Protection for 3D Files

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Technology has progressed extremely fast throughout the years, especially in recent years. In addition to the technology itself, the rate at which this technology is developed is constantly increasing at a rapid rate. One large, important part of these recent developments in this technology is digital three dimensional, or 3D, design. The primary program used for this today is Computer Aided Design, or CAD. Prior to computers and CAD, architects and engineers of many disciplines would make 3D models of buildings, mechanical parts, vehicles, or other items, all on paper. With the development of computers, this changed quickly. The first program related to digital 3D design was PRONTO. This was the first numerical control programming tool and it was developed and created by Dr. Patrick J. Hanratty in 1957 (Tornincasa and Di Monaco, 2010). While this program was groundbreaking and the first of its kind, the first recognized stepping stone is a program called Sketchpad, which was created by Ivan Sutherland, who is considered to be the father of CAD. Sutherland made Sketchpad in 1963 as a part of his PhD Thesis for MIT (Tornincasa and Di Monaco, 2010). Sketchpad and all other developing forms at the time started as two dimensional design programs and were used by many large companies as soon as they were created. Since then, CAD has progressed to incorporate so many more details, functions, components, and features, to say the least, design using three dimensions. Now, CAD can be used to 3D print plastic parts, mill out metal parts, or still even modelling buildings or any sort of structure. In modern times, CAD can be used to design any 3D object imaginable, enough to where there are infinite possibilities of what can be created.

Parts of these new updates and improvements of CAD is being able to save files online and not only that, but being able to easily store, send, receive, publish, and download these files. With this being said, countless people publish their files often, either for sale or for public use.

A vast majority of people obtain and use these files legally and using legitimate methods, whether it be paying for them or simply citing when using them in a project or assembly of many 3D parts. While most of the users are going about obtaining these files the right way, there are a number of people who deal with the illegal distribution or obtaining of these files or designs of parts. Some cases can be extreme as people hacking a source and stealing a file for free, but most cases are along the lines of one buying a file and distributing it to their peers for free, when they have not purchased the rights to it. Other common cases can consist of one not properly using a citation, not giving credit to the source, when they are using a free file in a project they are doing. These issues are becoming more and more prominent in society. While these scientific and technological advancements are very beneficial to society, some members of these systems are taking advantage of others. This is an issue as it poses as a great ethical dilemma as those who are providing the files are being very wronged. The victims are being stolen from, whether it be monetary value or just the credit they deserve for the original file.

Current Methods

Many people are aware of the current problem at hand within the CAD and 3D design universe. Many of these problems in the US occur because of legal issues with patents, or a lack thereof. A patent allows legal protection of a person's original part and grants only them the rights to own, use, and sell the inventions. Any inventor or innovator in the past would obtain a patent for their original creation or part. The wording and verbiage of this gets very important when dealing with these particular issues. In the past and even today, patents are obtained for the physical part or invention. This does not include the drawings for the part, even though they are usually used and submitted when applying for the patent to better describe and explain what

the part is and what its functions are. Since this applied to drawings on physical paper, it very easily translates to the digital realm with CAD and 3D design. This leaves these files of online and digital drawings vulnerable to others for the taking. One could lock up and secure their storage so their files are protected, but if they need to share them with another, it only takes one bad apple to release the owner's files to whomever they please.

This indecent taking of files is an issue in and of itself, but it is especially problematic when it comes to plagiarism using 3D printing. In manufacturing, often times certain parts are needed to create products, which in turn generate revenue. When the drawings of the desired parts are located in files publicly online, it makes it very accessible for the manufacturers to obtain that file. The manufacturers could then print the part and continue on selling their products and making money on using someone else's part without either giving them credit, a certain reimbursement, or percentage of the revenue for the drawings (Engelmann, Holland, Nigischer, and Stjepandić, 2018). This introduces issues, both ethical and legal. With any other form of this, it is clearly not morally right. An example of this outside the digital world would be someone taking a physical part or invention, without paying for it, and then going on to make a profit using it in their manufacturing process. This scenario of taking files is much more common in smaller, local businesses than those that are more well known. This issue, even outside of manufacturing, only continues to grow as 3D printers are becoming cheaper and cheaper every day and more affordable for the average person of society (Engelmann, Holland, Nigischer, and Stjepandić, 2018).

One might think that as developed as the US legal system is, it would cover something like this in order to protect one's original ideas. On the contrary, even though the US legal system is progressing itself, it is not nearly progressing at the rate that technology is progressing.

