VR/AR Association White Paper

Virtual Reality and the World of Patents:

Augmented Opportunities Abound

Author: Stephen Ferance, Gowling WLG (Canada) LLP[1]

1 Stephen Ferance is a partner in the Vancouver office of Gowling WLG, where his practice focuses on patenting computer-related inventions.

Virtual reality and augmented reality may not be new, but are currently experiencing a research and development renaissance that will finally put some meat on the bones of their skeletal technological underpinnings. Those with the foresight to patent their solutions to current and future problems will be well positioned to reap the rewards of their innovations if these rapid-growth technologies become anywhere near as widely adopted as the industry expects.

More than sixty years ago, Morton Heilig built and patented a number of early VR technologies, targeted at different markets. In 1960, he obtained a patent for a "Stereoscopic Television Apparatus for Individual Use," which included not only 3-D stereoscopic viewing and binaural sound, but also air nozzles capable of directing air currents of varying velocities, temperatures and odors to the head of the user. The physical embodiment of his invention appears, perhaps unsurprisingly, quite similar to today's modern VR / AR headsets.[1]

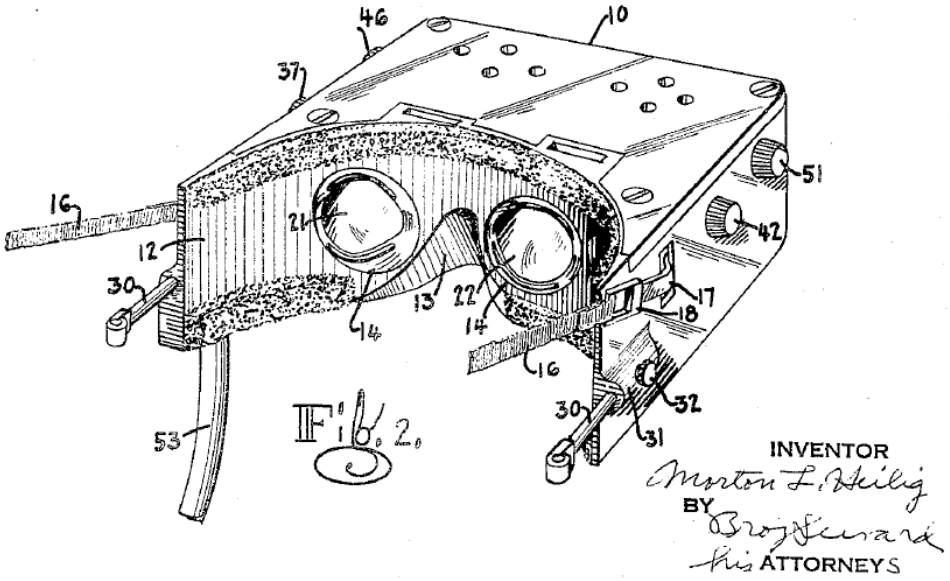

Fig. 2.

A few years later, Heilig patented a much larger, fully immersive, "Sensorama Simulator." Intended to simulate reality for a variety of purposes such as military, industrial or educational training, the Sensorama included a hood with a 3-D visual display system, binaural sound, a breeze and odor generator, and limited motion capabilities to simulate movements, vibrations or impacts, to stimulate four of the five senses.[2] Heilig produced five Sensorama movies to demonstrate his machine, including a helicopter ride, bicycle ride, motorcycle ride, go-kart ride, and even a belly dancer complete with wafting perfume and finger cymbals.[3]

1 U.S. Patent No. 2,955,156 to Heilig, filed May 24, 1957, granted Oct. 4, 1960.

2 U.S. Patent No. 3,050,870 to Heilig, filed Jan. 10, 1961, granted Aug. 28, 1962.

3 H. Brockwell, "**Forgotten genius: the man who made a working VR machine in 1957,**" *techradar*, April 3, 2016.

Heilig's patents were not particularly successful from a commercial perspective. The film-based Sensorama movies were passive rather than user-controlled experiences, but the greater obstacle to their success was a lack of available viewing content. 3-D films were expensive to produce and were not commonly made. Indeed, Heilig had to invent his own 3-D camera to film his five demo movies, and was ultimately unable to raise the necessary funding to produce more 3-D films.[4] Literally, the world was not ready for this technology in the 1950s and '60s.

