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Royalty Collection for 3D-printing Based on Nodes in Information Age

Introduction

How to collecting royalty becomes a question for both copyright and patent right in information age. If everyone can produce patented products at home simply through downloading digital files and then 3D-print them out, large-scale infringement will become unprecedentedly easy. With factories or retailers disappearing, the intellectual right holders must find new nodes for collecting royalty.

Royalty collection from distributor in the industrial age

Traditionally, authors or inventors collect their royalty from the publishers or the manufacturers. The reason is simple, if they want to directly collect royalty from the individual user, the transaction cost will be too high, compared to the royalty they can collect. First, they must find out the individual user infringing their intellectual property right; second, they must negotiate with the infringers; third, if negotiation fails, they must prepare the evidence to initiate a suit; and finally, if they win the suit, the payback is only the royalty of the individual user's share. On contrary, the publisher or the manufacturers are more ideal sources of the royalty. They have much bigger scale in infringing the intellectual property right, and thus it is easier to find them or gather evidence; the negotiation cost would not be much higher than that of the individual user; and the most important thing is that they can give out more royalty and then transfer the burden to those costumers purchasing the goods from them. In other words, the right holders collect the royalty indirectly from the individual users to reduce the transaction cost through the publishers or the manufacturers.

So, what is the role the publishers or the manufactures are playing? They are the distributor. Wherever the individual users are, they all -or mostly- obtain the products related to the intellectual property right from the distributor. Therefore, the distributor is a node in the network of product flow and money flow. The right holders control the node, they control the royalty source of their intellectual property right.

The question is why there is the distributor? It sounds like that the distributors stand on the right holders' side, and the individual users may not like the distributors for they must pay the royalty besides the product. However, the distributors are necessary, since the cost to copy a copyrighted book or manufacture a patented product ordinarily will be too high for an individual user to afford. Without the distributor, the individual users or the society will lose the benefit of implementing

the intellectual creation. The gross production as a symbol of industrial age not only reduces the production cost per unit, but also serves as the distributor, making the royalty collection possible by the intellectual property right holders.

Problems of 3D-printing in information age

What if there is no distributor? Well, it comes true today. As the digital technology makes copying unprecedentedly easy and low-cost, the internet makes the spreading extremely fast. The copyright holder would like to ask who is the distributor. The servers storing the copyrighted files? Well, there were some downloading website provided the directly downloading service, if you sue them, you probably win. But how about the peer-to-peer technology? Each individual user acts as a server for others; there is no central distributor. You sue the distributor, you sue everyone. Of course, such action will be pointless since the transaction cost is much too high.

It seems that copyright falls in trouble in the information age. However, the 3D-printing technology further gets patent involved. If the copyright only relates to digital files sleeping in disk, the 3D-printing technology draws the ghost out of the disk. Individual users have acquired unprecedented production ability to build patented products -maybe more related to structure but not components- with low cost.

Regarding to copyright of the digital files, the copyright of books, drawings and photos may be infringed by unauthorized copying. However, whether a digital file is qualified as a *copy* of a sculpture which could be enjoined by the copyright holder?[1] Although a 3D-printer may reproduce a sculpture based on the digital file, the digital file is more like a description. Is the description that "a sphere has a diameter of 3 feet" eligible a *copy* of a real, 3D ball having a diameter of 3 feet?

Regarding to patent right of the digital files, the gap between virtual document and the tangible product is even lager. The patent right holders will also ask who is the distributor. How about some servers, which provides the product data for the 3D-printer, in such a manner that an individual user can download the product data and print out the patented product? However, the product data is not the patented product itself but only a copy of description, just like the patent specification, which is meant to be public. Even if the patent right holder succeeds in proving that the server is infringing, maybe indirectly, the same problem to the copyright is raised. How about the peer-to-peer technology? Again, although the patent law grants the patent right holder a monopoly to sue everyone using his invention without authority, he will not do so due to the high transaction cost and low benefit.

Inefficient technical encrypting means in information age

The intellectual property right holders must be mad about it. That is why we heard about more and more technical encrypt means developed to prevent unauthorized copy such as CD key, account binding, or even requiring whole process online for decrypting.

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[1] See 17 U.S. Code § 106

Of course such technical encrypt means often fails, since there is always jailbreaking effort. Actually, such technical encrypt means bring inconvenience, or even additional cost, to the authorized users while failing to prevent unauthorized users. What is worse, an intellectual creation should have achieved better society effect by letting more people use it, which is also the object of intellectual property law. In traditional royalty collection ways, the right holders just collected royalty from the distributor, but did nothing else to hinder the spreading of the intellectual creation. As long as the right holder gains enough incentive, there may still be some social benefit through unauthorized use or fair use. However, such technical encrypt means does try to hinder the spreading of the intellectual creation besides collecting royalty. The result is that, the authorized uses pay extra cost for the encrypting means in addition to royalty, and the society cannot be benefited from certain unauthorized use or fair use. Therefore, the encrypting means increases social cost and reduces social benefit.

