Cultural and Religious Studies, May 2024, Vol. 12, No. 5, 286-294
doi: 10.17265/2328-2177/2024.05.002

Human-Machine Symbiosis: Philosophical Reflection on Virtual Human

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Virtual human is the simulation of human under the synthesis of virtual reality, artificial intelligence, and other technologies. Modern virtual human technology simulates both the external characteristics and the internal emotions and personality of humans. The relationship between virtual human and human is a concrete expression of the modern symbiotic relationship between human and machine. This human-machine symbiosis can either be a fusion of the virtual human and the human or it can cause a split in the human itself.

Keywords: virtual human, symbiosis, sustainability, machine, industry

A virtual human is a digitization of real human behavior, expressions, speech etc. Not only do virtual humans simulate humans in appearance, but they also gradually embody the simulation of human traits, such as intelligence and emotion. Virtual humans are now present in various fields, not only in imaginary images of humans such as science fiction films or games, but also in everyday scenarios such as virtual anchors, virtual idols, and virtual employees. While virtual humans provide entertainment and convenience to human life, they can also create imbalances in human-machine relations, industrial restructuring and unemployment, as well as various legal issues. Some scholars see virtual humans as the end of humanity and believe that virtual technology is the last technology of mankind, while others point out that virtual humans represent a stage in the development of human technology and should not be overly rejected or worried about. In any case, by mixing the natural and the artificial, the real, and the virtual, the virtual human will bring a foretaste of the transition from human society to post-human society, and the transition from natural society to a digital virtual society will take place.

There has been a lot of research into the study of virtual human technology and some analysis and reports of the virtual human industry. However, there are not many studies that look at the social substance behind virtual human technology in terms of the human-machine symbiosis and the sustainability of the virtual human industry based on this. In *How We Became Posthuman*, using the three waves of cybernetics as a developmental thread, K. Hayles clearly points out that virtual technologies will drive the construction of a highly heterogeneous cyberspace where the posthuman will transcend the inert physical body and invisibly inhabited (Hayles, 1999). M. Rothblatt, in *Virtual Human*, looks forward to humans reaching immortality and living healthier and happier lives by virtue of digital technology, arguing that thought-cloning technology is democratizing (Rothblatt, 2014). N. Badler in “Real-Time Virtual Humans” delineates and discusses in detail the simulation dimensions of virtual humans (Badler, 1997). In “‘Real-Time’ Virtual Reality and the Limits of Immersion”, R. Misek points out that the world is a dimension of virtual reality that cannot be ignored, and that real-time rendering immerses people

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in an unfolding space (Misek, 2020). Tao Feng and Dang Yunyu focus on the technical and philosophical implications of a particular type of virtual human, the virtual anchor (Tao & Dang, 2022). These studies either analyze the virtual human as a case study in post-human culture or philosophize about the technology of the virtual human, but lack a specific, detailed analysis of the virtual human from the perspective of the human-machine symbiosis.

Therefore, this paper attempts to use the human-machine symbiosis relationship as a breakthrough to explore the virtual human technology and the social issues it brings about.

Introduction to Virtual Human and Its Technology

The basis for virtual humans is virtual reality technology. “In general, VR is the computer-generated simulation of a 3D environment, which seems very real to the person experiencing it, using special electronic equipment. The objective is to achieve a strong sense of being present in the virtual environment” (Linowes, 2015, p. 2). Specifically, virtual reality is a comprehensive form of technology that integrates computer technology, multimedia technology, communication technology, sensing technology, and artificial intelligence technology, allowing the viewer’s multiple senses to interact with the virtual environment with the help of technological intermediaries such as sensors, aiming to create a three-dimensional, multi-sensory, real-time interactive environment. The main features of virtual reality technology include immersion, interactivity, and simulation. With the support of virtual reality technology, primary virtualization enables the virtualization of space and time or the virtualization of individual objects or collections of objects, while the development of virtual humans is a realistic activity in which humans explore their own virtualization based on the simulation of external objects.

The digital virtual humans that have been realized in applications can be divided into three categories according to their functions: (1) professional service category, such as virtual experts, virtual employees, virtual customer service, etc.; (2) life companion category, such as virtual butlers, virtual assistants, etc.; (3) communication media category, such as virtual anchors, virtual idols, etc.

