

Design and Construction of a Kinetic Art Weather Display
(Technical Paper)

An ANT Analysis of the Analog Photography Renaissance
(STS Paper)

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On my honor as a University Student, I have neither given nor received
unauthorized aid on this assignment as defined by the Honor Guidelines
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Introduction

With over 1 billion active users every month, the social media application Instagram, reveals that taking photos and sharing them is wildly popular among the general population (Facebook, 2020). Typically, most people who share photos have a camera, be it a standalone one or their smartphone. Digital cameras were a revolutionary technology when they first entered the consumer market in the 1990s, but film photography remained the medium of choice until the market peaked in 2003 (Laurent, 2017). Shortly afterward, the analog art form began to see a downward spiral that culminated with the bankruptcy of Kodak in 2012, one of the most dominant companies in the photography business at the time (Bennet, 2012). Considering the advantages that digital photography has over film, such as the ability to instantly review photos, an extremely low cost per photo, and quick turnaround for professionals, it is no surprise that digital technologies eclipsed film. Another detriment to the film format is that nearly every individual who owns a smartphone also owns a digital camera, so there is now far less incentive to buy a dedicated camera, let alone one that is analog. Despite the proliferation of smartphones, there has been a surprising renaissance of analog photography in the latter half of the 2010s; learning the cause of this renaissance has broader implications for other “dated” technologies. Thus, the proposed STS research paper will determine the factors that have caused renewed consumer interest in analog photography.

The technical portion associated with this prospectus primarily focuses on a different topic when compared to the STS research proposed, but does continue the theme of studying art and analog practices by outlining the plans for a kinetic art weather display. This art piece will function to convey the status of outdoor conditions in windowless rooms by means of a display that uses mechanical movements to rotate various elements that indicate to users if it is day or

night, clear or raining, etc. Such a display could easily be made by simply programming graphics into an electronic display. However, the purpose of this project is to create a unique, physical piece of art that demonstrates mechatronics and the use of advanced manufacturing processes.

Technical Prospectus

A problem faced by many individuals in academia is that laboratories often have no windows where one can easily lose track of time, especially when personal protective equipment is being worn, making it difficult to check one's phone. Losing sense of time is a problem for the obvious reason of potentially missing other appointments and it is also jarring to go outside while not having expected it to be dark or raining. The objective of the capstone project, led by Lisa Accolla, Jack Davis, Katherine Ellis, Adam Lenox, and Joshua Rigby, is to develop a functional piece of wall art that uses mechanical movements and electronics to display various outdoor conditions. It will further be referred to as a kinetic art weather display, or weather display. This idea was specifically inspired by the conditions that students and researchers are under while working in the labs of the University of Virginia's Mechanical and Aerospace Engineering department, which are located in the basement of the Mechanical Engineering (MEC) Building at UVA. The weather display will serve to inform users of the current conditions outdoors such as rain, snow, clear skies, daytime, nighttime, etc., through pictorial means that are quick and easy to process with just a glance and also aesthetically pleasing. This display will also demonstrate important engineering concepts such as the modern-day synthesis of electronics and mechanical devices, as well as advanced manufacturing techniques such as 3D-printing, CNC machining, and laser cutting that allow for the construction of complex products with relatively low monetary and time costs.

A literature review shows one product that is of a similar concept to the one developed by the capstone group. The “Weather Clock” by Bramwell Brown is primarily an analog clock, but has a small display in the bottom portion that depicts various weather conditions with moving parts and what weather condition is displayed is dependent upon the information from an internal barometric pressure sensor (Bramwell Brown, 2020). The capstone group’s weather display will differ significantly from the “Weather Clock” description. The proposed display will be a circular design fashioned from wood using a CNC Mill, where the top half is a visible window for weather and the bottom will be space to store the mechanics that operate the weather changing devices. The weather display will feature two transparent, semicircular acrylic sheets that are engraved with rain and snow patterns. These sheets, when illuminated by strips of LED lights, provide an artistic simulation of the current weather conditions. The design will also involve sun and moon figures that rotate around the display to indicate the day and night. Smaller features that will be included are a backlight that can vary brightness within the window, a UVA-themed background, an LED matrix display indicating time, date, and temperature, as well as interactive buttons that will allow manual control of the settings. The goal is for all these movements and displays to be dictated by a Parallax Propeller microcontroller chip that is connected to a Raspberry Pi single-board computer that will relay weather and time data from an open-source application programming interface (API).

The capstone group plans to prototype the various mechanical movements to see if they are viable. Then, the entire project will be modeled in computer-aided design (CAD) software to determine the placement of all the components and overall size of the project. Once the modeling is complete, the weather display will be constructed with traditional techniques as well as new,

advanced manufacturing techniques such as 3D-printing, wood CNC milling, and laser cutting acrylic. The project is scheduled for completion in November 2020.

