A Manifesto to Responsibly Extend Reality Into Virtual Realms

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Link to publication

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A Manifesto to Responsibly Extend Reality Into Virtual Realms

As immersive technology blurs the line between the real and virtual,
here are seven rules that can protect society.

W e perceive physical reality with our senses: we see the blue sky, hear waves crashing on the beach, feel the wind in our hair. As technology such as augmented reality (AR) and virtual reality (VR) presents our senses with either partially or completely digitalized versions of reality, it is altering what we can see, hear, and feel. AR adds virtual elements to our perception of reality so that we can see what buildings looked like throughout history, or chase virtual monsters in the streets. However, VR completely virtualizes the environment, making it possible to simulate combat missions or hold virtual conferences. Such technology will facilitate a move away from the computer keyboard and mouse to a more immersive form of computing in which we interact with computers with gestures, physical behaviors, and voices, while the "world" becomes our screen.

Over the last decade, tech giants such as Facebook, Google, HTC, and Microsoft have invested billions in VR/AR technology, which they see as an important part of their future business model. As the technology has become more powerful, it has also become more sophisticated and more affordable for consumers. In 2019, more than 7,000 inventions relating to VR/AR were patented worldwide. Facebook now has more than 3,000 employees working on VR/AR, and the company's chief executive, Mark Zuckerberg, aims to have a billion people using VR on social media platforms, with the goal of changing "the way we work, play, and communicate."

Immersive technology has enormous potential to transform our lives as well as our work. Armies now use it for training, doctors treat patients using VR/AR therapy, and architects use it to create simulations of building designs. In the consumer domain, VR applications in diverse areas including gaming and porn have demonstrated successful business models. And AR apps, in particular Pokémon Go, which broke records in 2016 when it was downloaded 50 million times within 19 days, suggest that

increasing commercialization is both lucrative and likely.

The power of this emerging technology raises urgent social and political questions—particularly regarding surveillance, human augmentation, and digital modification of real spaces and objects.

First, immersive technology should be seen as *surveillance technology*, because it is constantly monitoring users and their living environment. For virtual simulations to be seamless and realistic, they need to be constantly fed with rich data about users, including biometric data. The amount and quality of information gathered raises questions about privacy, anonymity, and digital ownership.

Second, AR and VR are *human augmentation technologies* that digitally modify users' perceptions to make them feel immersed in a virtual environment. While the technology can empower users to experience and accomplish more, it can also be used to manipulate them.

Third, this technology engages in *digital modification* of virtual versions of ourselves, our houses, our streets, and the world. By enabling the construction of realistic environments that are fundamentally different from the physical world, immersive technology opens the possibility of conflict in real spaces as well. Upon its launch, Pokémon GO turned spaces including memorials, private property, and nature preserves into game zones overnight.