The fundamental rationale for designing virtual humans is to use human characteristics as the object of simulation, but just as the successful portrayal of a character in theatre requires not only looks, styling, or movement design, but also a distinctive personality, so too should virtual humans be an entity of unifying the internal and external characters. Virtual human expertizes have described the focus and specific requirements for the simulation of virtual humans in the field of digital media, arguing that simulation involves not only external requirements such as appearance and behavior, but also the deeper human essence represented by perception, emotion, and social traits (Sun, Q. Wu, & J. F. Wu, 2010). Some reports suggest that virtual humans should have six essential characteristics: persona, attitude, biological characteristics, creativity, knowledge, and skill (LeadLeo, 2022). N. Badler classifies the dimensions of virtual human simulation as individuality (simulation of characteristics such as gender, age and culture), representation (simulation of physical characteristics), function (simulation of physical and mental activity), time (simulation of interaction and feedback), and autonomy (simulation of control of self and the outside world and prediction) (Badler, 1997). All these classifications overlook an important distinction, namely that virtual human simulations should be divided into internal and external levels. The external simulations refer mainly to directly visible identities, appearances, actions, etc., while internal simulations refer to intelligence, emotions, personality traits, and possible intentional activities. While the external simulation is still only at the virtual level, the internal simulation of humans may lead to the

virtual human coming out of the controllable level and into the independent level with consciousness, autonomy, etc.

Therefore, by combining several simulation dimensions with internal and external levels, we have divided the main techniques for the simulation of humans by virtual humans (see Figure 1).

Five types of simulation dimensions & internal and external simulation		Appearance	Action	Interaction	Individuality	Autonomy
External simulation	Contents	Physiological characteristics	Physical actions	Real-time interaction of voice and movement	Identity settings	Automation, predictive simulation
	Methods	Computer graphics, 3D modeling, image design, parametric keyframing methods, etc.	Motion capture, process animation, micro-expression control, multimodal drive	Speech recognition, speech synthesis, speech and behavior interaction technology, virtual reality technology	Virtual world database, character setup, image processing, etc.	Big data, deep learning, artificial intelligence technology, etc.
Internal simulation	Contents	None	None	Personality development, character growth	Personality, language, emotion	Intentionality, sense of autonomy
	Methods	None	None	IP content production, distribution and marketing	Affective computing, natural language processing, multi-agent systems, etc.	Quantum physics, multi-disciplinary synthesis, etc.

Figure 1. Technologies used in the virtual human.

The symbiosis between humans and virtual humans in images and in real applications has different meanings and levels of concern. In works such as science fiction and games, the relationship between humans and virtual humans is more transcendent, focusing on the transcendence and substitution of virtual humans for humans, and this has led scholars to philosophize about the meaning of virtual humans in the future. The symbiosis between humans and virtual humans in real society, on the other hand, requires consideration of more realistic social issues, such as the relationship between virtual and real identities, and the involvement of virtual humans in human social, shopping, entertainment, travel, and even production activities, reflecting the embedding and alteration of virtual humans in human social and cultural systems. Our discussion below will also explore the human-machine relationship arising from virtual human technology on these two levels.

The Symbiotic Relationship Between Virtual Humans and Humans

Under the influence of AI technology, virtual humans are beginning to simulate human intrinsic dimensions such as autonomy. The virtual human will certainly pose a challenge to the existing social order and ethical relations, which requires that the essential characteristics of technology be explored in the context of the ethics of technology in order to provide the possibility of building a new type of technology ethics and rules. Specifically, the virtual human provides an unprecedented way of interaction between the real world and the virtual world, adjusting the traditional human-machine and human-human relationship. In this process, the virtual human facilitates the change of human identity from “controller” to “supervisor” to “symbiotic partner”.

The human-machine relationship has evolved to include three main phases. The first is the period of human-machine antagonism in which humans used machines as tools. In the middle age of last century, the science

fiction writer I. Asimov proposed the three laws set for robots, clearly proposing a human-machine relationship centred on humans. Humans approached robots with an instrumentalist attitude, welcoming and touting them as novel high-tech products on the one hand, and positioning them as tools to serve society, technology, and even ideology on the other. In the ethical codes of artificial intelligence developed in Europe and the United States, the first principle is invariably "human-centredness" (High-Level Expert Group on Artificial Intelligence, 2019, p. 4). This human-machine relationship is clearly a product of anthropocentrism. The world is all about people, and machines are created by people and should of course serve them. Some scholars argue that this human-machine relationship can be further understood as an emotion of shame for humans in the presence of machines. G. Anders notes that humans recognize the superiority of things, equate themselves with them, affirm their reification, and see their non-reification as a defect. This emotion, named "Promethean shame", is the feeling of inferiority that humans feel when confronted with something of their own making (Anders, 1961, p. 30) At this point, humans not only equate themselves with objects and affirm their reification, but also use machine standards as a criterion for judgement and emotional orientation. The confrontation between human and machine gradually leads to a confrontation between humans themselves. Human gradually examines himself with a "machine mind" and measures the world by machine standards, leading to the alienation of human by the machine. M. Heidegger refers to a "language machine" ([de] Sprachmaschine) when he speaks of the control of man by machines, saying, "The language machine makes language work and therefore controls the nature of man" (Heidegger, 1983, p. 149).