Today, it would seem, the world is ready. Although VR remained primarily focused on military, medical and other industrial purposes through the 1980s, the consumer market began to develop in the 1990s with the advent of VR gaming headsets, which replaced Heilig's passive analog content with interactive digital video and audio.[5] Those early gaming efforts, however, were hampered by the limited computing power available in the 1990s compared to today, as anyone who attempted to watch videos on a computer in the 1990s will recall. In 1991, the pinnacle of global computing power was the Cray Y-MP Supercomputer, which if equipped with the maximum eight processors could achieve just over 2 GigaFLOPs of computing speed. The Cray weighed in at about 5.5-tonnes, cost about $20-million, and its installation often required a crane and the temporary removal of the roof of the building in which it was to be installed. But fast-forward a couple of decades, and by 2013, the princely sum of $400 would get you a Sony PlayStation 4 running at nearly 2 TeraFLOPs, making it roughly a thousand times faster and a whole lot more portable than the Cray. The inexpensive and widespread availability of that kind of computing power has been a game-changer for VR adoption: with that much bang for the buck, it is little wonder that the PlayStation has become a popular VR platform.

In the third quarter of 2017, VR headset shipments exceeded 1-million for the first time in history, led by Sony with 490,000 shipments of its PlayStation VR headset. Other industry leaders included Oculus's Rift with 210,000 shipments, and HTC's Vive headset with 160,000.[6] One prediction calls for annual growth of over 50% in headset sales over the next few years, rising to over 80-million units by 2021.[7] Certainly the industry seems convinced that the growth prospects for AR / VR merit significant investment. In 2016 it was reported that there were over 230 companies developing hardware and content; Facebook alone had over 400 people working on VR.[8] On the AR side, one needs only point to the success of Pokemon Go, which was downloaded a half-*billion* times during the first six months after its release.[9]

4 S. Tate, "**Virtual Reality: A Historical Perspective**" (1996).

5 For example, Sega's VR headset (1991), Nintendo's Virtual Boy (1995)

6 P. Lamkin, "**Virtual Reality Headset Sales Hit 1 Million**," *Forbes*, Nov. 30, 2017

7 P. Lamkin, "**VR And AR Headsets To Hit 80 Million By 2021**," *Forbes*, Sept. 29, 2017.

8 K. Kelly, "**Hyper Vision**," *Wired*, May 2016.

9 **https://www.statista.com/statistics/641690/pokemon-go-number-of-downloads-worldwide/**; see also **https://en.wikipedia.org/wiki/Pokémon_Go**.

Okay, so the consumer world is ready for AR and VR. But is the patent law world ready?

No doubt, the patenting of computer-implemented inventions is more difficult today than it was 15 or 20 years ago. The most significant obstacle to patenting computer-implemented inventions in the United States today is the "abstract idea" exclusion under the new patent-eligibility framework set forth by the U.S. Supreme Court in 2014, in its infamous *Alice v. CLS Bank* decision.[10] Under the *Alice* framework, a patent examiner (or a reviewing court) must determine whether the patent claim under review is directed to one of the judicially recognized exceptions to patentability, namely, laws of nature, natural phenomena or abstract ideas. If so, then the examiner must then determine whether the patent claim includes additional elements that cause the claim to amount to "significantly more" than the abstract idea or other judicially recognized exception.[11] In particular, the claim will be directed to "significantly more" than the abstract idea if the claim "contains an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application."

