

The internal logic of intelligent surveillance technology

Wen Wu , Yanchun Wu

School of Marxism studies of Zhejiang Normal University, Jinhua 321004, China

Abstract: In the era of deep intelligence, intelligent surveillance technology not only enables social governance and economic development, but also generates complex and diverse value conflicts and ethical risks. Therefore, only by deeply understanding the internal logic of intelligent surveillance technology, can we accurately grasp its development trend and ensure that the technology is good. Its internal logic is combination matrix, phenomenon coding, domain selection and translational evolution, through revealing its internal logic, in order to provide theoretical reference for intelligent surveillance technology governance.

Key words: intelligent surveillance; Artificial intelligence; Combinatorial selection; Technological evolution; Essential law

In the era of deep intelligence, technology has increasingly deepened its surveillance of human behavior, especially with the blessing of artificial intelligence technologies such as intelligent recognition and intelligent algorithm, people have become traceable, analyzable and predictable objects. Brian Arthur cracked the “technology black box” from the perspective of technology ontology, and proposed that technology has path dependence. New technology is selected and reorganized on the basis of old technology in the past, and finally evolved into a more powerful technology. Arthur’s analysis of technological evolution is universal, and can be used as a theoretical analysis framework to help us reveal the internal logic of the development of intelligent surveillance technology.

I. Combination matrix based on heterogeneous technology

Based on Schumpeter’s “combination view” and the “technology combination” proposed by sociologists, Arthur uses the concept of “combination” to explain the mechanism of technological evolution, “the integrated block contained by technology is a technology, the integrated block contained by the next level is also a technology, and the integrated block contained by the next level is also a technology. This pattern is repeated over and over again until the most basic level of basic parts.” He summed up the principle of technology development by “recursive structure”, where various basic parts are combined to form a hierarchical tree structure, that is, technology is constructed by different levels of technology.

First of all, the link and combination of multiple heterogeneous technologies is the basic architecture of intelligent surveillance technology. Arthur pointed out that “technology to some extent must be from the previous existing technology of the new combination”, for example, the construction of smart city can not be separated from intelligent surveillance technology, then video surveillance system, global positioning system, biometrics system and other technologies are the main elements of intelligent surveillance technology, and so on, a variety of heterogeneous technology ultimately combined can be a powerful technical matrix.

Secondly, intelligent surveillance technology is not only the reorganization of old technology, but also the integration of new elements. For example, the combination of artificial intelligence and previous surveillance technologies can realize automatic identification, automatic recording and remote surveillance of unlimited space. In terms of intelligent video surveillance system, real-time video access analysis, intelligent early warning, intelligent control and real-time forensics can be achieved through artificial intelligence computing cluster.

In addition, non-related fields of technology may also become the support technology of intelligent surveillance technology. Since intelligent surveillance technology has jumped out of the initial national defense and security field, the function of technology to expand to various fields such as business, medical, education, technology is not limited to the inherent field, but to expand to other fields, which is an important reason for the original unrelated technology to become a new technical component, but also shows a new pattern of the Internet of everything in the intelligent era.

In Arthur’s view, “the collection of all technologies has grown up independently from nothing, from simple to complex. We can say that technology creates itself from itself, and this mechanism is called combinatorial evolution.” The convergence of technologies in previously separate fields yields ever larger volumes of data, which in turn leads to an output of information and a surge of knowledge, inspiring surveillance techniques to make even more powerful predictions -- such as when researchers at the University of California, San Diego School of Medicine used an artificial intelligence algorithm to predict how patients infected with viruses, including COVID-19, will survive. Obviously, the recombination of multiple technologies will give birth to the spread of functions, and the aggregation of functions has stimulated the huge potential of surveillance technologies, proving that intelligent surveillance technology is a multi-heterogeneous technology that constantly dynamically evolves and grows by itself through technology combination.