For this reason, the legal system cannot always keep up with the technological innovations of today, which is the exact case today. While there are laws regarding patents and copyright protection, the specific wording of them allows for this technicality of taking other's files. Downloading the file and creating the physical part without the user's permission serves as a rather troublesome loophole to the current legal system, as the individual who obtained the file is not "making," "selling," or "using" the patented device or any "component" of it either (Brean, 2013). The wording implies that a drawing, especially a digital one is not considered a component of the actual part. In order for one to obtain a patent, the inventor "must describe the art sufficiently to contain all aspects of the invention" (Vogel, 2016). Once more, the drawings do not suffice as an actual aspect of the invention. Manufacturers are not the only ones unethically taking these files either. Since 3D printers have become so commonplace in many American homes, many individuals have taken advantage of the system as well. When an individual gets their hands on a particular file of a 3D part, which is patented, they can simply print it, rather than rightfully ordering it purchasing it. This takes away much of the business of many manufacturers as they cannot make, sell, and ship the physical parts for each product that an individual 3D prints on their own (Brean, 2013). This also is technically legal, while the ethics of it are more than questionable. Even if it were illegal, the ease of obtaining and distributing of these files would make it very difficult for enforcement against any infringers.

An important idea behind copyright law, which can be applied here, can be observed through the history of the law, particularly through the case of music. At one point in time, copyright law differentiated the idea of a copy that humans could recognize and a copy that they could not. However, this law was established in 1908 (Grimmelmann, 2014). An example of this was piano rolls made by musical artists, where the rolls themselves could not be considered

copies of the music. This was explained with writing stating "even those skilled in the making of these rolls are unable to read them as musical compositions" (Grimmelmann, 2014). Music sheet could be used to distinctly observe the similarity of the rolls, but in those days, they were only considered to be part of a machine. Congress very quickly shifted mindsets and got rid of this idea. It has since then only driven further from that original idea with the piano rolls to the point, where in modern times, a "copy infringes whether it can be perceived directly or whether it requires the aid of a machine or device" (Grimmelmann, 2014). With this in mind, a 3D printer qualifies as the "machine or device." This clarifies that if something is printed or fabricated using the drawings of a certain part, then it is illegal. This is the case only if that certain part has a patent. If it does, then it would be considered copyright infringement, while if not, then it would be perfectly allowed. Many issues with legality and enforcement of laws come into play through this charge. The fact that the unjust downloading and sharing of these files being legal, allows for the files to get around with much greater ease. Once the file is obtained, it is just as easy to 3D print it, which is the action that makes it illegal. There is a clear and direct correlation between the legality of the sharing and downloading of files and the illegal use of printing copyrighted materials. If the files themselves could be copyrighted, then less of them would get around, which in turn would result in less illegal prints of those files.

Science, Technology, and Society Framework

The idea of the problem at hand is that any legal system has to work with technology as it is invented and innovated. When engineers or scientists develop new technology, most of the time, it plays a large role in society. Usually, there are both, positive and negative, impacts on society. It is up to the people, or the legal system, to make sure that these technologies are

limited to and used only in the best possible ways, which in turn mitigate any negative impacts as much as possible. As seen in this case, society is affected in many ways through the invention of CAD, 3D printing, and milling.

In this situation, there are both actors and actants involved that play a role in this dilemma. The actors are those who download and share files wrongfully. This is so, because they are the ones who are taking action and without them, this whole occurrence would never happen. These are not the only actors at play though. Those who originally create their own 3D files are also actors at play. Even though they are the victims and it may seem that they do not play much of a role in this, without them, none of this situation would ever happen. They are the creators of the files, so without them, the files themselves would never even exist. One final group of actors, that are often overlooked, are the lawmakers, legal enforcers, and all others involved in the legal system. It is up to them to make laws or deny a law's approval and existence, so they also play a large role in this system. It is not their fault for those who steal these files wrongfully and even print them, but a lot of the responsibility of letting that occur falls on these workers of the legal system. While there are three groups of actors, there is only group of actants. This group of actants would be the created files of 3D drawings. They only play a role with others doing something to them, whether it be making them, downloading them, sharing them, or printing them. Overall, all members of this actor network contribute to the result of the system and ongoing problem at hand.