The practical effect of the *Alice* decision was to instantly inflate the scope of the "abstract idea" exclusion a thousand-fold, while at the same time failing to provide any test, or even any meaningful guidance, for determining whether a patent claim is directed to an "abstract idea." The Supreme Court seemed to acknowledge the inherent danger in its decision, cautioning that care must be taken in construing the "abstract idea" exclusion, "lest it swallow all of patent law".[12] Needless to say, the *Alice* decision created unprecedented uncertainty. Inevitably, it is now falling on the lower courts to try to make sense of the Supreme Court's mystifying new framework for determining patent eligibility. The lower courts' initial reactions were not at all patent-friendly. Many patents fell. But each survivor's victory has helped to beat back and constrain the scope of the voracious black hole that the abstract idea exclusion so abruptly became in *Alice*.

In *DDR Holdings v. Hotels.com*, the Court of Appeals for the Federal Circuit upheld the validity of claims to a method that prevented website visitors who click on third-party ads from being transported away from the host site to the third-party site, by instead presenting the visitor with a hybrid page that combines visual "look and feel" elements of the host website with product information and purchase options from the third-party merchant site. The Court ruled that the claims were not directed to an abstract idea because they, "do not merely recite the performance of some business practice known from the pre-Internet world along with the requirement to perform it on the Internet.

10 *Alice Corp. Pty. Ltd. v. CLS Bank International*, 573 U.S. ___, 134 S. Ct. 2347 (2014).

11 For example, the patent claims in Alice itself, which were directed to a computerized platform for eliminating risk in financial transactions between two parties by using intermediated settlement, were ruled patent-ineligible because they were directed to the abstract idea of intermediate settlement, and the other elements of the claim failed to add "significantly more" because they were directed to the routine implementation of the abstract idea on a general-pur pose computer.

12 *Alice*, supra note 10 at 2352.

Instead, the claimed solution is necessarily rooted in computer technology in order to overcome a problem specifically arising in the realm of computer networks."[13]

In *Enfish v. Microsoft*, the Court of Appeals for the Federal Circuit provided guidance regarding the first step of the *Alice* framework, determining whether the patent claim is directed to an abstract idea. The Court ruled that under this step, it is necessary to ask, "whether the focus of the claims is on the specific asserted improvement in computer capabilities...or, instead, on a process that qualifies as an 'abstract idea' for which computers are invoked merely as a tool." In *Enfish*, the patent claims were directed to a self-referential logical model for a computer database, which enabled faster searching and more effective storage of data than previous methods. The Court concluded that the claims were "directed to a specific improvement to the way computers operate, embodied in the self-referential table," and were therefore not directed to an abstract idea. Accordingly, patent claims that focus on improvements to the functioning or capabilities of a computer can escape the jaws of the abstract idea exclusion.[14]

In *Bascom v. AT&T,* the Court clarified that the "inventive concept" required to transform an abstract idea into a patent-eligible claim can be found in a "non-conventional and non-generic arrangement of known, conventional pieces". In that case, Bascom's claims were directed to a new configuration of known local computers, local servers, ISP servers, filters, networks and network accounts, to achieve a novel type of web-browsing filtering at the ISP server level.[15]

In *McRO v. Bandai*, the Court upheld claims directed to an automated 3-D animation process for depicting facial expressions during speech. Conventional approaches had involved blending together multiple different "morph targets" which model how the face looks when pronouncing different respective phonemes, and required an animation artist to manually assign "morph weight" values that determine how much influence each morph target has in the resulting blend. Conventionally, the animation artist could assign such morph weights at intervals referred to as "keyframes" rather than for every frame. The claimed invention automated this process by applying a new set of rules to automatically determine the keyframes and automatically assign the morph weights for each keyframe, without the need for them to be determined or assigned manually by a human animator. The rules applied by the claimed invention were fairly sophisticated, and involved consideration of not only each relevant phoneme but also its context in a sequence of phonemes. The Court rejected the view that the claims were directed to the abstract idea of automated rules-based use of morph targets. Instead, the Court noted that the claims were limited to rules with specific characteristics, emphasizing the claim limitations that related to context and to the application of the rules to sub-sequences of phonemes. The fact that the claims were drawn to a genus of possible rule sets rather than to a specific rule set did not preclude patentability, because the claims did not

13 *DDR Holdings, LLC v. Hotels.com, L.P.,* 773 F.3d 1245 (Fed. Cir., 2014), at 20.

