiovisual materials (2020). These approaches are foundational, and this project aims to continue the ethos of their work and similar ideas they have brought forward while introducing other considerations and frameworks.

Alternative media theorist Gene Youngblood wrote in his book *Expanded Cinema* for an expansion of the notion of cinema to develop what he believed would be a new vision and form of consciousness. He claimed aesthetic application of technology would be the only means of achieving new consciousness to match our developing intermedia environment (Youngblood 2020: 189), in what he defined during his time of writing as the dawn of the "Paleocybernetic Age". Youngblood's claims and influence in the field of film and media studies inspires this project, particularly the ways his work pose notable questions for taking the great leap of leaving behind traditional ways of knowing in order to accept alternative understandings and realities. By translating films into visual captasets within *Indeterminable Frames*, we can derive an alternative visualization of a work and different approach to the viewing of cinema. The revisualizations in this project aim to illustrate a different form of film and media analysis, and by doing so, forge avenues for generating a consciousness in the vein of Youngblood's work. This project seeks not to define these methods of viewing and interacting with film as a new, "absolute truth" for film spectatorship but proposes the methods used as a form that warrants more critical investigation, use, and ongoing discussion.

1. P. Adams Sitney cited his use of the term "avant-garde" to categorize this movement of cinema he wrote about in his book *Visionary Film: The American Avant-Garde, 1943-2000* as one to be critical of due to its implied relationship to a norm (2002: xii). Yet, he claims it was used in his work because the term was not yet associated with the phases of the wider time span he aimed to cover during his time of writing. "Experimental" is used in this text given many of these works are commonly grouped under this terminology for purposes of simple description and categorization in contemporary times.

2. https://drodz11.github.io/particlesinspace/

3. https://drodz11.github.io/colors-of-ozu/

2 Background and Foundations

An intersection of moving image works, histories, disciplines, and theoretical works by a range of scholars grounds this project. *Indeterminable Frames* utilizes five foundations: a critical approach to digitization and its methods, the history of the moving image, the practice of deformance, moving image works as capta, and revisualization through digital means as a continuation of aura.

Figure 1 - The resulting image of Hollis Frampton's (*nostalgia*) (1971) when revisualized with Image Macroanalysis in JavaScript (IMJ). The film is visually composed of multiple photographs slowly burned by Frampton. The resulting image allows us to distinguish the 13 separate sequences of photographic images being burned within the film.

2.1 (Critical) Digital Humanities

The utilization of computer-assisted tools to forge an analysis within this project grounds the work conducted here within the field of digital humanities given its foundations in humanistic inquiry and interpretation of cultural record. The definition of digital humanities as a generative practice allows practitioners of the field to chart a specific path forward for their work while allowing them to focus on the affordances brought about by technological methods. As a field, the digital humanities generates a praxis defined by the intermeshing of ideology and computational methods working to redraw the boundaries between the humanities, the social sciences, the arts, and the natural sciences to foster a new tradition (Burdick et al. 2012: 4-7). Categorizing the digital-analog relation this work explores under a discipline in flux introduces both challenges and strengths to acknowledge.

While the digital humanities remains foundational for the work conducted in *Indeterminable Frames*, it is important to acknowledge what is simultaneously put at risk within its process. These challenges include the failures and complications of digital means and the potential for disorder introduced by the translation of analog works to computer-readable bits and binary. The works selected as part of this project have been digitized by institutions for broader distribution and access, and because of this, this project can make use of the digital copies for revisualization and analysis. Yet, when considering the revisualization of these digital files, we ask: what purpose does an inherently digital method serve in the revisualization of celluloid media, and what understandings are left out when we frame digitization as a visual goal and prioritize it as a means to an end? As a field, the digital humanities often leaves little to no room to reconsider what is lost within its margins to evaluate what its digital-driven focus has left behind or eradicated.

These methods can overshadow the medium specificity of analog media and an artist's intent. Digital renderings can also create bias in the interpretation of colors given color's origins in the physics of light and can also erase other aesthetic qualities of celluloid film during the analog-to-digital translation. One must also acknowledge that the digital method introduced by mechanization becomes an indispensable component of the process of reaching alternative visual understandings. There is a new relation to be forged and defined

within this coalescence rather than a discord based on purely digital assimilation. To conduct an analysis prioritizing the characteristics of the original media analyzed, we look at the history of the moving image as one to consider during the process.

Figure 2 - Two frames from a home movie shot on black and white reversal 16mm. Origins of film unknown. Dated around 1939 or later. From the author's personal collection.