The Rathenau Instituut, which is part of the Royal Netherlands Academy of Arts and Sciences, closely examined three types of immersive technology: virtual reality, augmented reality, and speech technology. Based on that research, we have worked with colleagues to develop seven design rules for extending reality into virtual realms. Presented here, these rules make a moral appeal to politicians, governments, businesses, knowledge institutes, social institutions, and the public in the hope of starting a debate about the values, norms, and rules of a world in which mixed reality has become commonplace.
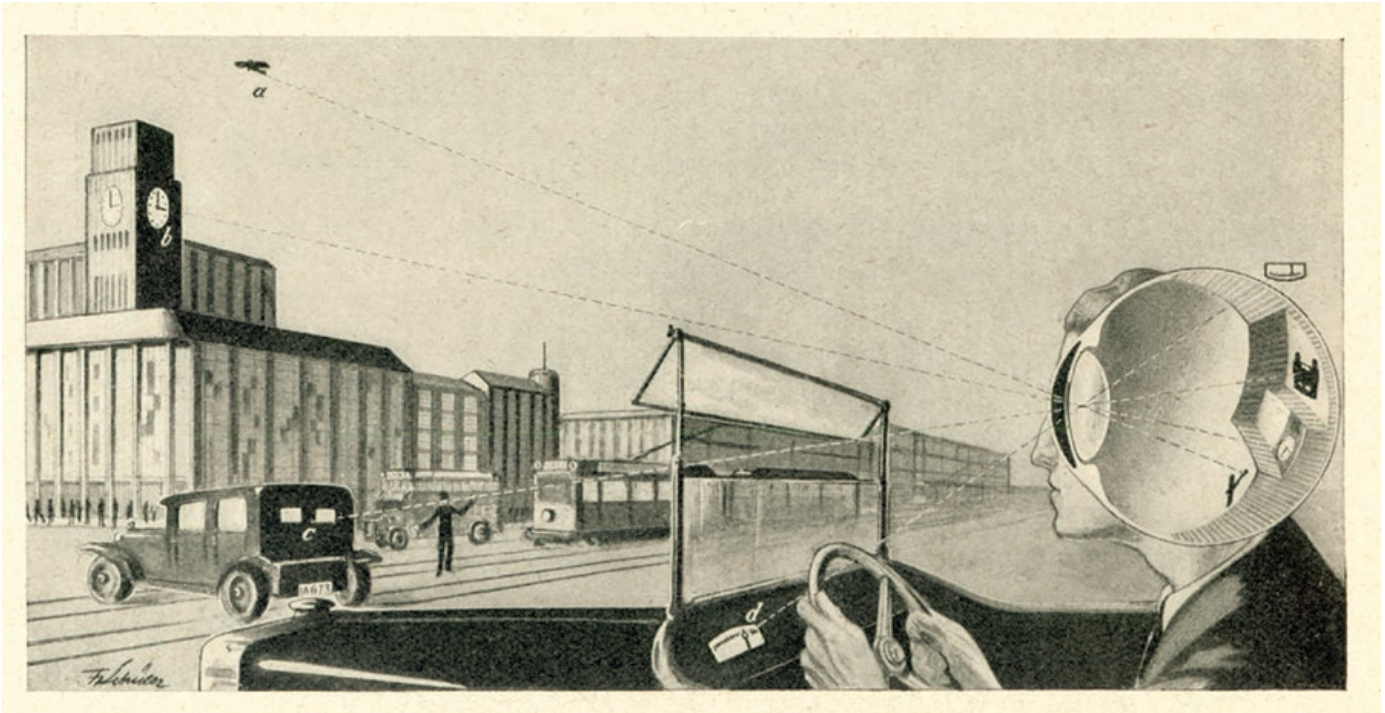
Adaptation mechanisms in the animal kingdom III, *Das Leben des Menschen* 5 (1931), 14. Art: Fritz Schüler. The scene is Berlin. A man drives a car in the Weimar urban landscape. Light waves transmit the image of the scene across the road through the retinal lens into the driver's eye. Kahn's science lessons often seem contrived, a pretext to show and evoke the transformative experience of modernity.

1. Guarantee privacy for VR/AR users and nonusers

Advanced sensors used by VR/AR technology are becoming increasingly better at recognizing facial expressions, behaviors, patterns of movement, and voices, which can all be used to identify unique individuals, objects, and locations. This violates the privacy of users, of course, but also that of anyone else who enters the devices' field of vision. As headsets get smaller, AR glasses proliferate, and gestures replace joysticks, this data-collection process can be done over ever-larger distances and is increasingly surreptitious, so that surveillance is not always obvious to bystanders. Google Glass, for example, seems to be a fairly ordinary pair of eyeglasses, yet allows users to take photos by winking.

This technology is not only a problem in and of itself, but it is susceptible to function creep: datasets collected in videogames could be sold to security firms for other purposes than those users originally consented to.

It is our position that VR/AR technology should be permitted only if the privacy and the anonymity of users and nonusers can be guaranteed. Even though some American cities, such as San Francisco and Oakland, have banned facial recognition technology in public spaces, such regulations do not apply to all cities—and, importantly, they are not backed by national legislation. Given the potential harm to society, banning the use of biometric applications in public space, temporary or otherwise, seems to be the most logical solution.

2. Create legal definitions for digital property

Immersive technology raises new questions about ownership in both virtual and physical domains. New legal frameworks are needed to clarify who owns real and virtual properties. For example, AR applications can lead to violations of property rights or damage to private property when they entice people to specific locations, as happened in the Netherlands in 2016 when tens of thousands of Pokémon GO users flooded a neighborhood in The Hague, trespassing on private property, damaging landscaping, and disrupting public order. Furthermore, virtual property, such as a virtual version of one's house, car, or self, could be digitally modified or impaired online.

One possible solution might be found in Germany's approach, which allows people to opt their property out of appearing on Google Maps. The legal scholar William T. McClure has suggested a "do-not-locate registry" to indicate that property may not be used for AR applications, giving people the power to prevent property from being manipulated and abused by such applications.

DER KREISLAUF DES SAUERSTOFFS.

