

VIRTUAL WORLDS, FICTION, AND REALITY

MUNDOS VIRTUALES, FICCIÓN Y REALIDAD

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RECIBIDO EL 13 DE JULIO DE 2011 Y APROBADO EL 30 DE AGOSTO DE 2011

RESUMEN ABSTRACT

Mi objetivo en este artículo es plantear y discutir algunas de las preguntas filosóficas sobre la Realidad Virtual (RV). El problema fundamental se refiere a la naturaleza ontológica de la realidad virtual: ¿es real o ficticia? ¿La RV es comparable a ilusiones, alucinaciones, sueños, o mundos de ficción? ¿Son todas las categorías filosóficas tradicionales suficientes para darnos la comprensión del fenómeno de la RV? Para abordar estas cuestiones, emplearé como mis herramientas filosóficas la semántica de mundos posibles y las teorías lógicas de la percepción y la imaginación. Mi conclusión principal es que la RV es comparable a una imagen en 3-D que puede ser vista desde el interior.

My aim in this paper is to raise and discuss some philosophical questions about Virtual Reality (VR). The most fundamental problem concerns the ontological nature of VR: is it real or fictional? Is VR comparable to illusions, hallucinations, dreams, or worlds of fiction? Are traditional philosophical categories at all sufficient to give us understanding of the phenomenon of VR? In approaching these questions, I shall employ possible world semantics and logical theories of perception and imagination as my philosophical tools. My main conclusion is that VR is comparable to a 3-D picture which can be seen from the inside.

PALABRAS CLAVE KEY WORDS

ficción, alucinación, imaginación, percepción, realidad, realidad virtual.

fiction, hallucination, imagination, perception, reality, Virtual Reality.

* This article is a revised version of a paper originally published in IO Internet Magazine, vol. 3: Virtual Environments, ed. by Pauline von Bonsdorff, Summer 2006.

What is Virtual Reality?

In his book *Virtual realism* (1998), Michael Heim states that virtual reality is a “technology” or “an emerge field of applied science” (4). This is, indeed, one way of looking at VR: computer programs, data gloves and helmets are used to produce artificial sensory inputs; these inputs resemble the participant’s normal interface with the physical environment and thus he feels himself immersed in a new “reality”. Hence, VR is a method of constructing and designing new kinds of artefacts.

As a technological activity, VR can be assessed by various criteria which include economy, efficiency, aesthetics, ergonomics, ecology, ethics, and social effects (see Niiniluoto 1997). For example, from the aesthetic viewpoint VR is a new form of media art: by using methods of interactive design it helps to produce works and experiences with interesting aesthetic qualities. From the ergonomic perspective, intense occupation with extraordinary sensory stimulations may lead to a state of nausea where images of virtual worlds and the actual world are confused; this is called the Alternate World Syndrome (AWS) and Alternate World Disorder (AWD) by Heim (1998).

In *Virtual Reality* (1991), Howard Rheingold points out that VR can be employed for the purposes of entertainment, but it may also function as a way of escape and addiction. These ethical and social concerns are also discussed by Heim who suggests that “virtual realism” could mediate between “naive realists” (who blame computers for all social evils) and “network idealists” (who promote all new forms of computerized technology).

Instead of aesthetics, ergonomics, and ethics, my main philosophical concern in this paper is *ontological*. Since Jaron Lanier coined the term “virtual reality” in 1986 and William Gibson spoke of “cyberspace” in his novel *Neuromancer* in 1984, this new field has been characterized in the United States and Japan by such terms as “virtual environment”, “synthetic environment”, “virtual worlds”, “tele-presence”, and “tele-existence”. Notions like “reality”, “world”, “environment”, “space”, “presence”, and “existence” are ontological categories in the sense that they refer to the most general structures of what is real or exists. On the other hand, they are here qualified by phrases like “virtual” and “tele” which imply some kind of deviation or distance from reality.

Today there is a tendency of calling “virtual” almost anything connected with computers: a “virtual library” allows multimedia works to be read in the Web, and a “virtual university” offers courses in Internet in an electronic form. The original Latin term *virtus* meant human powers and potentiality, and later it referred to human “virtues”. The *Concise Oxford dictionary* defines “virtual” as “that is such for practical purposes though not in name or according to strict definition”, and Heim defines it as “not actually, but as if” (*op. cit.* 220). In this as-if sense, terms like “virtual velocity” are comparable to expressions like “semiofficial”, “pseudoscience”, and “artificial leg” which imply that something is only half, falsely, seemingly, non-naturally, or non-genuinely so-and-so. In the same way as we may ask whether artificial intelligence merely pretends or “really” is intelligence (cf. the distinction between weak and strong AI in Searle, 1984), we may raise the question whether virtual reality is “really” real or not.