2.2 A Very Brief History of the Moving Image

The art of the moving image rests on the acts of photography as a capture of light and projection as a broader display of the aforementioned images. Mechanical studies of the moving image stemmed from the concept of the still-image and started as early as the late 1800s, with experiments in protocinematic devices such as magic lanterns, zoetropes, flip books, and phenakistiscopes (Kattelle 2000: 4-13). While the devices had variations in design and technical components, they all contributed to the formation of the persistence of vision—an optical illusion creating the illusion of motion perceivable by the human eye and cognitive mind. Centuries-old science in the study of the camera obscura, a precursor to the optics of modern-day cameras, simultaneously contributed to the idea light could project images for the enjoyment of a broader audience.

With ongoing advancements in industrialization and manufacturing, Eastman Kodak was able to make celluloid film strips first commercially available in 1889. The birth of 16mm film by Eastman Kodak in 1923, a less expensive alternative more accessible to amateurs and non-commercial filmmakers, changed the consumer market and professional industry for decades to come. The history of the moving image and its earliest physical principles becomes foundational for the framework of this project. It is important to distinguish the foundation of the moving image is itself an accumulation of individual still-images, hereby known as frames, brought together to depict movement when viewed. See Figure 2 for an example of individual frames in 16mm film.

2.3 A Practice of Deformance

Given the aforementioned facts and the physical qualities of film as celluloid-based media, a translation of a physical celluloid form with a frame-by-frame light projected structure and a specific frames per second exposure rate as determined by the original filmmaker is translated into a new form by its datafication through digitization, created into new "frames" via computational tools such as FFmpeg, and then presented here. However, one must also understand these ways of viewing or the practices conducted within this project do not have to be reductive processes.

The analysis for this project utilizes the critical practice of deformance as defined by Jerome McGann and Lisa Samuels to introduce a way of engaging with works and producing results (1999). Deformance is the act of disrupting or re-organizing a work's original order to bring to attention possibilities of meaning not seen otherwise. Rather than interpreting visual derivatives of the work on traditional notions of meaning residing in thematic forms and relying on the performativity of translation, it re-investigates the terms in which critical commentary is drawn and undertaken. The paradigm of deformance in this instance becomes the means of interpreting through the use of computational methods—a method of viewing not priorly associated with the works discussed in this project. Through the use of the digital tools in this project, we conduct deformance to embrace a new visual approach and allow an alternative experience to come to fruition.

2.4 Moving Image Works as Capta

According to the scientific method's approaches to inquiry, we can equate the accumulation of derived still-images from these moving image works as our "datasets" compiled through the act of digitization as datafication. However, Johanna Drucker's definition of data as capta provides a more suitable definition for the inquiry conducted within this project. According to her discussion, "humanistic inquiry acknowledges the situated, partial, and constitutive character of knowledge production, the recognition that knowledge is constructed, taken, not simply given as a natural representation of a pre-existing fact" (Drucker 2011). Data is assumed to be a "given"—recorded and observed; capta is "taken" actively—to engage and analyze.

The use of capta per Drucker's definition grounds the use of the films in this project first and foremost as artist-made works used primarily to answer humanities-based questions about avant-garde and experimental films as aesthetic creations. In addition, understanding the information gathered from these works as having an active, living process rather than a passive existence is key to our interpretation within the analysis. It allows the works to keep their visual and historical richness inherent to their existence during the process of inquiry rather than being reduced to static objects for the sake of digital technicality.

2.5 Reproductions vs. Revisualizations

The essence of authenticity as processed through the methods of mechanization has been debated over time. When discussing the simultaneous use of technology and art, one must consider the relationship between the two and the potential influences of one process over the other. Mechanization through the use of computers, otherwise known as the process of introducing machine-based methods for a generated output, defines the process of utilization conducted within this project.

Walter Benjamin argued in his pioneering essay "The Work of Art in the Age of Mechanical Reproduction" that while the act of reproducibility brought copies and replications to new physical places, and thus, increased modes of access, it also presented something new (1968). The aura, the unique aesthetic authority of a work of art crafted through historical testimony and the domain of tradition, could be absent from a mechanically generated copy.[4] Douglas Davis, writing specifically about the translation of aura as depicted within the new

4. Benjamin writes his essay on the experience of still-image paintings and three-dimensional artworks and discusses film as a form embedded in its own production processes, and thus, technical reproducibility and lack of aura. He later goes on to quote Georges Duhamel's *Scènes de la vie future* (1930) when discussing the relation of painting in a film as original and the moving image capturing it as rendering: "I can no longer think what I want to think. My thoughts have been replaced by moving images." However, moving images are indeed an art form, which was not a consideration of Benjamin's during the time of his writing in the mid-1930s when moving images primarily existed as commercial productions and a creative format inaccessible to a broader public. While critical of the moving image and its ability to conduct technical reproducibility that can counter the concept of aura, the moving image as an

digital technologies during a period of increasing access of home computers, claimed there was no distinction between an original and its digital rendering as "digital bits [...] march in precise, soldierly fashion, one figure after another" (1995: 382), advocating for a "perfect" reproduction without degradation that was always the same. His approach advocating for the advancements of computerized technologies left out key questions behind the science and technicalities differentiating analog as original and digital as renderings.

