**The Evolution of Graphic Design and Digital Art**

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Art is a crucial tool of expression and communication, and has been around since the beginning of mankind. Humans have gone from painting on cave walls to digitally creating a piece and turning it into a physical object, to artificial intelligence creating pieces without human assistance. History has strung us along through a plethora of different eras of art, and even now, has allowed the world to become as diverse as possible. In the modern age, also known as the contemporary era, one of the prominent styles of drawing is digital art, which encompasses various different uses of computer technology to create art. One of the ways we use computer technology to create art is artificial intelligence, which was pioneered by Harold Cohen, an artist and engineer, known for creating the first AI program used to create art. There are various ways in which artificial intelligence helps create art besides having it create it on its own through computations and databases. One of the more prominent inventions in graphic design is the graphic tablet. Digital art will continue to evolve and as technology continues to become more powerful, innovations will keep appearing. Innovations that transcend what the earliest man could think of producing.

Few things have been around since the beginning of time like art has. Throughout history, art has evolved from drawings and carvings in cave walls to digital creations that can even be turned into something that you can actually touch using tools like 3D printing. In fact, the earliest findings by historians are said to be cave paintings created circa 38,000 BC (*The history of Graphic Design*). In these cave paintings, found in the Lascaux cave, animals, weapons, and references to hunting were depicted, but the message that was intended was never discovered (*The history of Graphic Design*). Since then, art has gone through many eras, such as the renaissance era, which birthed some of the most famous and respected artists of all time like Leonardo da Vinci, Michelangelo, etc. (*Digital Art: History, media and artists of an expansive field* 2018). Many eras represented different styles of painting like the aforementioned renaissance era, which hosted realistic work that focused on correct human anatomy and intense lighting and shading, the impressionist era, when artists focused more on capturing the moment through quick paintings rather than capturing every single detail anatomically correct, and the surrealist era, where realism was void and paintings were viewed as bizarre, philosophical pieces, meant to make the viewer digest the work through a different lens (*Digital Art: History, media and artists of an expansive field* 2018). These eras do not account for the entire world as different countries produce different work, even in the same period.

As of today, we are in the contemporary era, which birthed the subgenre of digital art. According to Adobe, digital art is “any artwork that draws upon digital technology as an essential part of its creative process.” The broadest use of this is through computers, but also includes photography, animation, and video. Digital art attracts many positives over traditional art, such as the convenience of being able to view work without physically having to move to a new destination, reducing waste and clutter of having too many physical tools, and the efficacy of being able to make an error and not have to spend so much time correcting it (*What is Digital Art? | Digital Painting & Drawing Guide | Adobe*). Personally, I sketch traditionally, then scan the drawing and finish it on my iPad Pro, which in itself is vastly different from the program that first allowed people to create digital art, the AARON system.

Harold Cohen is considered a pioneer in digital art and his creation, AARON, started an entire new era of art that introduced the integration of artificial intelligence (Tluong, 2019). Cohen was an artist that graduated from London’s Slade School of Fine Art and through the help of various exhibitions, rose to international fame, with gallery shows in the United States and Canada (Tluong, 2019). In the 1960s, Cohen’s interest in traditional art dwindled, which prompted him to think of different ways to produce art and in turn, caused an interest in computer technology. While visiting the University of California, he met Jef Raskin, a graduate student who introduced him to computer programming. Throughout the early years of his interest in computer programming, Cohen transitioned through multiple 16-bit minicomputers like the Data General Nova and PDP-11 (Tluong, 2019). Eventually, he became a professor at the University of California, which allowed him to explore deeper into programming. In 1971, he created a painting system, which granted him an invitation to display this system at the Los Angeles County Museum. Cohen’s crossover between art and technology attracted prominent figures in computer science, like John McCarthy and Ed Feigenbum, who were pioneers in artificial intelligence and computer science, respectively. The earliest version of his technological work was a machine known as a turtle, which operated on sets and rules, moved by a set of wheels. All of this allowed the machine to “draw” on a frame smoothly, creating sometimes-fluid lines (*The first Digital Artist - Harold Cohen and his Aaron* 2021). The set of rules the machine operated on also allowed for the turtle to create drawings that are not visually different from each other. In a process similar to what I do for my artwork, Cohen would create the drawing through the turtle, and color the result, resulting in a piece made in combination with digital art. In its most primitive state, AARON created pieces as small as 3x8in, to murals like “Socrates’ Garden”, which is 18x23 ft. From the 1970s onwards, Cohen spent most of his time improving AARON. In the beginning, AARON would mostly create drawings that resembled children’s drawings, eventually progressing to depictions of actual objects, like plants and animals and even people (Tluong, 2019). After experimenting with different techniques and equipment for the machine, AARON was able to create drawings and color them as well.