Even though Heim warns that VR is “not synonymous with illusion or mirage or hallucination”, and “not a state of consciousness or a simulated drug trip” (4), the idea of “as-if reality” clearly has a connection to the old philosophical distinction between appearance and reality. Therefore, our analysis of the ontological status of VR has to proceed by comparing it to some important types of phenomena discussed in traditional epistemology.

Reality vs. Fiction

According to Karl Popper’s (1979) useful classification the domain of reality can be divided into three parts. *World 1* consists of physical objects and processes, *World 2* contain mental states and events within a human mind and *World 3* include human-made artefacts and socially produced institutions. Thus stones, atoms, and fields of force belong to World 1; beliefs, wishes, feelings and emotions belong to World 2; works of art, scientific theories, propositions and other meanings of linguistic expressions, natural numbers and social institutions belong to World 3. In the traditional terminology, the popperian three-fold ontology corresponds to the division between nature, consciousness, and culture & society.

Physical entities exist in space and time, and they are in causal interaction with each other. *Physicalists* take these features to be the general criteria of reality or actual existence (see Devitt 1991). Therefore, they either

eliminate World 2 entities or reduce them to physical states of human brains or bodies. Similarly, most physicalists are *nominalists* who either reject all World 3 entities as philosophically illegitimate abstractions or attempt to reduce them via subjective World 2 entities to World 1. Conversely, the *subjective idealists* (e.g., solipsists and phenomenologists) suggest that the whole of reality should be reduced to World 2, while the *objective idealists* take as the primary reality some abstract entities like Plato's forms or Hegel's objective spirit. In contemporary philosophy, idealism has gained some support in new linguistic and social forms: the *social constructivists* claim the world is a "social construction" arising from human practices and discourses.

In my view, the most plausible interpretation of Popper's ontology is *emergent materialism* which differs both from physicalism and idealism (see Niiniluoto 1999a-2006). Worlds 2 and 3 have historically developed from the primary World 1 through biological and cultural evolution, and their existence continues to be dependent on the support provided by the material reality. However, as emergent levels of reality, Worlds 2 and 3 have gained a relative independence from World 1: they are able to be in a complex mutual interaction with World 1, and they have their own characteristic features and lawlike regularities that cannot be derived from true theories about the physical world.

Emergent materialism accepts ontological *realism* in two different senses. In the first place, against nominalists, it admits the reality of some abstract entities (like concepts, propositions, numbers, symphonies) which are different from their physical documentations (like written and uttered words and sentences) and mental representations (like ideas and thoughts). However, against platonist versions of realism, such World 3 entities are regarded as human-made social constructions. Secondly, a realist may accept that human beings can causally interact with physical nature, and that World 1 can be structured or "carved up" in different ways by means of various conceptual frameworks; in this sense one may speak about "worldmaking" with Nelson Goodman (1978). Still, unlike Goodman and the recent versions of social constructivism, the realist asserts that World 1 exists independently of human minds, languages, and societies.

Charles Peirce defined "the real" as "that whose characters are independent of what anybody may think them to be" (5.311 5.405). This definition allows for the existence of *real possibilities*: for example,

fragility is a real dispositional property of a glass window, since it would be manifested in a regular way under certain conditions quite independently of what we may think about the matter. In this sense, powers, dispositions, tendencies, and propensities may be real even when they are not actualized.

As Peirce himself suggested, his definition gives us a criterion for distinguishing reality and *fiction*. For example, if I am thinking about a golden mountain, then my mental state of thinking-a-golden-mountain is a real fact about World 2, but the golden mountain is only a figment of my imagination. When Leo Tolstoy published his novel *Anna Karenina* a public work in World 3 was created, but Anna Karenina as a character in the novel remains a fictional entity. Her properties include only those implied by Tolstoy's novel. In contrast, natural numbers as mathematical constructions are real in Peirce's sense: any sufficiently large number which has never been investigated in arithmetic still has properties like being odd or even – even when we don't yet know that.