In the vein of Benjamin's thoughts on reproduction, the process of inquiry proposed here does not aim to create new reproductions of the works through digital means, therefore works in question keep their distinct auras formed by their historical trajectories and their presences in time and space. The visual elements included here are defined as *revisualizations*, rather than reproductions. Revisualization illustrates there are more visible qualities to understand about these works. While viewing a celluloid film projected in its analog form versus as a scanned and digital rendition remains a different experience, the given work is still the given work as it is understood as a philosophical entity and product of creative thought.

2.6 Frames, "Frames," and Still-Images

Frames are the individual frames as we've come to understand them within celluloid media, as seen in Figure 1. Through the act of deformance, we generate derivatives for this project. Thus, the derivatives mapped on ImagePlot are "frames" and derivatives created through FFmpeg are still-images.

The word frames itself is used in various contexts, which is why it is important to define the terms and draw boundaries here. The use of the term within the media industry and its related fields can be far different than what many traditional users and consumers may understand it to mean. Notably, born-digital video also uses frames per second standards as units of measurement. For the aims of this work, the project will stick to the definition of frames as it is understood within celluloid media.

3 Methods and Tools

3.1 Generating still-images from a digital video file

FFmpeg, an open-source command line tool featuring a large suite of libraries and programs for handling audiovisual files, is utilized to derive a sequence of still-images from a digital video file. Once the still-images are generated by FFmpeg, they can be used in the following two tools: Image Macroanalysis in JavaScript and ImagePlot for ImageJ. Using FFmpeg may require prior basic understanding of command line interfaces (CLI). To start, navigate to your working directory using the command `cd`. Below is the full command entered on the CLI to accomplish the task of splitting a digital video file into individual images. The command necessary for this task is sourced from the FFmpeg wiki[5] and ffmprovisr,[6] a repository of FFmpeg commands for archivists created by the Association of Moving Image Archivists (AMIA) Open Source Committee.

```
ffmpeg -i inputvideo.mp4 -vf fps=1 directory/outputname_%03d.png
```

This command can be understood as separate parts:

`ffmpeg` = tells the CLI we will be entering a command prompt for FFmpeg

`-i inputvideo.mp4` = the -i indicates we will be using a file input and then the video file is brought into the command using the file's exact name and format

`-vf fps=1` = the video filter (-vf) tool on FFmpeg will sample 1 image for every second of the file[7]

`directory/outputname_%03d.png` = specifies the directory where the derivative still-images are saved, a numerically ordered naming convention (%03 dictates the ordinal number of each output will be formatted

artform understood here also holds an aura established through a domain of tradition, a precondition for aura.

5. https://trac.ffmpeg.org/wiki

6. https://amiaopensource.github.io/ffmprovisr/

7. I utilize 1 frame per second within the command as an arbitrary number; however, this can be adjusted depending on the user.

using three digits, e.g. outputname_001, outputname_002, and so on), and the file format for the images (.jpg, .png, etc.).

For example, if a user wanted to use a digital video file named Film.mp4 and have the individual images generated from the digital video file be named numerically as Image_001.png and placed in the Movie folder located in their working directory, the user would input:

```
ffmpeg -i Film.mp4 -vf fps=1 Movie/Image_%03d.png
```

3.2 Image Macroanalysis in Javascript

Image Macroanalysis in Javascript (IMJ) is a web-based tool created by Zach Whalen, an Associate Professor in the Department of English, Linguistics and Communication at the University of Mary Washington.[8] According to Whalen's website, IMJ is a "movie barcode generator, montage generator, and image analyzer/plotter for creating visualizations for large image sets." ImagePlot, a free software tool for visualizing collections and exploring patterns within image collections, inspired its creation. However, IMJ's browser-based graphic user interface makes it an accessible and user-friendly visualization tool. The generator allows users to generate a Barcode, Montage, or Plot visualization style. *Indeterminable Frames*' revisualizations utilize the Barcode setting.

The aesthetic qualities of these images have since been popularized by blogs such as moviebarcode on Tumblr.[9] However, the blog includes primarily feature-length works, features little to no amateur or avant-garde and experimental works, and includes no textual analysis of the generated images.