14 *Enfish, LLC v. Microsoft Corp*., 822 F. 3d 1327 (Fed. Cir., 2016).

15 *Bascom Global Internet Services v. AT&T Mobility,* 827 F. 3d 1341 (Fed. Cir., 2016).

encompass all possible rule sets. The rules were new and did not merely describe the generally subjective criteria that had been previously applied by animation artists. The Court concluded that the claims were directed to a patentable, technological improvement over existing manual 3-D animation processes, rather than to an abstract idea. Throughout, the Court emphasized the importance of considering the claim as a whole under both steps of the *Alice* inquiry.[16]

In *Thales Visionix v. Elbit*, the Court emphasized that the mere presence of an equation in a patent claim does not compel a conclusion that the claim is directed to an abstract idea. The Court upheld claims that were directed to a novel way of using conventional inertial sensors to track the motion of an object on a moving platform.[17]

In *Visual Memory v. NVIDIA*, the Court upheld claims directed to creating a three-tiered memory system including bulk or disk storage, RAM, and a high-speed cache. The Court ruled that the claims were directed to an improved computer memory system, not to the abstract idea of categorical data storage.[18]

In *Finjan v. Blue Coat Systems*, the Court upheld claims for a malware protection method that involved scanning a downloadable for "suspicious code" and linking the results of the scan to the downloadable itself in the form of a "security profile," before a web server makes the downloadable available to web clients. The "suspicious code" scan was construed as behavior-based scanning, e.g., analyzing downloadables for dangerous or unwanted operations such as renaming or deleting files, rather than simply matching code segments to known malware programs. The Court concluded that the claimed method "enables a computer security system to do things it could not do before," emphasizing the advantages of behavior-based scanning, and further emphasizing the advantages that the claimed security profile approach allowed the system to be tailored to different users with different security clearances and ensured that threats were identified before a downloadable was actually downloaded by web users. The Court concluded that the claims were directed to "a non-abstract improvement in computer functionality, rather than the abstract idea of computer security".[19]

In *Core Wireless v. LG*, the Court upheld claims directed to an improved user interface for small-screen devices like smartphones. The Court rejected the argument that the claims were directed to the abstract ideas of summarizing information or providing an index, concluding that the claims were directed to an improved user interface for computing devices that employed a particular manner of summarizing and presenting information. The Court concluded that the claims "recite a specific improvement over prior systems, resulting in an improved user interface for electronic devices."[20]

---

16 *McRO, Inc. v. Bandai Namco Games America Inc.*, 120 USPQ 2d 1091 (Fed. Cir. 2016).

17 *Thales Visionix Inc. v. Elbit Systems of America, LLC*, 850 F.3d 1343 (Fed. Cir. 2017).

18 *Visual Memory, LLC v. NVIDIA Corp.*, 867 F.3d 1253, 123 USPQ2d 1712 (Fed. Cir. 2017).

19 *Finjan, Inc. v. Blue Coat Systems, Inc.*, CAFC No. 2016-2520 (Fed. Cir. 2018).

20 *Core Wireless Licensing S.A.R.L. v. LG Electronics, Inc.*, CAFC Nos. 2016-2684 and 2017-1922 (Fed. Cir. 2018).

So how does all of this affect the prospects for patenting VR and AR inventions in the United States?

First of all, hardware innovations are largely immune to the patent-eligibility problems discussed above. Many of the challenges facing the VR and AR industry will involve new types of hardware sensors and interfaces, or new combinations or configurations of conventional sensors and interfaces. Claims to such inventions are unlikely to be struck down as abstract ideas, as illustrated in *Bascom*.