Around the year 1900 a famous controversy took place between Alexius Meinong and Bertrand Russell. Meinong suggested that all names and definite descriptions, including empty ones (like 'the present king of France') and fictional ones (like 'Donald Duck'), should be understood to have referents, where the entities serving in this role are "real" but not necessarily actual or existing. Russell showed how discourse with such empty descriptions can be semantically interpreted as typically consisting of false statements – without assuming strange Meinongian entities. In terms of the *possible world semantics* there may be non-actual and unreal possible worlds where presently France has a king or Anna Karenina is living. Fictional entities are thus denizens of possible worlds. What is today called "Meinong's jungle" (see Routley 1980), is a composite of all objects and states of affairs which are logically or conceptually possible.

Perception and imagination

The classical problem of *epistemology* concerns our possibility of obtaining knowledge about external reality. Given Plato's definition of knowledge as justified true belief and Descartes' distinction between mind and matter, we may ask on what conditions our beliefs are reliable and correct representations of material facts. Stated in other terms, this is a problem about relations between mental states in World 2 and facts

in World 1. Another problem of epistemology concerns our knowledge of the human mind – this involves relations between states in World 2.

A paradigm case of knowledge is *perception*. Suppose that I see a tree. In the case of *veridical* perception, this means that there is really a tree in front of me, that it causally influences my sensory apparatus, and the received visual data give rise to a perceptual judgment of the form ‘This is a tree’. The tree exists in World 1, the mental state of seeing the tree in World 2. This causal account of perception can be combined with Ludwig Wittgenstein’s famous thesis that all seeing is *seeing as*. In order to see the thing in front of me as a tree, and thus to form the judgement ‘This is a tree’, it is presupposed that I have already learnt the concept ‘tree’.

In Jaakko Hintikka’s (1975) logic of perception, a statement of the form ‘I see b as an F’ can be interpreted as claiming that in all possible worlds compatible with what I see there is an object of type F in front of me, and this F-perception is caused by the object b existing in the actual world. Such an F-perception is veridical just in case the object b is really of type F.

A visual *illusion* obtains when I see a real object but make a mistake in its character: I see b, which is not an F, as an F. To see a bush as a bear is a typical case of illusion. Many philosophers have defined illusions as false beliefs caused by sensations, but as Hintikka points out, there are conscious visual illusions where we are not deceived by what appears to us. I know that an oar does not bend in water but I cannot help seeing it as bent when I put it in water (cf. Niiniluoto 1982).

When I see a star, the causal chain from the remote object to my perception may take millions of years. But even more complicated cases are obtained by allowing that the causal link is mediated by artificial technologies. Perhaps no one objects if I claim to see my wife through spectacles, a window, or even a mirror. But could I see her through a picture? If I am looking at a photo of John Wayne, or watching John Ford’s western *The Searchers*, do I see John Wayne? And if I am arranging a tele-seminar with my colleagues in London, do I see them from my video-conference room in Helsinki? As long as the causal chain is more or less mechanical and the signals causally transmit sufficiently correct information about the source, I am inclined to answer these question positively –in the same way as we are already accustomed to saying that we hear other persons (not only their recorded voice) on the telephone or radio. But if the picture is a painting of John Wayne made by an artist,

then it seems more natural to construe the situation to be such that the object of my perception is the painting- and add that under certain circumstances a picture of X serves as an iconic sign of X in Peirce's sense (see Niiniluoto 1999b). Icons are signs which are similar with their objects in some respects (cf. Niiniluoto 1987 Ch. 1). Thus, seeing a picture of X may indirectly give information about X as well. In particular, seeing a picture of X and directly seeing X may involve perceptual experiences closely resembling each other (cf. Gombrich Hochberg & Black 1972).

Hallucination is usually treated as a limiting case of perception, since the person is convinced that he sees or hears something. If I am having a hallucination there is no object in front of me, or the "normal" causal link between reality and what I seem to perceive is missing. If it seems to me that I am seeing a pink elephant in my room, this deceptive appearance may be due to extreme nervous exhaustion or drug excitement of my brain functions.

The logic of *imagination* can be developed along the same lines as the logic of perception by employing the possible world semantics (see Niiniluoto 1986). The statement 'I imagine that p' means that in all possible worlds compatible with what I imagine it is the case that p. Acts of imagination may be voluntary (fantasy, daydreaming) or involuntary (dreaming). Again we have statements of the form 'I imagine b as an F'. Here b may be a real object, but then no direct causal link from b to the contents of my imagination exists: for example, I may imagine of my wife (who is in Helsinki) that she is coming to meet me during my trip to Rome, or in my dream I may discuss with my late father. But b may also be an imagined object. I may use private phantasy to create in my mind a person and then imagine that she is dancing with me. Or I may imagine that I am walking with some publicly known fictional character like Mickey Mouse.