3.3 ImagePlot for ImageJ

ImagePlot is a free software tool that visualizes and explores patterns in large image collections.[10] The software runs as a macro[11] that works with ImageJ. ImageJ is an open source Java-based image processing program developed at the National Institutes of Health for scientific image analysis.[12] ImagePlot was developed by the Software Studies Initiative, a research lab and design studio working on the analysis of cultural datasets and to advance the theoretical analysis of how software systems shape contemporary cultural and social life.[13] The resulting visualizations graph the individual still-images by median brightness on the x-axis (horizontal line) and median saturation on the y-axis (vertical line).

4 Visualizations

8. http://www.zachwhalen.net/pg/imj/
9. https://moviebarcode.tumblr.com/
10. http://lab.softwarestudies.com/p/imageplot.html
11. In computer science, a macro, short for macroinstruction, is a rule or pattern specifying how a certain input will be mapped to an output. In lay terms, ImagePlot runs as an expansion of ImageJ.
12. https://imagej.net/
13. http://lab.softwarestudies.com/

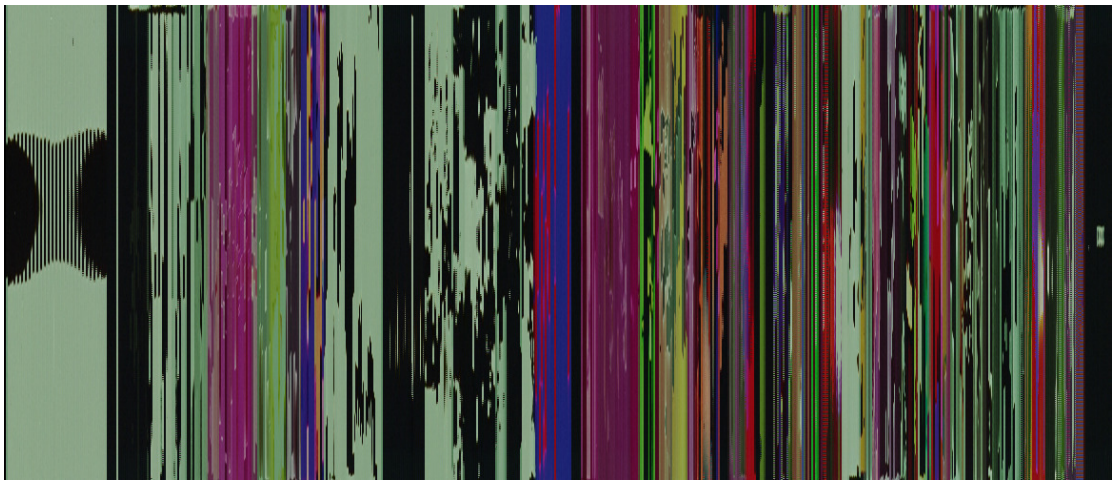

Figure 3a - *7362* (1967) by Pat O'Neill revisualized through IMJ.

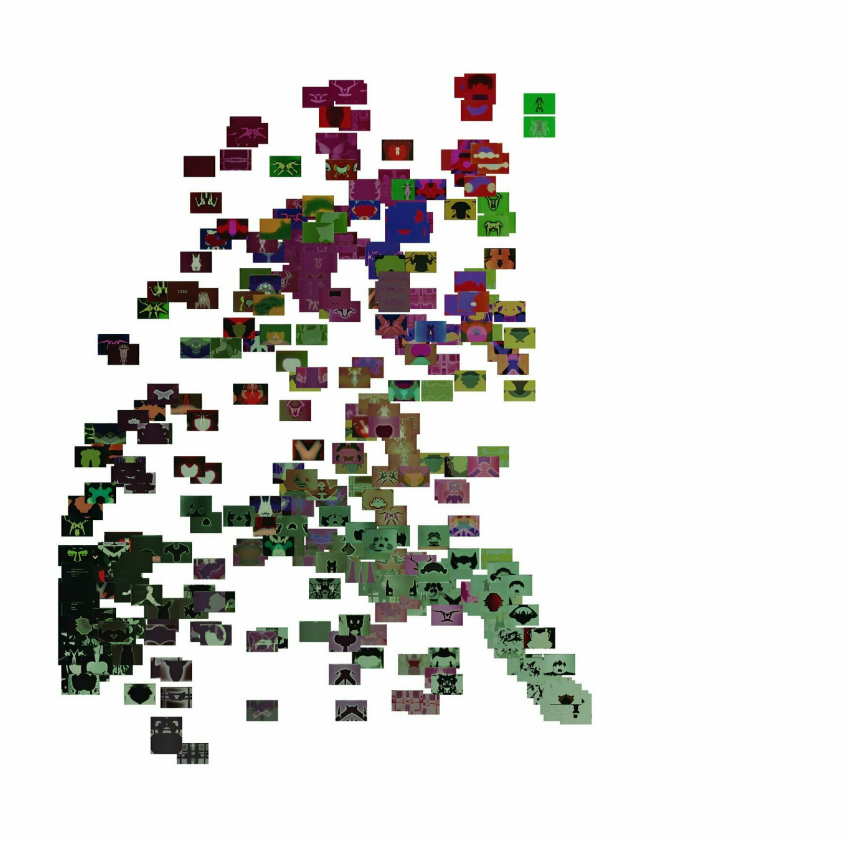

Figure 3b - *7362* (1967) by Pat O'Neill revisualized through ImagePlot.