Secondly, even for software-implemented inventions, VR and AR technologies are conveniently amenable to a number of the exceptions to the "abstract idea" exclusion from patentability. Many VR and AR developments will improve the functioning or capabilities of a computer, as in *Enfish, Visual Memory* or *Finjan*. Some VR and AR inventions may provide new sets of rules to improve animation, as in *McRO*. Given the computational demands of VR and AR systems, there will always be a need for more efficient use of available computing resources.

The situation in Canada is, if anything, more permissive than in the United States, because Canadian Courts have not followed the *Alice* framework. Under Canadian law as it is applied by our Courts, all hardware claims are patent-eligible, as are all method claims that include either something with physical existence or something that manifests a discernible effect or change.[21] Although the Canadian Intellectual Property Office has been in a state of civil disobedience since 2013 by imposing restrictions on computer-related inventions that are clearly unlawful, those restrictions are expected to be eventually overturned by our Courts. In the meantime, those unlawful restrictions generally provide exceptions similar to those discussed above in connection with U.S. law, leaving wide openings for inventions that solve computer problems or that provide technological solutions to technical problems.

Accordingly, the *Alice* framework does not pose nearly as daunting a challenge for VR and AR inventions as it does for other categories of computer-implemented inventions such as business or commerce methods.

If patents can be obtained for VR and AR inventions, what motivation do companies in this area have to patent their inventions?

In a general sense, the reasons for patenting are the same as in any other industry. Typical motivations for obtaining a patent could include a company's desire to maintain market exclusivity over its innovation to increase its own sales, or to license its innovation broadly across the industry to generate licensing streams, or to raise venture capital, or to have something to offer in cross-licensing negotiations if it is ever accused of infringement by a competitor, or all of the above. Although these general considerations apply to all types of inventions, their effects may be amplified by the nature of the AR/VR

21 *Amazon.com, Inc. v. The Commissioner of Patents*, 2011 FCA 328 at para. 66.

landscape: for example, if venture capital investors have literally hundreds of innovative companies to choose from, their screening processes will almost certainly eliminate those companies that have not taken adequate steps to patent and protect their intellectual property.

Moreover, the potential rewards for early patenting may be staggering. Despite recent sales of VR headsets, the industry considers itself to be at a fairly nascent stage, with many important problems still awaiting innovative solutions. Oculus's chief scientist has predicted that the following challenges will likely be solved before 2022:[22]

- Eye-tracking;
- Face-tracking;
- Hand-tracking;
- Inside-out tracking;
- External body-tracking;
- 140 degrees field of view;
- 4k display resolution per eye;
- Personalized positional audio;
- Varifocal display, allowing the user to focus on different distances; and
- Foveated rendering, reducing the number of pixels needed to be rendered by factor of at least 10.

These are, of course, only a tiny fraction of the many problems that will be solved by the hundreds of companies that are now developing VR and AR technologies. Today's opportunity seems akin in many ways to the great gold rushes of the 19th century, with prospectors rushing to stake out their claims. Opportunities for patenting abound, but so do the hundreds of companies that are innovating in this space today. Inevitably, owing to the sheer size of the industry today, there will be instances in which two or more companies independently develop similar solutions. Against this backdrop, it must be borne in mind that the patent system is a first-to-file system, so patenting is indeed a race, just as much so as the race to the land claims office back in the days of yore. Those who sit on the sidelines to see how things shake out will find themselves left out and likely eclipsed by their competitors, while those who instead take decisive action to protect their innovations at the earliest opportunity stand to reap the rewards of an industry poised for exponential growth in the coming years.

22 Brennan, Dominic (2016-11-04). "**Oculus Chief Scientist Predicts the Next 5 Years of VR Technology – Road to VR**", cited in Wikipedia, **Virtual Reality**.