Appearance and reality

The traditional distinction between *appearance* and *reality* can be directly applied to cases involving perceptual illusions (the real bush appears to me as a bear) and hallucinations (the pink elephant that I seem to see is not real). From my perceptual experience alone I cannot judge whether it is veridical or not. The *sceptical* question immediately arises: how can we ever be certain or justified in thinking that our perceptions correspond to reality?

Some philosophers have found idealism attractive since it abolishes the distinction between appearance and reality: if no reality is hidden behind our observations, then scepticism becomes obsolete. The ancient sceptics had a more pragmatic attitude: follow the appearances in your everyday life and withhold all judgments about their reality (see Niiniluoto 2000). Immanuel Kant's critical idealism accepts things in themselves behind phenomena but asserts that nothing but their existence can be known by human beings. Edmund Husserl's phenomenology adopts the research programme of studying the-world-as-conceived-by-us and putting the external world-as-it-is-in-itself into brackets.

However, a realist who accepts the three worlds ontology outlined above cannot avoid the problem of scepticism (cf. Niiniluoto 1999a). Moreover, he has to be ready to consider its most radical version: how can I know that I am even perceiving something rather than only seeing a dream?

World literature contains many touching descriptions of situations where a person feels uncertain whether he is dreaming or not. "We are such stuff as dreams are made on, and our little life is rounded with a sleep", Shakespeare exclaimed in *The Tempest*. In *Hamlet*, he described an alienated outsider, beset with a weakened sense of reality and a melancholic feeling of a shady dream-like existence. This ambiguous mood of mind was expressed by romantic poets of the 19th century in well-known verses Samuel Taylor Coleridge in *Reality's dark dream* (1803):

I know 'tis but a dream, yet feel more anguish
Than if 't were truth. It has often been so:
Must I die under it? Is no one near?
Will no one hear these stifled groans and wake me?,

and Edgar Allan Poe (1845):

All that we see or seem
is but a dream within a dream.

The same theme, treated as an epistemological rather than existential problem, has been discussed by philosophers ever since Plato's dialogue *Theaetetus*. To refute the attempted definition of knowledge as perception, Socrates raises a question "you must often have heard persons ask":

How can you determine whether at this moment we are sleeping, and all our thoughts are a dream; or whether we are awake, and talking to one another in the waking state?

Theaetetus replies:

Indeed, Socrates, I do not know how it could be determined, for in both cases the facts precisely correspond; and there is no difficulty in supposing that during all this discussion we have been talking to one another in a dream.

This thesis -viz. merely illusory, imagined, or dreamed experiences do not contain any observable feature that would distinguish them from "real" presentations- was called the *Theaetetus theorem* by Eino Kaila in 1958 (see Kaila 1979). Perhaps the most famous formulation of this "theorem" was given by René Descartes in his *Meditations on the First Philosophy* (1641). In exercising his method of universal doubt, Descartes ponders in his chamber:

However, I must here consider that I am a man, and consequently that I am in the habit of sleeping and of representing to myself in my dreams those same things, or sometimes even less likely things, which insane people do when they are awake. How many times have I dreamt at night that I was in this place, dressed, by the fire, although I was quite naked in my bed? It certainly seems to me at the moment that I am not looking at this paper with my eyes closed; that this head that I shake is not asleep; that I hold out this hand intentionally and deliberately, and that I am aware of it. What happens in sleep does not seem as clear and distinct as all this. But in thinking about it carefully, I recall having often been deceived in sleep by similar illusions, and, reflecting on this circumstance more closely, I see so clearly that there are no conclusive signs by means of which one can distinguish clearly between being awake and being asleep, that I am quite astonished by it; and my astonishment is such that it is almost capable of persuading me that I am asleep now. (1968 96-97)

The Theaetetus theorem does not deny that sometimes in dreaming I may have a strongly felt conviction that "this is only a dream". Plato and Descartes were looking for a general criterion which would exclude all doubt about my state. But if a property F is proposed as a criterion

of waking, in particular cases it is always possible to claim that I only dream that my experience has this property F.

Kaila concluded that the Theaetetus theorem is valid. However, he argued that Descartes failed to distinguish *logical doubt* from *empirical uncertainty*: Even if it is always logically possible to doubt the reality of our impressions, we may still in fact be in some weaker sense empirically certain about their reality.