Was geht in dir vor, während du dieses Bild beschaust?
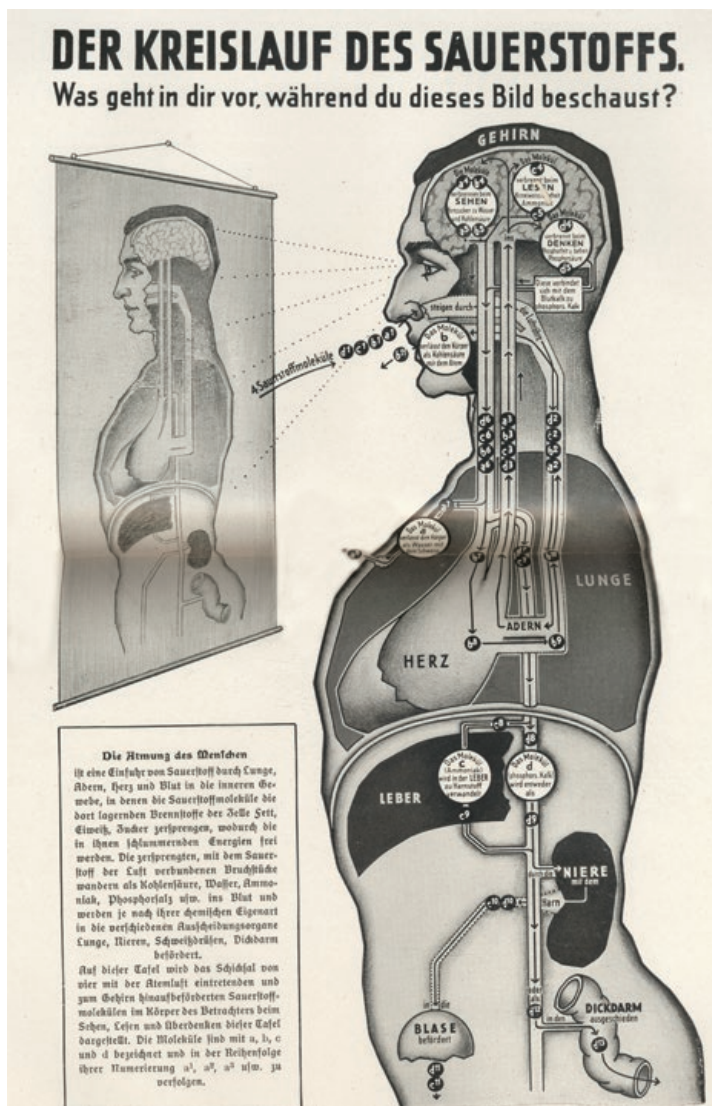
The Oxygen Cycle: What Goes on in You When You See This Picture, Kahn, *Das Leben des Menschen* 3 (1926), foldout, pl. 11. Artist uncredited (Fritz Schüler or Otmar Trester?). National Library of Medicine. Kahn's illustrations, taken singly and cumulatively, are designed to have cognitive effects. The effect is partly visualized in an illustration that addresses the reader. A cross-sectioned profile of a generic armless man diagrammatically shows how the human respiratory system uses oxygen to fuel the sensory apparatus and brain activity (thought) as he gazes at an anatomical wall chart of himself.

The second essential category of ownership issues concerns virtual objects. Ownership of avatars, objects, personal data, and virtual goods needs better legal definition. Currently, it is not clear whether users have exclusive rights to their own behavioral and perception data. Google has been granted a patent for technology to monitor what the wearer of a Google Glass is looking at by tracking eye movements. Data such as this would be highly lucrative to companies that aim to profile and influence users. Explicit legal definitions of this type of data are needed immediately.

3. Protect the mental and physical health of users

Immersive technology is known to improve human health by teaching people new skills, empowering them, and reducing the money and time required for them to learn things. However, VR/AR health care and therapy applications are still in early stages, and there is clear potential for such tools to be detrimental to users' physical and mental health.

The short- and long-term risks associated with immersive technology are unknown. Several researchers argue that experience-based technology can be highly addictive, and sometimes users stop being aware of their own physical safety. Already, 21 players of Pokémon GO have been killed in traffic accidents, according to the Pokémon GO Death Tracker.

Jakki O. Bailey and Jeremy N. Bailenson, communication researchers at Stanford University, have found that immersive technology can make it difficult for people—particularly children—to distinguish between virtual and real physical experiences. In their study, children had their VR avatars swim with orca whales; later, some children believed they were remembering an actual, real-world experience. Whether such experiences will lead older children and adults to believe they have had "real" experiences is unclear.