The marginal cost of duplicating the intellectual creation is almost zero, so limiting the scope of users would not be optimal to social benefit, and the right holders actually lose nothing from the free riders who are definitely unwilling or unable to pay. An example, about 15 years ago, Microsoft sold their *Windows* software in China at the price of 199 dollars. It was an incredibly high price in China, especially at that time. Eventually, Microsoft could only obtain their sales income from the government or some big companies who are too big to hide. Most individual users or small companies just used unauthorized *Windows* software. That is the portion of royalty Microsoft does not have. The only thing Microsoft could do was to prevent those people from using its software, either by law enforcing or by technical encrypt means, but in no way those people could afford to buy it.

A simple follow-up for the above paragraph is that, those free riders have got used to *Windows* software, and when they buy new computers nowadays they probably will choose those having pre-installed *Windows*, in which, of course, the royalty to Microsoft is included. One of the reasons is that Microsoft becomes smarter. It still charges the government or the big companies high price, but greatly reduces the price to personal users, say, 50 dollars. In addition, China has law requesting all branded computers to have pre-installed OS software. Provided that the price is acceptable, the computer has warranty, why not *Windows*? Of course there are always some people buying computers with pre-installed non-*Windows*, and then installing unauthorized *Windows*. However, it asks for some degree of professional skill, and people also need to pay for the unauthorized *Windows* if they do not have the skill. Paying 10 dollars for saving 199 dollars seemed to be attracting in 15 years ago, but paying 20 dollars for saving 50 dollars and losing warranty, does not sound like a good idea to most people nowadays. As a result, the unauthorized use of *Windows* is greatly reduced in China at present.

Why the intellectual property right holders do not waive their royalty to those free riders, such that more people can enjoy their intellectual creation? The reason may be that, if they do so, there may be no people willing to pay the royalty. The reason seems to be plausible. It is also costly to identify people unable to pay it from those unwilling to pay it. Therefore, we have the contradictory conclusion that, the more effective the unauthorized users are prevented, the higher

the royalty can be collected.

However, the higher royalty is not the goal of the intellectual property law, but the balance between social benefit and incentive of creation. “The patent monopoly was not designed to secure to the inventor his natural right in his discoveries. Rather, it was a reward, an inducement, to bring forth new knowledge.” *Graham v. John Deere Co. 383 U.S. 1 (1966)*. It is predictable that, the stronger the technical encrypt means is, the higher the cost authorized users afford and the less the social benefit is. It is neither fair nor efficient. If removing the technical encrypt means, the price of the product can be lowered, and there will be more authorized users besides unauthorized users. In that situation, both the intellectual right holders and the society obtain more benefit.

Node of software for collecting royalty in information age

Let us come back to the node. There is no distributor in the information age, which does not mean that there is no node. If the intellectual holder can find the node to collect royalty, but not directly from the individual users, it will greatly reduce the transaction cost and eliminate those inefficient encrypt means. What is more, if there is a node, with more users, the royalty collected will be more, and the extremely low marginal cost may further bring long-tail marginal revenue.

Node of attention: free antivirus software

Once in China, cracking the antivirus software was also a big business. People all use *Windows*; *Windows* gets virus. There were companies selling antivirus software, and some others cracked the antivirus software and provided for free downloading. The crackers are not Robin Hood; they make money from it.

The most direct way to earn money from providing free downloading is that, they display advertisement on the downloading webpages. It sounds like the business that *Yahoo!* runs. It is rational to ask such a question, why the producer, i.e., the intellectual property right holder of the antivirus software does not provide free downloading of their antivirus software, and make money from displaying advertisement? In that circumstances, the intellectual property right holders make themselves the node, they do not directly collect the royalty from the individual users, but with the concentration of attention, they make money from the advertiser on which the individual will spend money later. However, it seems no longer intellectual property law here. The intellectual property right holders collect royalty from the publishers or the manufacturers according to the intellectual property law. What law mandates the website exclusive right to collect *royalty* from the advertiser, a third party who may never use the intellectual creation?

The intellectual property right holder of the antivirus software just could not provide free downloading, because it is interesting that, at that time, the so called *thief link* was very common. *Thief link* means that a first website provides the download link of the antivirus software storing on its server, some other website also provides download link, and also makes money by displaying advertisement on their webpages, but the download link actually comes from the first website. Thus, the second website *steals* the link from the first website to avoid the cost of storing

the file in their server, and thus *steals* the money of displaying advertisement by attracting people with something they do not have. Accordingly, an antivirus company, or even a cracker also needs to prevent the *thief link* by other pirates.

