DRUM MACHINE (WHIPLASH)

(Technical Report)

A LOOK INTO A.I. IN CREATIVE ART

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Uriel Gomez Ibarra

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Technical Project Team Members

John Lily

Leonardo Anselmo

Max McCullough

Davis Lydon

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

Signature _____ Date _____

Uriel Gomez Ibarra

Approved _____ Date _____

Harry Powell, Department of Electrical Engineering

Approved _____ Date _____

Joshua Earle, Department of Engineering and Society

A LOOK INTO AI IN CREATIVE ART

Introduction

As Machine Learning (ML) and Artificial Intelligence (AI) are becoming increasingly prevalent in today's world. We often think about these in the context of traditional technology. However, there is an increasing use of these technologies in creative arts. One such example is A.I.s involvement in image generation. Projects such as *Midjourney*, *Dream Studio*, and *NightCafe* to name a few. With this what was once only done by humans can now be copied by AI (Cetinic & She, 2022). There has been a history of technology and machine helping humans to create art both in the visual sense as well as in other forms of art. However, any quick use of any of the aforementioned projects shows that now anyone can create "art" just by typing in a couple of words. Now people have the power of art in the form of a simple google search. Now with this in mind, who should get credit for the new image that will be created by the machine (*Who Gets Credit for AI-Generated Art?*, n.d.)?

However, most of the time the AI is not drawing a new image, it is collecting information that the machine has already received before. This art creation is not completely 100 percent original, as it looks through different databases that are already existing and then takes into account what words were used to describe them as well as the images that are in the image itself (Cetinic & She, 2022). This then means that the person who types in the words in the search bar to generate the image is the creator of the image, assisted by AI trained by ML. This then becomes an issue as to who is the original creator of this new AI image.

On the topic of who should get the credit for the AI-generated images, there are a few possible answers. That the people behind the original images that were used in the database that was used to teach the machine should get the credit. That the people who taught the machine,

i.e., the people who acquired the images and taught the machine to recognize what keywords correspond with what images should get the credit. That the end user who plugs in the keywords that they are interested in that should get the credit. Upon not knowing the answer let us consider where the images came from in the first place the original artist. Alongside the main question of who should get the credit for the AI-generated image, I will also look into how AI-generated art will change the future of creativity.

TECHNICAL PROJECT: DRUM MACHINE

Our technical project group wanted to focus on a technical project that would be fun to explore and design. Thus, we have turned into a common interest among the group members which is music. While all group members listen to music regularly, only two of us are musicians. From there only one of us is a drummer. Conveniently that is I. Currently, there are fewer and fewer people that are being taught music, since fewer schools are offering music education. (Bath et al., 2020). This means that there are fewer people with music education. With the decline of people with music education, it will be more difficult to find someone to play music with. Given that there will be a general lack of musicians in any given area, which makes it very difficult for people to get together and play live music together either just for fun or for band practice. Given that also drums take up much more space and are therefore less portable than other instruments it makes it difficult to be able to get with other musicians just logically.

With this problem in mind, my team and I decided on making a machine that would be able to take any input signal from an audio jack and will be able to detect the beat and then a machine that will control drumsticks to hit a drum in time with the beat and be able to output these drum hits in real time, accurately alongside an audio output. With this device, people can not only teach themselves the basics of beat playing but also get a better feel as to how it would feel to play alongside a drummer instead of playing to a metronome. This project will be done with the implementation of Digital Signal Processing (DSP) as well as Pulse Width Modulation (PWM), to successfully analyze the input as needed and then be able to characterize the output in a way that makes it readable to the servo drivers that will be moving the drumsticks.

DSP is a method of signal analysis in which a digital signal is processed in a central processing unit (CPU) and modified per how the CPU is instructed. The CPU can be

programmed in whatever manner is desired for any specific purpose. So the signal goes into the CPU and the CPU does the DSP and then will generate data from the DSP process. Explaining how the PWM works. A PWM signal is an output signal that will come from a CPU, this PWM signal comes in the form of a square wave. However, this PWM signal is not symmetrical. Meaning that the amount of time when the square signal is high, the equivalent to the signal being on, is not the same as the amount of time when the square signal is low, where the signal can be seen as off. The CPU determines the PWM signal which can then be used to control a machine.

The fact that the project will rely heavily on DSP means that the group as a whole will need to have a firm understanding of DSP and how it can be implemented into beat detection (Laroche, 2001). Also, the group as a whole will need to be informed on how PWM signals can be optimized to work with servo motors while consuming the least amount of energy possible (Lai & Hsu, 2018). The end product is a design that should not be used as a replacement for a human but more of a teaching tool and an accompaniment to a musician who does have access to a drummer and what a more authentic play-along experience. So, while aspiring drummers may not have access to a teacher, they should be able to at least via exposure and listening be able to learn how to play a beat accurately to a song of their choice. Given that this project does need audio input from a prerecorded song that means that the actual human who created the song is still full owner of the song beat and everything else, this machine does not create music, it only mimics what it hears. What sheet music is to humans, an audio signal is to this drum machine.