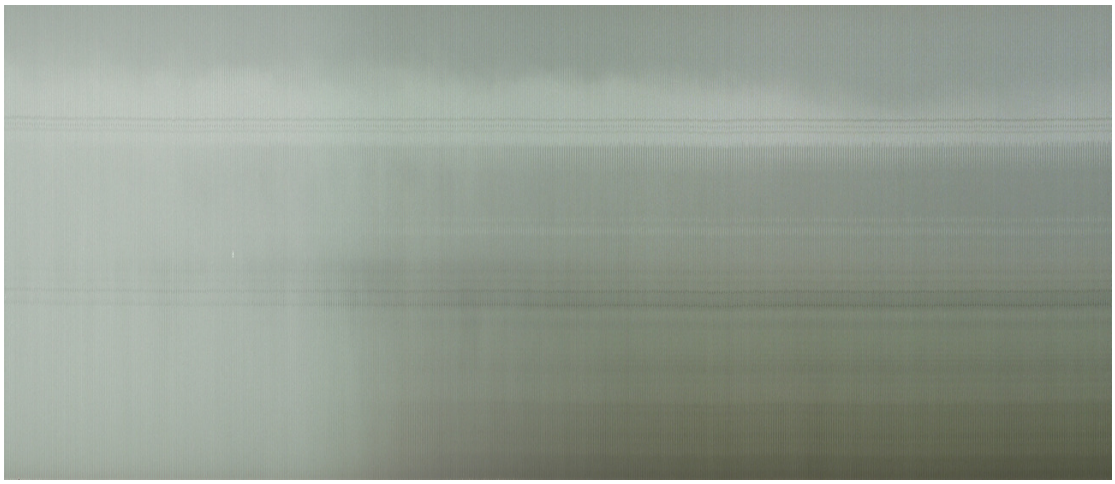

Figure 4a - *Fogline* (1970) by Larry Gottheim revisualized through IMJ.

Figure 4b - *Fogline* (1970) by Larry Gottheim revisualized through ImagePlot.

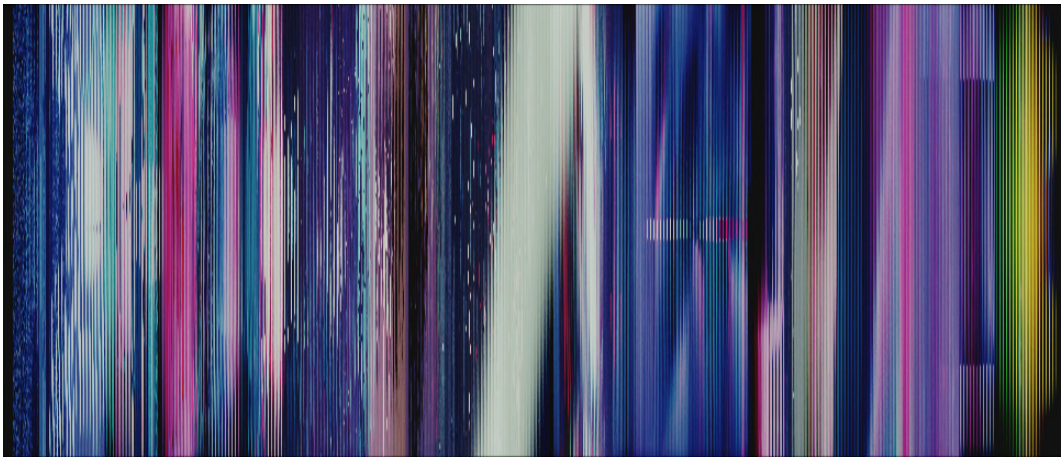

Figure 5a - *Chakra* (1972) by Jordan Belson revisualized through IMJ.

Figure 5b - *Chakra* (1972) by Jordan Belson revisualized through ImagePlot.