A related issue concerns filters, from apps such as Snapchat, that create idealized digital self-images from self-portraits. A study conducted by Susruthi Rajanala and colleagues at Boston University suggests that frequent use of AR filters sometimes leads to body dysmorphic disorder. Some people have undergone plastic surgery to re-create filtered images.

In light of the above, there is a need for more scientific research on the long-term effects of VR/AR. Because immersive technology poses potential physical, mental, and social risks, an important question is whether it should be seen as a biomedical technology, which would necessitate a more rigorous and considered approach to regulating and integrating it into society.

4. Protect users against manipulation

Because they are capable of collecting intimate data on a person's personality, behavior, and preferences, VR and AR offer advertisers an opportunity to target people at a direct

and subconscious level. According to the legal scholar Emil Albihn Henriksson, the immersive nature of virtualized environments makes virtual advertising even more persuasive and better equipped to influence behavior.

Companies, governments, and other groups could use these tools to try to steer citizens' perceptions, choices, and behavior. Just as highly personalized information environments on the internet have had real effects in recent elections, immersive technology holds the potential for political or commercial repercussions. Propaganda, for example, could take on new forms in advanced tools that deliberately make people believe in alternate realities.

Professional settings, such as hospitals, military facilities, and distribution centers, may also be sites for behavioral manipulation. Headsets linked closely to an employee's eyes, ears, and voice, using powerful techniques such as artificial intelligence and gamification, can potentially hijack the individual's attention, leaving less room for his or her own cognitive experiences. This could lead to human labor being degraded to robotic work; it could also incentivize workers to do things they might otherwise consider immoral.

Ensuring that immersive technology enhances people's cognitive autonomy, and does not harm it, is one of the biggest challenges of the virtualized era. The social norms and rules are currently determined by the parties that produce the hardware, software, and platforms. We believe there must be wider participation in this process of shaping standards and values. The public should debate and decide the rules of social etiquette of the virtualized world.

5. Balance power relations in the virtualized world

Although multinational information technology companies relentlessly profile their users, rendering them virtually transparent, the conduct of those companies is becoming increasingly obscure to citizens. The enormous information asymmetry between consumers and producers of immersive technology results in consumers, almost unwittingly, giving away their most intimate data, making them even more vulnerable to the whims of these large corporations. At the same time, it is increasingly difficult for citizens to track or understand the information-gathering practices and business strategies of the producing companies. It is essential that users are properly informed about these risks and protected from them. Governments must guarantee fair relationships between companies and users.

6. Preserve public spaces in a virtualized world

Immersive technology has the potential to change the character of our public space, transforming both communities and the ties between individuals. As the data ethicist Michael Katell writes, by transforming how we experience a community, AR can disrupt its standards. When hordes of gamers descend on a train station, it will quite suddenly lose its traditional function—of helping people catch trains—and it can even become an exclusionary space. Public common spaces such as nature reserves, beaches, and public squares could become heavily commercialized through the use of immersive technology, with benefits being taken from local communities and given to faraway technology companies.

Public spaces are already being functionally privatized by services, such as those that block out unpleasant parts of shared reality, prioritizing contacts between only members of certain services. In 2016, the online magazine *Halting Problem* reported on a programmer who created an AR app to filter homeless people out of streetscape images in San Francisco. The public philosopher Hans Schnitzler has written that this individualization of the public space will undermine its status as a communal public environment. This eventuality raises the question of how we can successfully create noncommercial, possibly open source, virtualized spaces for the public good. To guarantee the livability of an increasingly virtualized world, governments should work to safeguard its public character for the future.

7. Make the construction of the virtualized world a joint effort

The emergence of immersive technology has sparked little reflection on the future of the virtualized world. The design, development, and infrastructure of virtual environments is dominated almost entirely by the multinational companies that shape the current internet. Despite the utopian ideals that characterized the internet's emergence in the mid-1990s, which forecast that the technology would lead to increasingly shared knowledge, space, and cooperation, the internet has become a highly commercialized and increasingly privatized and divisive space. The dominance of the internet companies in the development of VR/AR suggests that the future of this technology will be largely one of commercialized virtual environments in which personal data are valuable commodities and users have little power to limit use of or profit from their own data.

To chart a new course for a shared digital future, the public must be involved. It is not in the public interest to leave the development of this technology entirely to the market. Only by jointly constructing an extended reality can we ensure a future virtualized world in which immersive technology enriches our lives, jobs, and relationships.

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