The second period in the human-machine relationship is that of human-machine cooperation, which is the condition for artefacts to be on an equal footing with humans and a prerequisite for human-machine symbiosis. The facts show that machines no longer exist as mere tools of convenience at the hands of humans, but are increasingly becoming human assistants and even colleagues who combine technology, services, and decision-making. P. Scharre classifies the specific forms of human-machine cooperation into semi-autonomous, assisted-autonomous, and fully autonomous, depending on the type of task the machine undertakes, the human-machine relationship in performing the task, and the complexity of the machine's decisions (Scharre, 2018, p. 35). Due to technical limitations, most human-machine cooperation is still in the first two forms. It should be noted that human-machine cooperation should not be confused with human-machine symbiosis, because the symbiotic relationship requires that the other party should be a subject of the same essence, but human-machine cooperation tacitly acknowledges the relative separation of human and machine. The "cooperation" is only a change in the relationship of use, which does not directly mean that human and machine reach a symbiotic state. The essence and status of human and machine are still different.

As the third stage of the human-machine relationship, human-machine symbiosis is a sharing and even unification of machine and human in terms of body, intelligence, and information. The symbiosis should be as M. Heim reveals, "our affair with information machines announces a symbiotic relationship and ultimately a mental marriage to technology" (Heim, 1994, p. 84). The human-machine symbiotic relationship is two-sided. On the one hand, the highly integrated state of human and machine allows for human enhancement, especially in terms of physical and intelligence. N. Bostrom and A. Sandberg argue for the systemic nature of the body. They define enhancement as an intervention that results in the improved functioning of certain subsystems beyond their normal state of health in certain individuals, or the addition of new capabilities (Bostrom & Sandberg, 2009, p. 378). T. Garcia and R. Sandler consider human enhancement as technology that is intended to improve or enhance some core human cognitive, physical, perceptual, or mental ability, or to make possible some ability

beyond basic human capacity (Garcia & Sandler, 2008, p. 278). On the other hand, if it is the machine that integrates the human being, or if the human being becomes machine-like, it would make the human being lose its natural nature and become a cyborg, a synthetic human being. The dignity of the human being will also cease to exist when, according to techno-pessimists, intelligent machines or virtual humans replace the power of the human mind. To address the imbalance in the relationship between humans and technological objects, J. Licklider and W. Clark propose a human-machine symbiosis, using the mutually beneficial symbiotic relationship between the fig wasp and the fig tree in nature as an example, arguing that the human brain and machines also form a mutually complementary relationship. He says, "the intellectual power of an effective man-computer symbiosis will far exceed that of either component alone" (Licklider & Clark, 1962, pp. 113-128). In a highly intelligent society where everything is connected, humans and intelligent machines will become one, with various technological parts integrated into human flesh. "Cyborgs" will no longer be an individual experiment but a universal phenomenon. Humans will place the highest trust in intelligent machines—entrusting them with their lives. The sharing of the right to life suggests that a symbiotic relationship is being established that goes beyond the traditional human-machine and human relationships. However, this is also extremely dangerous, as the excessive combination of humans and machines in the real world could lead to the mechanization of humans.

The emergence of the virtual human offers a new way in for human-machine symbiosis. That is, human-machine integration and symbiosis are not on the human body and function, not the mechanization of the human but the humanization of the machine. The realization of virtual humans with a high degree of simulation in a virtual world gives a certain degree of controllability to human-machine symbiosis. Virtual humans and humans can construct a more concrete and specific human-machine symbiosis. This specificity is determined by the essential characteristics that distinguish virtual humans from traditional artefacts and other intelligent products. Firstly, the virtual human is a synthesis of intelligent technologies, which involves a greater variety of technologies, higher difficulty, and more fluid cooperation than other technological objects. Secondly, unlike other technological objects that have no specific object to simulate, the simulation of virtual humans is clearly directed towards human beings, and is also more anthropomorphic. In addition, virtual humans will have more opportunities to interact with humans than other technological objects, and they will become a bridge between two worlds with their intimate visual effects, smooth interactive experiences, and warm emotional transmission. Thirdly, virtual humans are in the virtual network world. Compared to the real world, the cyber world has a certain degree of controllability and can be used as a laboratory for human-machine symbiosis. The virtual human is the product of the human-machine symbiosis experiment, and achieving harmony in the virtual human is the ideal goal of the human-machine symbiosis relationship.