In order to better understand this issue, the system has to be analyzed further. The main system at play is the creative concepts established on 3D drawings via online sources, mostly being CAD, which can be beneficial and innovative for the society if the creators openly share their ideas. This does not mean that they are just giving without getting something in return,

which is why they can either be paid with money for their ideas or decide that it will be free, but proper citations would be required. If these creators solely kept their ideas to themselves, then society would never benefit, which is why having them open to the public is important, but of course, only in legitimate and legal methods, where they are somehow paid for their works. This creation of drawings can be viewed as positive, but upon another glance, one could also view it as a negative effect upon society. One who views it as negative could see it as a means of further adding to the capitalistic view of taking advantage of those of society, by holding technological advancements over their head for the exchange of payment. Whichever view is taken, these creators still determine much of the effect on society itself.

This taking of others' files is considered stealing, even if it is legally defined as so. Some would attempt to justify this taking of files with honorable intentions. An argument could be made that those taking the files and wrongfully distributing them are actually bettering society more than the creators. They could be seen as releasing productive, effective, and efficient knowledge at no cost to help those around them improve their lives. This view could be further strengthened if the intent of the creator is observed to have negative effects on society. Once more, if the creators were only doing it to obtain financial gains and not genuinely care about helping progress society, then this argument could be even more justified.

Analysis

While CAD, 3D printing, and milling are relatively new, theft and stealing, even of intellectual property, are not. A similar case, which greatly relates to the current discussion of 3D drawings, is one of pirating music and movies online. Digital piracy is defined as "the unauthorized copying of digital goods—software, digital documents, digital audio (including

music and voice), and digital video—for any reason other than backup without permission and compensation to the copyright holder" (Gopal, Sanders, Bhattacherjee, Agrawal, and Wagner, 2004). There is no question about whether or not this is within one's legal rights or not, it is clearly stated as breaking the law. According to the No Electronic Theft Act of 1997, any distributing unlawful copies of music CDs, films, DVDs, and other copyrighted digital media, even if there was no financial gain involved, was made illegal (Constitutional Rights Foundation, n.d.) Digital 3D drawings are not considered to be digital media, but are rather digital scientific documents. This signifies the only difference between the two different cases. With such similarities, it makes it difficult to see the reasoning of why one is so protected, while another is almost completely unprotected.

There is one more case involving 2D printing, which has similar aspects to those of 3D printing. With any document that can be printed on paper from an ink printer, a copyright protection can be obtained for said document. One might argue that the part of a 3D print can have that same copyright protection, which is true, but the file itself does not. The file of the printed 2D document can also have the copyright protection the actual printed paper has, which is contrary to the 3D printed object. Once again, with a case so similar, one could really have difficulty seeing the reasoning in these differing cases and how they are treated.

After observing the current situation and similar cases to it, a decision is to be made by the US legal system. There are a few options from which they can decide to choose. The first option would be to remain with how it has been and take no action to further restrict or extend the protection of these files. Laws are not easy or quick to pass in the US legal, so unfortunately, this remains a very plausible course of action for the near future. The second option would be to make it clear that the protection of these files from the public will be restricted in order to better

society with greater ease. Some believe the purpose of copyright is more so "not to monetarily enrich the owner of the copyright, but to further increase society's access to culture and information" (Reitinger, 2016). The only reasoning that could be used to explain this is that it would better society, as the files would be much more accessible to the public. This option is not very viable, but is not to be disregarded as all options are always to be considered. A third and final option would be to take action to extend more protection for these files, which would allow for the preservation of the creativity and originality of the creators. This appears to be a very reasonable option, as it allows for the creator to have more rights over their own work. This seems to be a very feasible option, the question is more of when would it happen rather if it would happen in the first place. After all, the United States Constitution Article I, Section 8, Clause 8 states that Congress has the power "To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." (U.S. Const. art. I, § 3, cl. 8.). According to this, the authors and inventors should have the right to their discoveries. This is only beginning to come into focus with the legal system (Menell and Vacca, 2019).

Conclusion

The current state of the copyright protection and patent system on files of 3D drawings is truly a predicament. The physical part can be protected, while the file itself cannot be. With 3D printing and milling becoming more and more popular, illegal production of these patented parts is much easier. The US legal system needs to address the discrepancies within the copyright protection realm. However, that is not the only lesson to be learned. One can learn how to fix this specific case, but it is most definitely more important to understand the greater lesson at

hand: The US legal system needs to more closely work with inventors and innovators in all cases in the future, so that a gap like this never happens again and the legal system is always up to date with the constant renewal of updated technologies.

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