Virtual Reality

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Virtual reality (VR) technology emerged in the 1980s, with the development and marketing of systems consisting of a *head mounted display* (HMD) and *datasuit* or dataglove attached to a computer. These technologies simulated three-dimensional (3-D) environments displayed in surround stereoscopic vision on the head-mounted display. The user could navigate and interact with simulated environments through the datasuit and dataglove, items that tracked the positions and motions of body parts and allowed the computer to modify its output depending on the recorded positions. Other types of VR that arose subsequently included *projection virtual reality*, in which users who wear special glasses interact with three-dimensional virtual models that are projected in a room and can be perceived from different angles, and *desktop virtual reality*, in which users stereoscopically view a virtual environment represented on a computer screen (using special stereoglasses) and interact with it using datagloves, or, more commonly, a mouse.

VR is used to simulate real environments, such as existing buildings or city areas, or to visualize imaginary ones, like spaceships or battlegrounds. VR is a technique with great possibilities for training, visualization, and entertainment. Applications are found in computer-aided design, construction, computer gaming, education, military exercises, aviation training (flight simulators), surgical training, therapy, and art.

Meanings of Virtual Reality

As Howard Rheingold (1991) notes, VR merges overlapping interests from the military for more realistic but risk-free training, of the science fiction imagination, and of entertainment industry efforts to intensify the vividness of various media. Although the term "virtual reality" most often refers to systems of the type just described, it is also used in a wider sense, to denote not fully realized virtuality, as in lesser forms of three-dimensional computer-simulated environments that are engaged from a first-person perspective. The most common example is first-person 3D computer games. Such games are varieties of desktop virtual reality minus the stereo glasses. Wider still, VR sometimes denotes any interactive computer-generated environment, including those represented through two-dimensional graphics or through texts or symbols. In fact, the term *virtual* may be attached to any kind of object, event, or environment that is not realized physically but electronically, as in virtual money, virtual casinos, or virtual doctors (i.e., medical doctors that can be consulted over the internet). In such cases, "virtual" may mean no more than "computer-simulated," or "on the internet," or "in cyberspace," as opposed to "in physical space." This broad use of the term points to the fact that for many people, the term "virtual reality" and "virtual" are interpreted metaphysically as denoting a new, fictional kind of reality.

Mostly, however, the term "virtual reality" is used more narrowly, to refer to 3-D computer-simulated environments incorporating a first-person perspective that includes some degree of immersion, meaning that users feel that they are situated in an environment. Immersion can be enhanced through such means as realistic graphics and sounds, surround and stereo vision, surround sound, position tracking, and force and tactile feedback.

A distinction can be made between single-user and multi-user or networked VR. In single-user VR, there is only one user, whereas in networked VR, there are multiple users who share a virtual environment and appear to each others as *avatars*, which are graphical representations of the characters played by users in VR. A special type of VR is *augmented reality*, in which aspects of simulated virtual worlds are blended with the real world that is experienced through normal vision or a video link, usually through transparent glasses on which computer graphics or data are overlaid. Related to VR are *telepresence* and *teleoperator systems*, systems that extend a person's sensing and manipulation

capability to a remote location by displaying images and transmitting sounds from a real environment that can (optionally) be acted on from a distance through remote handling systems like robotic arms.

Ethical Issues in Virtual Reality

VR has been the subject of speculation and critique in both academic circles and mass media. Popular culture portrays futures in which immersive VR is routinely used in society, as in science fiction movies like *The Matrix* (1999), *Lawnmower Man* (1992), *Existenz* (1999) and the *Star Trek* series (with the Holodeck), and in novels like William Gibson's *Neuromancer* (1984) and Neal Stephenson's *Snow Crash* (1992). VR is portrayed both positively, as a medium that offers endless possibilities for learning, entertainment, social interaction and self-experimentation, and negatively, as a medium that causes users to flee from or deny everyday reality, that is used by evil minds to manipulate and gain control over others, and that dissolves any distinction between reality and fiction.

In the academic literature, authors have mainly tried to come to grips with the questions of how VR will transform our conception of reality and how it will transform social life. As for the former question, authors tend to agree that VR will change our concept of reality and cause the distinction between reality and fiction to blur. However, some authors, like Michael Heim (1993) and Sherry Turkle (1995), have argued that a distinction between physical and virtual reality will always exist because we are biological human beings that are born and die in the physical world and retain our roots there, whereas others, like Philip Zhai (1998) have argued that such biological background facts are irrelevant and that VR can offer us a limitless world as rich and detailed as physical reality and can even replace the physical world as our primary habitat.