Many philosophers have accepted the Theaetetus theorem for momentary experiences, but still they have suggested that the interrelations of sequences of experiences provide a criterion of reality. In the Sixth Meditation, Descartes concluded that “our memory can never connect our dreams with one another and with the general course of our lives, as it is in the habit of connecting the things which happen to us when we are awake” (*op. cit.* 168). This consistency requirement is hardly so conclusive as Descartes implied, since sometimes a single dream at least seems to cover a whole life.

G.W. Leibniz admitted in 1704 that “it is not impossible, metaphysically speaking, for a dream to be as coherent and prolonged as a man’s life”, but he regarded this as highly improbable.

Consequently I believe that where objects of the senses are concerned the true criterion is the linking together of phenomena, i.e., the connectedness of what happens at different times and places and in the experience of different men. (Leibniz 374)

In his works in the 1930s, Eino Kaila accepted and elaborated on Leibniz’s idea that the defining character of reality is *invariance* regularity, lawlikeness, and the possibility of prognosis (Kaila, 1979). He proposed that different types of things can be placed on a scale of levels according to their *degree of reality* defined by their degree of invariance: perceptual experiences, everyday physical objects, and objects postulated by scientific theories. Dream experiences clearly have a low degree of invariance, and should be placed on the lowest levels of Kaila’s hierarchy.

One way of supporting Kaila’s argument can be based on the theory of evolution: the evolution of life and the human species would not have

been possible in an irregular dream world. But at the same time, we should acknowledge the fact that our actual world is not completely lawlike in all of its respects, but includes chance and irregularity as well.

Verisimilitude and Virtual Reality

The classical problem of realism has received new impetus from the techniques of *representation* that have been developed in the history of art – from poetic language to pictures, cinema, television, cd-roms and virtual reality. The relation of an artistic representation to reality can be discussed in the same way as the relation between perceptions and reality. But just as the products of imagination, works of art may also be intended as representations of fictional possible worlds.

Rheingold (1991) starts the history of virtual reality from the wall paintings in the caves of Lascaux. Paintings in medieval churches were understood as “windows onto other worlds”. At the same time, there was the Roman tradition of poetics and rhetoric which demanded that even fictional narrative stories should have *verisimilitude*: their characters should not have queer or supernatural powers, but rather be plausible relative to the reader’s expectations (see Mehtonen 1996 cf. Andrew 1984 Niiniluoto 1999a).

Besides the school of realism which seeks accurate representations of external or inner reality, romantic poets and artists have always been attracted by irregularity, unpredictability, and space-time-discontinuity (i.e., lack of invariance in Kaila’s sense). These analogies of dreams (phantasms, hallucinations, myths, absurdities) were consciously employed in the theoretical writings and artistic experiments of the dadaist and surrealist schools.

Susanne Langer presented in *Feeling and form* (1953) her famous thesis that film as a poetic art uses “the dream mode”. According to Langer, visual arts like painting create an artificial or “virtual space” that can be seen but not touched. Cinema is like a dream: it creates an illusion of reality, a virtual present where the moving camera takes the place of the dreamer.

The dramatic character of dreams -without a specific reference to films- was discussed already by Jean-Paul Sartre in *L’Imaginaire* (1940). Sartre argued against Descartes and the Theaetetetus theorem that unlike

perceptions, dreams are associated with a special type of “belief” or “fascination without existential assumption”: my dreams are adventures like stories in novels; they close on my consciousness in an imaginary world without presenting themselves as apprehensions of reality:

The dream is not fiction taken for reality; it is the Odyssey of a consciousness dedicated by itself, and in spite of itself, to build only an unreal world. (Sartre 206)

Sartre’s argument is important since it explains the haunting and often frustrating character of dreams: even if my dreams are authored by *my* subconsciousness and there is often *me* playing a central role in these stories, dream-events occur to me without my full control and frequently my dream-plans fail or change in disturbing ways.

In this sense, I have less control over the contents of my dreams than over my daydreams or waken imaginations. But in compensation dreams have a much stronger apparent verisimilitude or illusion of reality.

However, films need not be compared to dreams in order for us to argue that they are systematically based upon visual illusions (see Niiniluoto 1999b). In seeing a film, a documentary or a fiction, I am in fact looking at a screen onto which pictures are projected 24 times per second, and the impression of continuous movement is created in my mind. Moreover, by using the technique of editing the film material, dramatic scenes may be composed of pictures taken in different places at different times, actors replaced by stuntmen, etc. Still, by filling in missing details and by combining different sequences, I see the events as taking place in a “virtual space” in Langer’s sense. This virtual space is not actualized unless the film is perceived by someone, but the film as an artefact has the dispositional capacity to produce these audiovisual perceptual experiences in spectators.