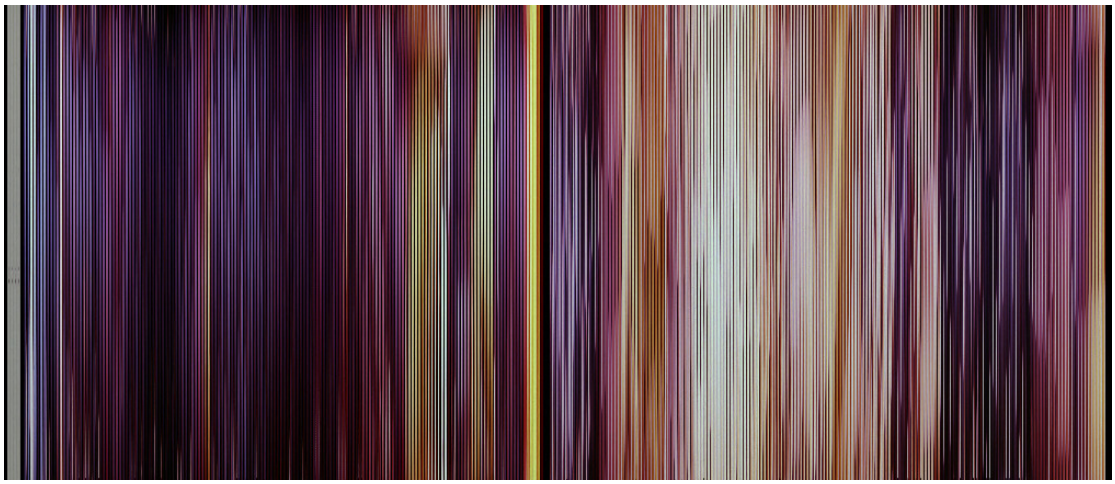

Figure 6a - *Bad Burns* (1982) by Paul Sharits revisualized through IMJ.

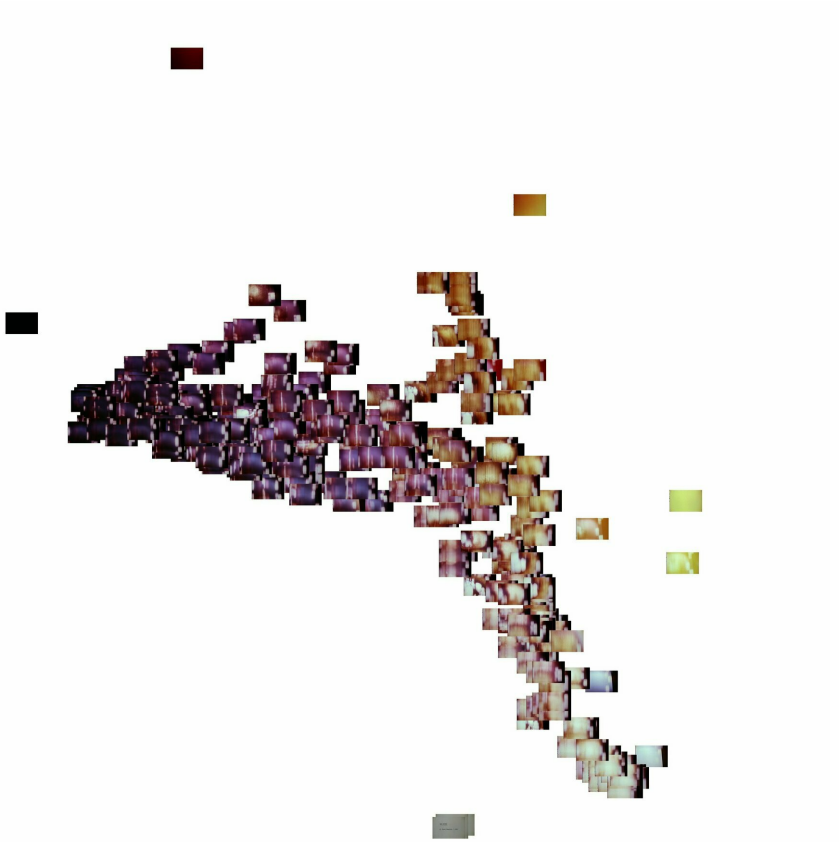

Figure 6b - *Bad Burns* (1982) by Paul Sharits revisualized through ImagePlot.

5 Analysis

Pat O'Neill's *7362* (1967) was created on Eastman Kodak High Contrast 7362, which also serves as the namesake of the film. The synopsis of the film states the work as a "fusion of human, biomorphic and mechanical shapes in motion"[14] and cites use of the Sabattier effect, which is the creation of an image partially reversed in tone in photographic practice. O'Neill's *7362* (1967) is also created by an assemblage of photographic techniques, with the filmmaker's work often highlighted by his notable use of optical printing methods (James 1997). The challenges of translating physical media to a digital form become apparent in the jagged lines of the IMJ visualization of the film as depicted in Figure 3a. A smoother color gradient within the resulting image would represent a more accurate revisualization of the film as more frames of the celluloid media would be accounted for within the compressed IMJ revisualization. One can claim these textures of the revisualization do not make for an accurate depiction of the movement occurring in O'Neill's film, and the digital rendering of O'Neill's work with physical media is erasing the significance of his celluloid practice. The ImagePlot revisualization of the film in Figure 3b proves more useful for a visual analysis and study of the film given its mapping of the colors used throughout O'Neill's work.