A popular technical means is to create watermark on the downloaded software, and tell the individual users where is the real source of the file such that the individual users will know where to go next time. However, it does not work well. People may not care whether they are visiting a *true* website, but only care whether they get what they want.

An updated technical means by the crackers is to bind a homepage hijacking plug-in into the installing package, such as notorious *3721 assistant*. Thus, the individual users have to watch designate advertisement, no matter where they download it. However, such plug-ins are much similar to, if not yet, virus, . They hijack your homepage, pollute your DNS, are very hard to be uninstalled, and even fight with each other to disturb your system.

Now everyone is mad about the war on his web browser, and thus the times of free antivirus software has arrived. Why not combining the hijacking plug-in into authorized antivirus software? The same company producing the *3721 assistant*, *Qihoo 360 Technology Company Limited, NYSE:QIHU*, switched to provide free antivirus software, and of course, hijacked the homepage of the users, in a slightly gentler way, while eliminating all other homepage hijacking plug-ins out based on the higher system priority of antivirus software. People are so happy to gain free and authorized antivirus software, and get rid of the fight among several plug-ins on their browser. *Qihoo* has achieved great success, almost all the antivirus softwares in China are provided freely now.

What to do with IP law now? The antivirus software company, *Qihoo*, makes itself the node of displaying advertisement, but it may have no right under IP law to the the advertisers, and the money it earns is not royalty. However, I would say that, it is exactly the IP law. The copyright or patent right is the exclusive monopoly, and the right holder can decide whether or when to use it. It does not necessarily have anything to do with royalty. As long as the right holders achieve proper incentive, and the society enjoys the widely spreading of the intellectual creation, the IP law system runs well. *Qihoo* earns much more money by providing free antivirus software than selling it, and the more users the antivirus software has, the more money *Qihoo* will earn. It is an ideal balance between the rewards to the right holder and the social benefit. By the way, if other antivirus software companies want to copy the source code or infringe the patent right of *Qihoo*. *Qihoo* can also obtain relief under IP law, where its intellectual property right servers as a fence to exclude the competitors.

Node of quality: *World of Warcraft*

The most successful MMORPG in the past years is *World of Warcraft* with no doubt. It sells time credit to the players, such that the players pay by time to obtain the right to play the game in the server, which seems to be kind of royalty. However, there are always so called *server emulators*. *Server emulators* are unofficial servers charging the players no money on time credit. How do the

server emulators make money? They may also display advertisement or sell virtual items such as weapons to the players, since it would be obvious that, if the *server emulators* simply copy the *World of Warcraft* and sell time credit, nobody wants to play on it. Of course, the *server emulators* are ordinarily illegal for infringing the intellectual property right of the producer, *Blizzard Entertainment*, and they steal the money that the players could have spent on official servers. However, there are still two questions.

The first question is, whether the players will switch to the official servers and pay royalty to *Blizzard Entertainment*, if the *server emulators* are shut down. The answer probably is no. Obviously, the game experience in the *server emulators* is worse than the official servers for the free players, since the advertisements are annoying, and it is very unfair that the *money players* who spend even millions of real dollars to buy virtual weapons from the operator of the *server emulators* can easily destroy anyone who does not. However, so many people still choose the *server emulators* because it is free. A large population of the MMORPG players in China are young people who have plenty of time but low income. (People under 20 years old, or monthly income lower than 80 dollars both take one third of the players, see https://www.cnnic.net.cn/hlwfzyj/hlwxzbg/201409/P020140901332967921309.pdf) It means that, they may just play free games, no matter which game. Even if there are no more *server emulators* of *World of Warcraft*, they may switch to another free MMORPG, but not the official servers of *Blizzard Entertainment*. As for the few *money players*, they will not choose the official servers either, since they can not gain exceptional advantage by real money. They will choose another free MMORPG and spend great amount of money on it. Again, that is the portion of royalty not belonging to the right holders.

The second question is, why *Blizzard Entertainment* does not reduce or even waive the income by selling time credit, but display advertisement or sell virtual items. Indeed, some Chinese companies, such as *Giant Interactive Group Inc (ADR) (NYSE:GA)*, is running a very successful free MMORPG named *ZT online* by displaying advertisement and selling virtual items. However, for *Blizzard Entertainment*, the answer probably is also no, since such actions will impair the quality of the game. It is *Blizzard Entertainment*'s choice to maintain the balance in the virtual world. A big difference between the antivirus software and the MMORPG may be that, the anticipation of the users may not change the user experience of the antivirus software, but will decisively determine the environment and atmosphere of the virtual community in the MMORPG, which biases away the original design of *Blizzard Entertainment*.