These issues have gained new significance in the “postmodern” communication society, where we live in the middle of various kinds of electronic signs, neon lights, radio waves, TV screens, movies and videos – and reality seems to be replaced by a web of representations of reality. These representations (especially when they are transformed into digital form) can easily be manipulated and distorted by “image processing”. Jean Baudrillard (1984), a radical commentator of postmodern culture, is claiming that reality itself ceases to exist and is transformed to a *hyperreality* or a *simulacrum*, an apparent copy intended to deceive us.

In an exaggerated but amusing way he urges that our cultural products or “hyperreal” signs do not any more reflect a basic existing reality or even mask or pervert it, but rather “mask the absence of reality”. Thus, for example, “Disneyland is there to conceal the fact that it is the ‘real’ country, all of ‘real’ America, which *is* Disneyland”. (To Baudrillard’s delight, a new European Disneyland has been opened near Paris).

Observations of this sort suggest that the basic Cartesian question of dream vs. reality could be replaced by another question: am I at this moment *dreaming or seeing a film*? Here I think the most plausible answer is the one that applies more generally to attitudes towards fictional “texts”. The author and readers of a fictional text F do not assert that F is true, nor do they non-deceptively pretend to assert that F (cf. Searle 1979). Rather, more or less openly they ask us to imagine that F (see Niiniluoto 1986). As Kendall Walton (1990) states, a fictional work is “a prop in games of make-believe”. In so far as films create visual illusions they are conscious illusions which may entertain, thrill and amuse us but (*pace* Baudrillard) in general they do not deceive us.

But perhaps the make-believe character of audiovisual signs is based upon the contingent historical fact that the old methods of representation have not been true-seeming enough? From ancient China to Woody Allen, there are stories of artists who have entered their own paintings or films. Virtual reality seems finally to bring to a completion the technological utopia of creating a perfect illusion of reality. This applies especially to VR in the strong sense defined by Heim (1998), characterized by immersion (i.e., the experience that you-are-there), interactivity (i.e., you are not any more an external observer but also an actor or a participant moving in a synthetic cyberspace) and information intensity (i.e., the ability of the program in the memory of a digital computer to create in us experiences of telepresence).

But as Jaron Lanier remarks, we enter this virtual world awake. The environment is given to us but we can choose how to move in cyberspace. So how do we know whether we just now are living *in the real world or in virtual reality*? Is the Leibniz-Kaila criterion of invariance still applicable? At least in the present stage of technology, the answer still seems to be clear. The objects that “we” can encounter by moving in virtual reality are shadowy figments like the “toons” in the Toontown of *Roger Rabbit*. In this sense, virtual reality does not yet have complete verisimilitude, but still has some characters of dreams and phantasms.

Virtual Reality as a picture

Suppose that I put on a data helmet and enter a virtual city. As the city that I appear to see is not really there in front of me, my perception is not veridical. On the other hand, my visual experience of a city is not merely a product of my imagination, since it is based upon visual data provided by a computer – and, moreover, these data depend partly on my movements recorded by the computer. Hence, my visual experience should be classified as a case of a visual illusion.

It is important to add that this illusion is not merely a subjective experience, existing mentally in World 2, but the virtual environment is “out there” for anyone who places himself or herself into the appropriate position. In this sense, the virtual city is a public artefact, belonging to World 3. It can be understood as a complicated *three-dimensional picture* that we are able *to see from inside* by using the technological apparatus. Seeing a virtual city is thus an extension of situations that have been discussed by philosophers and psychologists studying the perception of two-dimensional pictures (see Gombrich Hochberg & Black 1972).

Just like any picture a virtual city can be constructed in three different ways. First, it may be intended as a simulation of some real city: virtual Helsinki is an icon of Helsinki. In such cases, we may ask how realistic (i.e., accurate and comprehensive) a representation of its intended referent the virtual city is. Secondly, VR may be an expression of a city which so far has existed only in the mind of an architect. Then the virtual city may be understood as a description and elaboration of a World 2 entity. Thirdly, VR may represent some fictional city (e.g., Batman’s Gotham City). In this case, the question of realism does not arise, and the virtual environment provides a window to a possible world.

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