STS TOPIC: A LOOK INTO A.I. IN CREATIVE ART

Art is a creative endeavor that has been practiced by humans for many years. It is a way that humans have to express themselves and also document people and places. From the age of the Renaissance, art has been tied with culture. People who make art are normal thought has people who have talent. That making of art is for people who are skilled in their art. Painters, playwrights, authors, musicians, etc. As time progressed so has how people create art. With the invention of the camera, there are now photographers, and with the invention of recorded music, there is a new way to create music. With technology such as this art can not only be innovative and done differently, but art is also becoming more accessible to people with technology. It is becoming more accessible to create quality art, in imaging we can drawing tools can be used, in music, tools such as MIDI (which is outside the scope of this paper) people can listen to how things will sound even before picking up an instrument and learning how to play the appropriate notes on the instrument.

The method that I will be using to answer the question of who should get the credit when it comes to A.I.-generated art will be case studies. I will research situations in which this problem or a similar problem was presented before. Maybe I can find a court case on the use of sampling which is not related completely but does take into account how others manipulate the art of others to make a new piece of art. Another approach that I will take after the case studies will be actor-network theory and how that applies between humans and the A.I. that they have created. This is interested because the actor-network theory goes in both directions. As there is the programmer of the program as well as the user of the program, they both have to interact with the machine but in many different ways.

First, we will need to define what art is. There are different arguments as to what art is. Is it objective, or is it subjective? Different sources will state different definitions. In a video, a creator goes on by saying that the Oxford dictionary definitions leave a lot to be determined such as if creations by animals can not be considered art. (The Art Assignment, 2020). In a video essay creator CJ, The X brings up an interesting point by saying that art only happens when a user interacts with the object or idea (CJ The X, 2022). Even when it comes to visual art there are also different genres of art and how each genre is defined denies certain art from being considered art within another genre. (*Battcock - 1995 - Minimal Art a Critical Anthology.Pdf*, n.d.). With this humans cannot agree with what is art, however, different creations can be considered art by individual people (CJ The X, 2022), thus anything can be art.

In recent years now technology has evolved enough so that people can have A.I.s that have learned how to generate art from learning from previous art. This means that now, not only can humans continue to make art, but machines make art for them now (*AI-Generated vs. Human Artworks. A Perception Bias Towards Artificial Intelligence?* n.d.). However, this art will come at a price.

Who will get credited for making the art? Is it the people who are included in these databases, essentially the template for which A.I. will learn how to make art? Will it be the people who teach the machine what words go with what art, the ML algorithm itself that will be the brain to properly train this machine? Or will it be the person at the keyboard, the one who chose what words to put into that search bar to tell the machine to generate the image desired? Nevertheless, there will be bias on all sides. The original illustrator whose work was in the learning database will want to make sure that they are credited given that it is their intellectual property(*AI-Generated vs. Human Artworks. A Perception Bias Towards Artificial Intelligence?*,

n.d.). This can also then go into the realm of whether or not it is legal to have these works in the original database in the first place (*A Legal Anatomy of AI-Generated Art*, n.d.). That is an extension of the who owns the generated image argument.

Foundational Text and Primary Resources

So far I will need to do more research to adequately describe the solution. However, going into the two most interesting articles that I have found so far are the *A Legal Anatomy of AI-generated Art,* published by Harvard, and *Understanding and Creating Art with AI: Review and Outlook,* by Cetinic & She.

Given that I initially was not going to look too much into the law side of the topic the article stood out to me. I knew that there were going to be copyright issues with the original illustrator given the nature of the intellectual property of art. However, I was surprised to see that laws are in the act of being made to comply with this new and up-and-coming technology. One of the things that I found most interesting in the article was the potential of the idea to have the original creator of a work of art involved with the training algorithm for the A.I. to create more detailed and in-line A.I. outputs given the training and the user inputs (*A Legal Anatomy of AI-Generated Art*, n.d.).

The other interesting article to me was the piece by Cetinic & She, as I do believe that the authors go into good detail as to what they are considering to be A.I.-generated art. They go into detail as to how advancements in technology are contributing to the evolution of art as a whole. Examples such as the camera and movies are some main focus points for technology helping to create more art (Cetinic & She, 2022). Also, one thing that was very interesting as well, to see the actual evolution of the A.I. art generation projects. How does the output of the first couple of projects with the first algorithms compare to the newer project updated with the advanced algorithms (Cetinic & She, 2022)? Research wise I would need to look into more case studies in this new art generation to determine the consensus of people on the topic.

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