Thus, the game experience is totally different between the *server emulators* and the official servers. The *server emulators* are for free players and money players. A user expecting a fair and balanced environment will not choose the *server emulators*, but rather would like to pay for time credit in the official servers. Accordingly, it is not efficient for *Blizzard Entertainment* to suppress the *server emulators*, while a better choice is to focus on optimizing the quality of its own game. Actually, the *World of Warcraft* is also extremely successful in China, even with the *server emulators*. It effectively attracts the target customers to collect royalty by constantly updating and improving user experience.

As to the IP law analysis, *Blizzard Entertainment* has the intellectual proper right to suppress the *server emulators*. However, it maybe inefficient to do so, for the players on those *server emulators* are not its target customers. Even if *Blizzard Entertainment* pays cost to suppress the *server emulators*, it still cannot transfer those players into its official servers. Thus, the limited prospect revenue compared to the high cost seems not attracting. However, by continuously updating the game version and improving the user experience, the *World of Warcraft* still makes itself the node of quality and money flow. An example is that, the expansion set of *Wrath of the Lich King* delayed for nearly two years to enter mainland of China, many players just joined the official servers in Taiwan and paid time credit for it. It may illustrate that, in the information age, if you do something well enough or update it frequently enough, your intellectual creation may be uncopyable.

Finding node of 3D-printing for collecting royalty in information age

We have discussed that some software companies have developed some efficient ways to collect royalty in information age. However, 3D-printing may be too new, and have not become a big business yet, but we can still try to figure out some possible nodes for it.

Where is the node of 3D-printing? A significant difference between the 3D-printing and the software is that, 3D-printing is a tool of manufacturing. The software may be produced and run by a single right holder who can make himself a node, but nobody has an idea what products the 3D-printer will be used to produce and how many right holders will be involved.

To print an object, the 3D-printer must have its product data input. The product data may be obtained by 3D-scanning an object, designing oneself, or simply downloading, and then an individual user can duplicate the object. In the whole process, we must find out some nodes that many individual users may pass, so as to reduce transaction cost.

For the individual users who design themselves, it has nothing to do with 3D-printing actually. For hundreds of years, there have been some people making patented products in their backyards, and the patent right holder cannot sue them due to the high transaction cost. A 3D-printer is also not something special for the patented product and knowingly provided for it. And thus the patent right holder cannot sue the producer of the 3D-printer for contributory infringement. The biggest obstacle is actually that such DIY requires professional skills and much energy and time consumption. For another group of people, who duplicate the patented product by 3D-scanning to obtain product data, the situation is similar. They must get a patented product at hand first, which also requires some special conditions. These two types of infringers will not be too many. However, the people who simply download the product data and 3D-print out will be the majority of the infringers. We must figure out some ways persuading them not to do so.
A first proposal is to have the individual user give up 3D-printing themselves. The cost for 3D-printing at home is still very high now, but it will be reduced in the predictable future. However, I believe that even at that time, the tangible objects are not digital files whose marginal cost is almost zero, the gross production still has the advantage of reducing production cost. Think about the family printer, it has not replaced the publish industry after so many years. People may

print some pages of materials, but for a whole book, it is still too expensive and of low quality. Suppose that you buy a printer for 100 dollars and print a book at the cost of 10 dollars, but the book may be just 50 dollars, despite the time you spend. If the production and delivery system has been optimized enough, the patent right holder can make themselves a node by building a website showing the price of purchasing, or even simultaneously providing one-key purchasing link. Furthermore, there may not be ready printed object when the individual user purchases it, it is produced in a 3D-printing plant on demand, which, is the ideal node for the right holders to collect royalty.

A second proposal is to provide a download sever storing the product data for 3D-printing. If the patent right holder can not persuade people not to 3D-print themselves, why not make himself the source of the product data so that he can earn money from selling membership or displaying advertisement? The reasons for the necessity of the downloading sever may be that, most people do not have much time to design the product, or have handy objects to generate the product data by 3D-scanning, they may obtain the product data mostly by downloading. Accordingly, the downloading sever can sell the copy of the product data, where each right holder has his share in the price, or display advertisement, where the royalty may be allocated by downloading times. A key principle here is to provide better service and higher quality than the pirates do, just as the examples of the free antivirus software and *World of Warcraft*, and the right holder can earn more money with more people use their intellectual creation.

OK, I know someone will mention peer-to-peer downloading technology. Shall we also lock the homepage and fight with the antivirus software? Well, there has long been a big fight for the attention of people, maybe we can try exploring the value of the printed object or considering updating it frequently to form new nodes. Sorry I am not that genius figuring out all solution now.

Conclusion

I would like to repeat that, the intellectual property right is passive monopoly. That it is not directly enforced does not mean that it does not work. As long as the right holder can figure out appropriate means cooperated with IP law to obtain royalty, he has the incentive, the society has benefit. However, the means should be based on the principle that more people can enjoy the intellectual creation but not be isolated from it, and the right holder should allow some degree of unauthorized use for social benefit. IP law may not die so soon, with proper means, the new technology comes all way back to IP law.