II. System programming based on phenomenon capture

Arthur believes that the deepest essence of technology is “the collection of phenomena that are captured and utilized, or technology is the purposeful programming of phenomena.” Technology always needs to depend on some phenomena that can be exploited or utilized, including physical phenomena and non-physical phenomena. Complex intelligent surveillance technology is the re-development or reuse of a series of phenomena, in which the subsystem is the “fractal” of the whole technical device, the intelligent surveillance system mentioned above is a subsystem that can be continuously decomposed, in which the technical components of each system are the “fractal” of the whole surveillance system, these “fractal” is derived from the “phenomenon” capture. It also means that according to different technologies,

the “phenomenon” continues to be decomposed, until the most basic part. Specifically, it contains three meanings: one is that technology becomes technology through capturing phenomenon, the other is that technology needs to unmask the capturing phenomenon, and the third is that the way of technology realization is through system programming.

First, intelligent surveillance technology is developed by capturing phenomena. For example, the “surveillance” of intelligent surveillance involves the “look” or “listen” to others, “look” is different from the traditional human era of surveillance or surveillance, but the data collection about people, is “look” people’s data, “test” and need to apply the algorithm of mathematical model to analyze the collected massive data, the same way, intelligent recognition technology needs to simulate biological perception and so on. Therefore, intelligent surveillance technology is broken down layer by layer into tracking technology, perception technology, analysis technology, various technologies can be broken down layer by layer, and the final basic technology comes from a variety of captured “phenomena”.

Second, intelligent surveillance technology is the masking of phenomena. Phenomena are hidden and cannot be directly obtained, which needs human to explore intentionally or unintentionally. Deep phenomena also need scientific means. Intelligent surveillance technology replaces human perception system and upgrades to intelligent technical system, so that the information that can not be directly perceived by people is presented through technology, and makes up for the perception defects of people themselves. Heidegger analyzed that the essence of the existence of technology is to help people to “unfold” the world. He used the term “Gestell” to reveal the nature of technology. The gestell means the way to unmask things in the world as objects. There is no doubt that intelligent surveillance technology is to solve the problem of people as an object, and constantly explore the body and behavior of people.

Third, intelligent surveillance is realized through “system programming”. Intelligent surveillance for the perception of the phenomenon of programming is the system

Using the concept of “being programmed”, Arthur emphasized that the series of phenomena that make technology technology are organized in a planned way, and they “compose music” for the purpose of “use”. In addition, Anthony Giddens has also pointed out that surveillance is the accumulation of coded information, here “coded information” is actually the same as “system programming”, Giddens believes that the difference between “surveillance” and “coded information” is becoming less and less obvious, in the surveillance environment of the digital age, Coded information has gradually become a way of surveillance.

III. Function selection based on re-domain

When the phenomenon is captured and developed, it will form a large number of new technical clusters, such as laser, optical sensor and other gathered into optoelectronics, Arthur called this cluster or technical body “domain”, the technical domain only exists in the form of a toolbox, from which any useful technical elements can be selected to form a new technical body. The process of selecting the components suitable for constructing a device is “domain”. From the perspective of the operation mechanism of technology, intelligent surveillance technology is the functional choice of technology re-localization.

On the one hand, “localization” provides the choice of intelligent surveillance technology. Different from the traditional surveillance technology, today’s intelligent surveillance technology is composed of multiple and heterogeneous technologies, similar to the integrated system, this “domain” exists in the form of similar surveillance toolbox. At the same time, the choice of “domain” is developed and changed over time, relative to the traditional image technology “see” to the information, the information obtained under the intelligent surveillance algorithm is more accurate and detailed, the intelligent era surveillance technology is defined by the domain, not only provides a new set of more effective technical devices, but also provides new possibilities to achieve subversive changes in technology.