The author was involved in the formulation of the "New Generation of AI Governance Principles" by the Ministry of Science and Technology of China, and proposed the concept of "human-machine harmony", which was adopted (Ministry of Science and Technology of China, 2019). The premise of human-machine harmony is based on the fact that human society can no longer be distinguished from machines and that machines have become an inseparable part of human life, in which case the human-machine relationship actually reflects the human-human relationship. In this state, man should reconsider the human-machine relationship and realize a harmonious relationship of mutual respect and interdependence. The harmonious coexistence of virtual humans and human beings is not only a need for the development of human society and civilization, but also a prerequisite for the sustainable development of the virtual human industry. We should not allow virtual humans to replace or

isolate human beings, and virtual humans should not exacerbate the unbalanced development of human beings or lead to their alienation. Only in this way can human society and the virtual human industry develop in a sustainable way.

The Impact of Virtual Humans on Human Civilization

The arrival of virtual humans is causing the boundaries between the artificial and the natural, the family and the individual to dissolve. True and false dimensions, multiple personalities, thinking and practice are being continuously fragmented, which may bring enormous impact and challenges to human civilization. The widespread use of virtual humans in various fields, such as culture, art, sports, finance, and services, may accelerate changes in the industry and lead to the unemployment of some practitioners, which may lead to ethical and legal risks. Therefore, while we rejoice in the technological progress, we have to consider how to view the widespread use of virtual human technology from the perspective of sustainable development.

Under the influence of the virtual human, human civilization in the post-human era will embody a number of fusion and homogenization features. The first is the fusion of biological and virtual humans. According to M. Rothblatt, today's flesh-and-blood society will be transformed into a consciousness-centred society in the future, with new forms of thinking clones extending human existence precisely because they are replicas of particular persons' mannerisms, personality, recollections, feelings, beliefs, attitudes, and values (Rothblatt, 2014, p. 96). N. Hayles argues that the post-human subject will become "an amalgam, a collection of heterogeneous components, a material-informational entity whose boundaries undergo continuous construction and reconstruction" (Hayles, 1999, p. 24). Data essentially transforms humanity, with bits replacing cells as the basic building blocks of the post-human, and the trajectories of biological and virtual human existence intersecting. The physicality of human beings will be weakened, while the spirit and consciousness move toward virtualization and data. In the post-human context, the body as reality is allowed to be reshaped and replaced, the human anchor is replaced by the virtual anchor, the human body is digitized, the human becomes a virtual human, and our world is digitized and becomes the metaverse (Dionisio, Burns III, & Gilbert, 2013).

Then comes the dissolution of gender, family, and race. The virtual man symbolizes the disintegration of human flesh, and blood and gender become meaningless concepts. D. Haraway considers cyborgs as creatures of the post-gender world, i.e., genderless human-machine hybrids. She calls the cyborg myth about the transgression of boundaries, powerful integration, and dangerous possibilities (Haraway, 1990, p. 154). At this point, all the old boundaries formed by relying on human flesh will face disintegration, and the old framework of human society will be accelerated by the virtual man to break through.

Finally, since virtual humans are packaged by massive data, and data has explosive transmission and pervasive penetration, virtual humans will also, to a certain extent, eliminate the generation gap of consciousness between subjects, and the cultural aspects represented by language, thinking, and aesthetics will be integrated. Taking aesthetics as an example, under the influence of massive data, human aesthetics has gradually tended to be homogeneous and moderate. According to Han Byung-chul, by eliminating negativity and all forms of shock and harm, beauty itself becomes smooth (Han, 2015, p. 11). This trend toward aesthetic homogeneity is also likely to become more pronounced under the influence of virtual humans. Because virtual human interaction means more targeted and easier digital interactions, it means that the resistance and cost of interactions are minimized.

Any technology is possibly both constructive and destructive, and the impact of virtual humans on human

civilization will be twofold. While intelligent and anthropomorphic qualities can integrate human civilization, the fluidity and non-determinism they embody can also cause a split in human perception, identity, and practice.