STS Research Prospectus

It is perplexing that analog photography has gained interest recently rather than continue to die out because it is generally a complex and time intensive process with less room for error when compared to digital photography. This is not so much a problem, but rather, an anomaly in technological progress that could offer valuable insights once understood. To begin understanding why film is returning, one must first have an understanding of analog photography and how it works. Analog and digital photography are similar in that they both require the use of a lens and the press of a button to record a photo, but from there, the differences begin to emerge. Using film to record an image is a physical process; there is chemistry occurring, there are no ones and zeroes. Film often comes in the form of a transparent strip of plastic that has a gelatin emulsion coating on one side that contains silver halide crystals, and these crystals are light sensitive such that when the camera takes a photo, an image is imprinted on the film. (Masterclass, 2020). To take a photo on film, one must first choose a film stock, of which there is a vast number to choose from, all offering different color palates, light sensitivities, and grain structures. Harman Technology alone produces 11 different black and white film stocks (Ilford Photo, 2017). Once a photo is taken on film, it is not immediately available as a digital photo would be. One must then have the film developed in a series of chemical baths to reveal the recorded image on the film and then have it scanned or printed for viewing (Fujifilm, 2010).

Using a film camera is a far more laborious activity than using a digital camera, yet the evidence shows that analog photography is experiencing a comeback. Harman Technology, the manufacturer of the popular Ilford Photo black and white films, claimed to have a film growth of

5% year-on-year from 2014 to 2017 (Laurent, 2017). Fujifilm claimed that sales were “strong” in quarter 3 of 2019 for their *instax* line of cameras, which are instant-print film cameras (Fujifilm, 2019). Kodak in late 2018 re-released a consumer film stock that had been completely discontinued in 2009, Ektachrome E100 (Kodak, 2018). Lastly, Kodak also saw its film business revenues grow 21 percent in 2019 (Kodak, 2019). These are very telling signs from the three largest film producers in the world that the analog market has seen growth in the last five years.

Actor Network Theory (ANT) will prove critical in the attempt to understand why there has been renewed interest and growth in film photography when there exists a technically superior option in the form of digital photography. ANT can simply be described as a theory that emphasizes the connections between both human and non-human entities because it is these connections that lead to the creation of new entities (Dankert, 2011). However, there are many finer details that are not covered in that definition. Namely, how the theory describes an actor and the idea of a “heterogeneous network,” which will likely prove critical to answering the proposed STS research question because they are why ANT is useful when attempting to accommodate a system of human and non-human actors. In ANT, an actor is “something that acts or to which activity is granted by others. It implies no special motivation of human individual actors, nor of humans in general. An actant can literally be anything provided it is granted to be the source of an action” (Latour, 1996). The idea of a heterogeneous network is used to overcome what is seen as an unnecessary duality between humans and non-humans (Cressman, 2009). In clearer terms, the heterogenous network means that both humans and non-humans both have agency and are treated no differently when analyzed, which will become important when attempting to look into how film itself is an actor within the network. ANT is well suited for the purpose at hand, but that does not mean there are not any criticisms of this

concept. One of the major criticisms of ANT is that it is immoral. Whittle & Spicer (2008) state that ANT is “unable to pursue a more ‘critical’ agenda.” However, this point is irrelevant to the research proposed because it is a question of why film is returning and not should film be returning?

The actors that will be included in the proposed network are general film photographers, the manufacturers of film stocks, film itself, and individuals with large online followings, known as influencers, who use film. By analyzing how these various actors interact and what their relationships are, it will be possible to determine why there has been renewed interest in film photography. Film photography’s popularity is important to understand because it will help determine if other subdued technologies will make a comeback and will inform predictions about current technologies and their longevity. Studying an older technology and why it is growing in popularity will also inform design decisions for newer technologies.

Research Question and Methods

The research question proposed is: What are the factors among various actors and their relationships that have caused a renewed interest in analog photography?

To answer this question, a combination of network analysis, discourse analysis, and documentary research will be used. Discourse analysis will first be used to analyze opinion articles and interviews to gain a better understanding of the general reasons why amateur and professional photographers are attracted to or influenced towards using film. A preliminary search yielded that some of these reasons, as outlined by Ilford Photo in their Global Film Users Survey, are the creative control, the aesthetics, and the archival qualities (Ilford Photo, 2019). Documentary research will be used to follow-up on those stated reasons by finding psychological

reasoning to explain why a given aspect related to film is popular and understanding these reasons will prove useful for predicting the futures of other technologies.

Conclusion

The technical deliverable will be a weather display that makes use of mechanical movements and artistic design to convey various outdoor conditions to its users. Once completed, it will be displayed in a regularly trafficked, windowless area such as a lab and provide users with a convenient means of knowing the conditions outside.

The STS deliverable will determine factors that have caused a renewed interest in analog photography. By utilizing Actor Network Theory to analyze actors within the realm of film photography and their relationships to one another, I suspect to find that there are a few influential actors who make known the qualities of film and those qualities are ultimately what gets curious individuals to become regular users of the medium. Understanding what these qualities are will have important implications when studying and determining the longevity of other technologies.

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