On the other hand, constantly “re-domain” to achieve the upgrade and optimization of intelligent surveillance technology. Traditional surveillance technology to image technology, communication technology as the core of the integration technology, now artificial intelligence, big data, biometrics and other technologies continue to join as a subset, converge into a new intelligent surveillance technology, equivalent to adding a new technical “gene”, once again promote the “perception” function of intelligent surveillance technology to strengthen. Among them, artificial intelligence as the core of the main integration technology, itself is constantly being “re-localized”. From the perspective of the technological evolution of artificial intelligence, the primary intelligence relies on the information storage and memory extraction of computers, and the upgraded artificial intelligence adopts deep learning to learn and analyze data by simulating the human brain neural network and imitating the human brain mechanism.

IV. Purpose-oriented translational evolution

The essential feature of intelligent surveillance technology is the rational purpose orientation, and the development of technology is always related to a certain demand purpose. Arthur clearly pointed out that when the demand purpose is linked to the exploitable phenomenon, new technology is likely to be invented. In other words, only the technology that meets the needs of human society will continue to develop and evolve.

The idea of technological evolution originates from the idea of “survival of the fittest” in Darwin’s theory of evolution, indicating that the process of technological evolution is the survival of the fittest. Biological evolution is the variation of natural selection and preservation of species. Technological evolution is similar to biological evolution in that “technology is the variation retained after social selection”, and technology also has the “genetic characteristics” similar to that of organisms. New technology is always based on the development of old technology, but the biggest difference between technological evolution and biological evolution is that “biological evolution is purposeless, and human needs are one of the main driving forces in technological evolution”. Obviously, intelligent surveillance technology is purpose-

oriented based on perceptual needs, and with the improvement of the scope and degree of surveillance needs, the evolution of technological perception function is also higher. From the perspective of artificial intelligence technology, from weak artificial intelligence to strong artificial intelligence, from basic intelligent computing to complex human-computer interaction intelligence, and then to the intelligent perception of conscious emotion in the future. The strong purpose orientation of the perception needs pulls the functional evolution of intelligent surveillance technology.

In addition to the purpose-driven pull, technological evolution also requires a process of translation, that is, the translation of principles into workable technologies. The process of translation includes technological innovation and technological variation. There are always various obstacles in the process of realizing the technological needs of human beings. Only by breaking through these obstacles can the real evolution of technology be realized. People need to materialize the technological concepts in their brains, usually by associating the principle of the corresponding function generated by the technology in the known field to transform, upgrade, and then transfer to the new technology to be invented. It can be seen that the translation process of technology is a key link in the evolution of technology. Intelligent surveillance technology is based on the purpose orientation of perception needs. On the basis of traditional surveillance technology, it integrates the technical principles of sensing technology, intelligent technology, algorithm technology and other fields, and extracts the principles with similar functions in various fields for conversion, upgrading and improvement. Constantly replace to the technical system of intelligent surveillance technology, and finally realize the translation and evolution of intelligent surveillance technology.

From the combination matrix of heterogeneous technologies, the system programming of phenomenon capture to the functional selection of re-domain and the translation evolution of purpose, the internal logic of intelligent surveillance technology is gradually clear, that is, the capture of every phenomenon, the domain of every technology and the translation of every principle will affect the functional evolution of intelligent surveillance technology. It shows that every link of technology research and development plays a key role in the good development of technology.

References:

- [1] Yilin Hu. Technology as Human Organ: Evolution of Reconstruction Technology [J]. Research in Dialectics of Nature, 2021, 37 (02): 26-31.
- [2] Wang V, Tucker J V. 'I am not a number': Conceptualising identity in digital surveillance[J]. Technology in Society, 2021, 67: 101772.
- [3] Boenink M, Kudina O. Values in responsible research and innovation: from entities to practices[J]. Journal of Responsible Innovation, 2020, 7(3): 450-470.

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About the author:

Wu Wen (1985-04), female, postdoctoral fellow, Institute of Philosophy, Chinese Academy of Social Sciences, Associate professor and master’s supervisor, School of Marxism studies of Zhejiang Normal University. Her research interests include philosophy of technology and ethics of technology.

Wu Yanchun (1999-12), female, master degree, School of Marxism studies of Zhejiang Normal University.