As for social and ethical aspects of VR, most discussion has focused on the question of how the blurring of reality and fiction in VR may affect its users, on how reality is (mis)represented in VR, and on what forms of immoral behavior may occur in virtual environments. These issues will now be discussed in turn.

VR and the real world. Some authors who hold that the extensive use of VR applications induces a blurring of the boundary between the real and the imaginary worry about negative social consequences. They worry that the idealized, vacuous and consequenceless worlds of VR come to serve as a model by which people comprehend the real (i.e., physical) world, and conversely, that the attention and care that people attach to real-world people, animals, and things is also attached, inappropriately, to virtual things and personae. Another worry is that people may come to prefer the freedom and limitlessness of virtual reality and cyberspace over the limitations of physical existence and invest most of their time and energy in their virtual life, to the neglect of the real people and affairs in their physical lives. Proponents of VR argue instead that most people will be able to maintain a good sense of reality and will strike a healthy balance between their virtual life (which is, in part, also real life) and their physical life.

Representation in VR. VR environments that are intended to simulate actual realities may *misrepresent* these realities, according to expected standards of accuracy. This may cause their users to make false decisions or act wrongly, with potentially serious consequences, especially in areas in which life-or-death decisions are made, such as medicine and military combat. When VR is used for education and training, therefore, high standards of accuracy and realism should be expected, and developers have a responsibility to adhere to such standards. VR simulations may also contain *biased representations* that are not necessarily false, but that contain prejudices about people or situations. For example, a surgery training program may only practice surgery on young white males, a VR game may represent women and minorities in stereotypical ways, or a combat simulation program may only simulate combat situations in which civilians are absent. Like other media, VR may also break taboos by depicting morally objectionable situations, including violent, blasphemous, defamatory, and pornographic situations.

Behavior in single-user VR. Most moral issues regarding representation in VR are not unique to it, and also apply to other types of simulations and pictorial representations. What is unique about VR, however, is the possibility to interact with environments that look real but are not. Because virtual environments are

not real, any consequences of one's actions in VR, specifically in single-user VR, are not real-life consequences. It is therefore possible to perform actions in VR that would be cruel and immoral in the real world because they do harm, but can be performed without retribution in VR because no real harm is done. But is it morally defensible for people to act out graphic and detailed scenarios of mass murder, torture, and rape in VR, even when done in private? Are there forms of behavior that should not be encouraged or allowed even in VR, either because of their intrinsically offensive nature, or because such simulations desensitize individuals and may facilitate immoral behavior in the real world? Or is it the case that the possibility to act out fantasies in VR keeps some people, like sex offenders or people prone to violence, from acting out this behavior in the real world, so that VR may actually prevent crime?

The interactivity made possible by VR developers also raises moral questions. VR applications may invite or discourage, require or prohibit, reward or punish behaviors. They may cheer users who go on killing sprees, or may instead voice moral outrage. Developers may be held to have a moral responsibility to reflect on the way in which they deal with immoral behavior by users, and whether and how they signal approval or disapproval of such behavior, or remain neutral.

Interactions in multi-user VR. In multi-user VR, users may engage in immoral or illegal behaviors such as theft, vandalism, murder, sexual assault, and adultery. What is confusing is that some of these behaviors may be real while others are imaginary. A user may harm or kill another user's avatar, but cannot harm or kill another user. Yet a user may also cause real harm to another user, by deeply insulting that user, stealing an identity, or wreaking havoc in a virtual apartment. Such actions are thought of as real and may even lead to criminal prosecution. Sometimes, however, it is not so clear what actions mean. Does genuine sexual assault occur when one user fondles another user's avatar against his or her will? What if such behavior is performed by a programmed avatar (a *bot*) that has been programmed to do so by its owner? Very different moral intuitions may exist about these and many other actions in multi-user VR, and more broadly in cyberspace.

Another issue that plays in multi-user VR and cyberspace is identity. As has been argued extensively in academic studies, VR avatars and roleplaying in cyberspace enable people to experiment with identities and to experience otherness more vividly than ever before. A man can learn what it is like to be a woman, a white person can have the experience of a black person, and so forth. Negatively, such roleplaying can be used to deceive others about one's true identity. But as psychologist Sherry Turkle (1995) has argued, such experiences may help users expand and develop their own identities and may deepen a distinctly human form of self-awareness.

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