The split is firstly reflected in the failure of traditional human cognitive experience due to technological simulation and eventually leads to a crisis of trust. The emergence of virtual humans has made humans aware for the first time with the possibility that humans themselves can exist through virtualization, and at the same time, virtual humans affect the reliability of human relationships. In fact, the high simulation of human beings by artificial intelligence and virtual technologies has led to a crisis of trust in human society. The deepfake face-swapping technology, for example, has been used by unscrupulous people in fraud, extortion, and pornography industries. This is why the EU's AI Ethics Guidelines specifically includes "trustworthy AI" as a central theme (High-Level Expert Group on Artificial Intelligence, 2019). To address this issue, humans have chosen to change their cognitive approach to minimize cognitive fragmentation. Human perceptual judgments have been gradually replaced by true-false judgments, and before formally communicate with the others, humans need to determine whether they are really human or not.

The split characteristic is also reflected in the sense of identity dislocation between the two spaces in which humans live. The virtual space that accompanies the virtual humans allows a person to have not only a real personality, but also a "virtual personality". A. Kroker argues that the behavior of individuals in virtual communities creates a corresponding virtual personality (Kroker, 1992, p. 62). Compared to real personalities in the real world, virtual personalities are more artificially constructed and less naturally generated. People can use virtual personalities to play various roles on the Internet to satisfy their desires. However, in the long run, the contrast of multiple personalities will lead to the fragmentation of human perception of their own identity. At the same time, the virtual world will also make the public raise their judgment standards and thresholds. Once humans gradually rely on virtual people, virtual worlds, and virtual personalities, it will be difficult to accept the banal scenes of the everyday world and realistic interpersonal relationships, and this long-term uneasiness and doubt will also lead humans to a deeper split.

Finally, under the impact of virtual human, human may face the split between practice and thinking, and further lead to unemployment problem and industrial structure imbalance. Practice is a uniquely human productive activity that plays a significant role in the progress of human civilization. However, in the future, virtual humans will, to a certain extent, encroach on the practice opportunities that originally belong to human beings. This is because the original purpose of creating virtual humans is to replace human beings in various productive activities. And when the virtual human technology is highly developed, it will far exceed the average human in many skills. The degradation of human beings does not only stay in practice, but the original thinking ability will also be weakened by the extensive intervention of virtual humans and intelligent machines, and the impact of information will lead to the gradual deformation of human higher thinking ability. Once a certain critical point is crossed, the virtual human's massive mastery of data also means that the nature of things is hidden. In this case, virtual humans can think more easily than humans, because they have the super ability to store and discriminate massive information. It is not difficult to imagine that if the human situation is one of chaotic thinking ability guiding poor practical activities, then the break of human civilization will come soon.

Humanity's anxiety about the virtual human also comes from the end of history due to runaway technology. When the virtual human is out of control, the human race possibly faces the ultimate destruction, that is, the end of history in the real sense. The risk posed by an out-of-control virtual human has two main characteristics: First, the technical risk and social risk coexist, and the virtual human can be combined with the technological risks that

humans already have (e.g., nuclear threat, artificial intelligence, etc.). Once the virtual human triggers nuclear power in case of loss of control, human civilization may usher in a realistic end of history. Secondly, as for the "unpredictability of the future", technology will always develop with uncertainty. However, there are two types of consequences of technology, namely, "unpredictable but expected" and "unpredictable but unexpected" (Zhang, 2018). The power of virtual humans belongs to the latter, and as their intelligence increases, they may have complex emotions and consciousness such as the desire to conquer. It will lead to unpredictable consequences, perhaps ultimately cause the destruction of humanity.

Conclusion

The boom of virtual human technology and industry is an inevitable result of the highly developed human technology. While we enjoy the entertainment and convenience brought by this technology, we also need to think about the crisis and injustice it may cause. The relationship between virtual human and human—that is, the human-machine relationship is the embodiment of interpersonal relationship and human-technology relationship. Promoting the harmony of human-machine symbiosis first requires the realization of human harmony. Human-machine symbiosis is the basis for the sustainable development of virtual human technology and industry, and only by cautiously dealing with the problems of unemployment, human self-imposed isolation, and the digital divide caused by virtual humans can we achieve beneficial, sustainable, and efficient development of the industry. Otherwise, the virtual human technology will only be reduced to a tool of capital, and people will be gradually replaced by virtual humans, so that the human-machine relationship will be inverted to one in which people are alienated and dominated by machines.

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