Given ImagePlot's setting of graphing by brightness on the x-axis, the ImagePlot revisualization of Larry Gottheim's film *Fogline* (1970) as pictured in Figure 4b results in a graph of numerous horizontal lines on ImagePlot, echoing the film's namesake. Gottheim's film utilizes a fixed shot of fog slowly dissipating over a field in upstate New York, where the filmmaker lived and worked in the early 1970s. This revisualization is helpful for a color analysis of Gottheim's film, as it maps out the deepest tones of the fog by saturation on the y-axis while the horizontal length of the rows of frames within the coordinate illustrates the speed and phases of the fog clearing out throughout the length of the 11 minute work. The IMJ revisualization depicted in Figure 4a pairs neatly with the ImagePlot visualization and allows viewers to see the lightest and deepest tones of the fog all at once.

Jordan Belson, a filmmaker with a dedicated essay in Youngblood's *Expanded Cinema*, is discussed by Youngblood as an example of a maker whose work embodied "cosmic consciousness." Belson's painting-like cosmic images in *Chakra* (1972) make his work a suitable choice for analysis, as it connects Youngblood's ideas directly to the methods conducted within this project. According to Youngblood, Belson's body of work as an artist creates "an emotional force that lifts his work far beyond a realm of 'purity' and into the most evocative dimensions of sight and sound." (2020: 158) A *chakra*, a word from Sanskrit that translates to "wheel" in English, equates points of physical or spiritual energy in the human body in Hinduism. One can extend this idea of energy into the visual display of Belson's work, with the many colors in Figure 5a and Figure 5b representing the sets of light and energy Belson aimed to capture.

Paul Sharits' *Bad Burns* (1982) provides a different study of avant-garde and experimental filmmaking in comparison to the other works as physical damage to the celluloid media itself constitutes the film. In the synopsis of the six minute work, Sharits mentions how the film the work was shot on was loaded improperly into the camera.[15] This results in the images becoming off-center and blurred, with the film in the frame burning about a fourth of the way into the work. Sharits' use of celluloid media frames situated within the viewer's frame makes it an interesting example for the dissection and even expansion of this cinematic terminology—going so far as to visually refute the purpose of the rectangular structure. The off-centering of the individual celluloid media frames in the work are depicted in the IMJ revisualization of Figure 6a where the purple-black outlines of the celluloid media loaded improperly by Sharits are displayed by the concentration of darker colors.

6 Conclusions

The conclusion of this project lies not on the idea of what, if anything, can be specifically and objectively ascertained from each of the films as case studies through the use of these methods. A conclusion rests on the fact these methods and frameworks offer a generative process for further visual study, rather than a conclusive statement or product. The analysis conducted centers the utilitarian nature of these tools and the

14. https://iffr.com/en/iffr/2011/films/7362

15. https://film-makerscoop.com/catalogue/paul-sharits-bad-burns

foundations necessary for encountering affective results generated by new methods of moving image visuality. Centuries-old empirical methods of acquiring knowledge such as the scientific method have taught us to prioritize conclusivity, ascertainty, confirmation, and pass-fail notions of hypothesizing. This work aims to move forward from this structure of inquiry and accept a non-definitive nature to motivate ongoing exploration and experimentation of this topic.

Limitations of this project include the lack of examination of sound and its forms as ones synchronized to the moving image and part of artist intent, which are key to some of the works analyzed. Gottheim's *Fogline* (1970) and Sharits' *Bad Burns* (1982) are both silent films, making visual analysis and revisualization through IMJ and ImagePlot more relevant to their overall analysis. The analysis of O'Neill's *7362* (1967) and Belson's *Chakra* (1972), films with synchronized sound key to the experience of the work, are far limited due to the scope of the tools used. Belson was known as a filmmaker who synthesized electronic sound to correspond with his visual works, and analyzing them exclusively through visual means weakens analyses drawn given the sound's integral relation to the image. While simultaneously acknowledging the limitations of the digital humanities and its methods, various researchers can use the methods proposed through this critical digital humanities framework for viewing and engaging with these works for their further studies. Just as other projects mentioned have paved the way for this work, this is on each of us as scholars, researchers, and audiences of film to expand this approach and explore alternative methods of visual understanding.