Harold Cohen created a pivotal piece of technology that changed the way artists work. Albeit very different, AARON was a step towards the AI technology we use nowadays, with the difference being that the newest AI technology creates pieces based off of work in a database. There are many different ways in which computers are used to assist with artwork, such as drawing tablets, which allows you to draw on a tablet and have it presented on a computer screen. This allows for much less clutter of having different tools and brings the efficacy of not having to go through much trouble correcting a mistake, which at times can ruin the piece for an artist. The first major breakthrough in art tablets was the Stylator, created by T.L. Dimond in 1957 (*History of the art tablet*). Being the first digital tablet, it brought along many problems that created a hindrance to creative output, but was a base for the next groundbreaking invention, the RAND Tablet. This was the first graphics tablet that allowed actual real time handwriting to be projected onto a screen while writing on the tablet (*History of the art tablet*). It did so by connecting a display to a writing surface and receiving information to determine the position of the stylus. The creation of the RAND Tablet is monumental because it provided a basis of the tablets we use today (*History of the art tablet*). While there are still tablets that use this same format of drawing on the tablet and having it presented on a computer display, like the Wacom Cintiq, there are also tablets that allow for a display and drawing surface at the time, like the iPad Pro. The iPad Pro is one of the most recent and powerful tablets that allow for the ability to draw on, while displaying the drawings. This tablet is packed with power that equals some computers, along with one of the best displays on a tablet out now. A problem that a digital artist can face is the power restrictions that a tablet can give, possibly limiting the amount of layers one can use on an application. The iPad Pro is not the only powerful tablet, and is not even a table specifically made for graphic design. There are tablets like the Wacom Cintiq Pro 27 which vastly surpasses the iPad Pro in terms of digital ability to create art. The resolutions and internal power allows for artists like game developers, videographers, and photographers to work seamlessly and at the highest resolution and power possible. Everything is optimized from the pen it uses, to the responsiveness, sensitivity, and display capabilities for the tablet. These innovations in art technology provide us with the ability to create as humans have never created before.

One form of creating art that is groundbreaking and recent is 3D printing. The first 3D printer was made by Dr. Hideo Kodama in 1981(Chapman, 2023). This was done by combining a resin with UV lights. Although the earliest prototype created was in 1981, 3D printers did not become commercially available until 2006. The first of these was the RepRap. One of the fascinating things about the RepRap is that it was created with plastic parts that can be 3D printed. In other words, one can purchase a RepRap and create other 3D printers with the RepRap alone (Chapman, 2023). As the desire for 3D printing grows, the capabilities also grow as well, due to innovations that add quality of life improvements, making 3D printing more efficient and reliable. For example, according to Chapman, “the International Space Station printed the first tool in space, using a low-gravity 3D printer. This enabled workers to access the tools they needed for maintenance far more quickly, rather than waiting for them to be delivered from Earth.” Not only is the growth of 3D printing allowing for 3D printing to become more efficient and desirable, the market is also expected to grow almost 4x in value from 2020 to 2030 (Chapman, 2023). Different materials to 3D print will also become more and more available. For example, printing metal is also now possible and is beneficial to pretty much every manufacturer, since this decreases product developmental periods, reduces manufacturing costs, and allows for geometrically complex parts to be created as well (Chapman, 2023). In fact, according to MarkForged, “no custom tooling or fixturing setups are needed to run a metal 3D printer, regardless of the parts printed. This reduces overhead costs associated with manufacturing and produces low-volume parts more quickly and affordably.” On the other hand, “machined parts require drawings, CAM, or both”, while 3D printed metal parts do not (*Benefits of metal 3D printing technologies - why use metal additive...*). There are many advantages to being able to print objects into existence. Objects that are reliable and are much more cost-effective will change the landscape of manufacturing and possibly society.

When it comes to timelessness, art is the embodiment of that term. Art will always be around as long as there is expression and communication. Society has gone through many different eras of art, and even today, more than ever, there are many different styles of art used around the world. From paintings in cave walls to printing items out of almost nothing, the world has come a long way. As new technology arises, things that were concepts like a drawing tablet, 3D printing, and even just drawing on what we know now as regular were concepts that were unimaginable in the earliest times. The unimaginable becomes imaginable because of art, innovation, and expression.

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