Using the frameworks within this project, we can study the use of color, brightness, tones, and shapes within films. We can explore new philosophical understandings of time and its relation to time-based media forms—works with physical and temporal dimensions that unfold to their viewer over time. For example, through the use of IMJ, we can visually depict sequences within a film and visualize their relation to the entirety of the given work during a single instance. (See Figure 2 featuring Hollis Frampton's *(nostalgia)* (1971) which allows us to see all 13 sequences at once.) This form of viewing changes the concept of time and its relation to a film.

During the process, one may be hesitant to make connections between traditionally analog works and their digital renderings and how that leaves large room for criticism of the work conducted here. While a 16mm print of a film scanned and digitized remains the same work in essence, the viewing of the work through digital means is no longer a similar experience. It was important to address this gap and transition of media through the theoretical frameworks discussed at length in the Backgrounds and Foundation section. This project again argues these methods are revisualizations and the artworks used as examples are not reduced to static works for the purposes of digital technicality. When these concepts and foundations are used to guide an inquiry, one can approach the digital humanities and its computational methods as one useful for the formulation of a different method of engagement with moving images.

With these processes, we can determine there are more to frames than meets the eye. What is a frame? What new meanings can we draw from its traditionally rectangular figure? What happens when we interrogate its form, its attachment to time, and the ubiquitous nature of this four-cornered structure? And most importantly, what other means of viewing frames can we create when we utilize new terms of commentary and procedure? While many of these questions remain key considerations for further study, we can conclude that our approaches to cinema have indeed moved forward from the concept of the single window onto the world Bazin proposed in his earliest writings due to advancements in computational methods allowing us to reach alternative visualities. In the meantime, indeterminacy remains. However, more methods of viewing frames, analyzing moving images, and avenues for consciousness may arise in the future.

References

Bazin, André (1965). "Theater and Cinema: Part Two." In *What Is Cinema? Volume I*, translated by Hugh Gray, 95–124. Berkeley, Los Angeles, and London: University of California Press.

Benjamin, Walter (1968). "The Work of Art in the Age of Mechanical Reproduction." In *Illuminations*, 219-253. New York: Harcourt Brace.

Burdick, Anne, Johanna Drucker, Peter Lunenfeld, Todd Presner, and Jeffrey Schnapp (2012). "Humanities to Digital Humanities." In *Digital_Humanities*, 4–26. Cambridge: MIT Press.

Davis, Douglas (1995). "The Work of Art in the Age of Digital Reproduction (An Evolving Thesis: 1991-1995)." *Leonardo* 28 (5): 381–86. https://doi.org/10.2307/1576221.

Drucker, Johanna (2011). "Humanities Approaches to Graphical Display." *Digital Humanities Quarterly* 5 (1). http://www.digitalhumanities.org/dhq/vol/5/1/000091/000091.html.

Ferguson, Kevin L. (2015). "Volumetric Cinema." *Journal of Videographic Film & Moving Image Studies*, [in]Transition, 2 (1). http://mediacommons.org/intransition/2015/03/10/volumetric-cinema.

Frampton, Hollis (1971). *(nostalgia)*.

Flueckiger, Barbara (2017). "A Digital Humanities Approach to Film Colors." *The Moving Image* 17 (2): 71–94. https://doi.org/10.5749/movingimage.17.2.0071.

James, David E. (1997). "An Interview with Pat O'Neill." *Millennium Film Journal* 30 (31). http://mfj-online.org/journalPages/MFJ30,31/DJamesInterview.html.

Kattelle, Alan (2000). "Chapter One: The Ancestry of the Motion Picture." In *Home Movies: A History of the American Industry, 1897-1979*, First Edition., 1–21. Nashua: Transition Publishing.

Rodriguez, Dave (2020). "More than Access: Audiovisual Collections and Transformative Digital Scholarship." Presentation at the 2020 Association of Moving Image Archivists Conference, Online, November 19.

Samuels, Lisa, and Jerome McGann (1999). "Deformance and Interpretation." *New Literary History* 30 (1): 25–56.

Sitney, P. Adams (2002). "Preface to the First Edition." In *Visionary Film: The American Avant-Garde, 1943-2000*, xi–xiv. Oxford; New York: Oxford University Press.

Youngblood, Gene (2020). *Expanded Cinema*. 50th Anniversary Edition. New York, NY: Fordham University Press.

Patricia Ledesma Villon – University of California - Los Angeles (United States)
https://orcid.org/0000-0003-0164-680X
pvillon@g.ucla.edu
Patricia Ledesma Villon is a moving image archivist and MLIS student specializing in Media Archival Studies at the University of California, Los Angeles. She is a co-programmer for Light Field, an international exhibition of recent and historical experimental moving image art on celluloid held in San Francisco, and is involved in the Bay Area's artist-run film laboratory movement. She received her B.A. in Media Studies from the University of California, Berkeley and currently serves as co-chair of the Small Gauge and Amateur Film Committee of the Association of Moving Image Archivists.