The International Journal of Metaverse & Virtual Transformation (IJMVT)

https://mvt.artahub.ir

ORIGINAL RESEARCH ARTICLE

An Overview of the Cybernetic Applications of Different Sciences in the Metaverse

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ARTICLE INFO

Article History:
Received: 2023-12-07
Revised: 2024-03-25
Accepted: 2024-06-23
Published Online: 2025-03-01

Keywords:
Cybernetics, Psychocybernetics, Cybernetic applications, Medical cybernetics, Metaverse.

Number of Reference: 29
Number of Figures: 6
Number of Tables: 0

DOI:

ABSTRACT

Since the progress of science towards specialization, a kind of distance between awareness and knowledge has been created. But there are some views that believe that since all sciences are born of a single science, then the world of science should become a single land. An example of such a view is evident in cybernetics. Cybernetics emerged from the 20th century and has entered most sciences with the aim of investigating the nature of control and communication in humans, machines, and animals, as well as by paying attention to concepts such as communication, control, feedback, stability, regulation, information, etc. Metaverse is also an emerging phenomenon in which we witness the interaction between man and machine and actually the interaction between physical and virtual space. The study of sources shows the wide application of cybernetics in various sciences, and considering the importance and practical role of cybernetics in order to solve problems, control and regulate systems and create stability and stability in various sciences, in the present research, a review of the available studies in a library method in the field of cybernetics applications until its applications as a unit in various sciences such as industry, physics, chemistry, computer science, management, information storage and retrieval systems, cyber security, psychiatry (psychocybernetics), physiology, biology (biocybernetics), control Bioelectricity and medicine should be investigated in the metaverse space. By using Cybernetic principles in various sciences, Metaverse can be used for its evolution to adapt to the life of humanity. **©authors**

►**Citation:** Roshani, M., Dehkhodaie, R., Hamidi, F., Zandian, F. (2025). An Overview of the Cybernetic Applications of Different Sciences in the Metaverse. *The International Journal of Metaverse & Virtual Transformation (IJMVT)*, 1(1): 57-70. Doi:

1. Introduction

From the time when science was separated from philosophy, humanity moved towards sciences with different specializations instead of a single knowledge. This caused the fragmentation of human consciousness and knowledge, and as a result created a gap between consciousness and knowledge. But this issue will not continue because all sciences are born of a single science. Among the concepts born from this thinking, we can mention the general theory of systems and the science of cybernetics, which claim that no phenomenon is independent of elements, and this also applies to science. Cybernetics is based on the premise that the world of science should be transformed into a single land, and therefore it is directed towards the knowledge and control of the world and nature. This matter became more important when man realized that he is also a part of nature and can learn from nature and use sciences like biology and geology to enrich other sciences (Gholamzadeh and Fathi,1986).

The concept of cybernetics emerged in the 20th century and with its growth, it found its way to other sciences as well. Since its main purpose is to examine the nature of control in humans, machines and animals, it is also related to sciences such as biology, psychology, mechanics, engineering, management and other sciences and has an interdisciplinary nature (Jamali Mehmoui and Asadi, 2004). Ashby (1954) believes that cybernetics uses mathematical topics to create a framework for discussing topics related to feedback, stability, disorder, regulation, information, entropy, transmission, and limitations. These abstract principles can be applied to almost any scientific field such as physics, engineering, biology, physiology, neurology, psychology and other sciences; The more complex the system, the Cybernetic principles such as the "law of diversity" lead to a reduction in complexity and contribute to diversity in disturbances (Ashby,1954; Adams, Hitefield, Hoy, Fowler and Clancy, 2013).

Cybernetics is a combination of theories related to system flow, information control and communication. American mathematician and philosopher Norbert Wiener explains how organic, human, machine and information form a similar system of feedback and self-organization. Cybernetics - coined from the Greek word for "steersman" and refers to the three actors of information, control and communication that create an unprecedented combination of the organic and the mechanical. The continuation of these two modes of contact between organic and mechanical or man and machine is in a circle of conflict. Hence, the relationship between computer and human is the basic example of cybernetics. Simply put, cybernetics is a closed system through which machine-human interaction takes place. Machines are becoming a widespread tool of humans to perform certain tasks, such as building machines using assembly line machines, working with patients using medical equipment, and exploring the cosmos using the Hubble telescope (Nuncio and Felicilda, 2021).

Experts believe that now we are in the era of transition from all systems to Cybernetic system. In this regard, a concept that shows the transition to the Cybernetic system and the process of inevitable global changes to the Cybernetic system is the metaverse. Referring to Wiener's definition, it is clear that in the metaverse, the real world is connected with the virtual world, and in fact, the connection between the human world and the machine world has been formed, and in fact, the human and machine worlds have come together in a new way (Mohammad Hasani, 2023). So, if we examine the applications of metaverse in different fields from the perspective of human-machine interactions, we have actually looked at this issue from a Cybernetic point of view.

Considering the importance of cybernetics and metaverse that their study provides information about the future developments of humanity's life, no research was found that investigated the cybernetics application of different sciences in the space of metaverse in different fields. Therefore, considering that the three basic concepts in cybernetics include information, feedback and control, and these concepts are necessary for every science in order to maintain

its survival and create stability within itself, in the present research, we decided to review the existing studies.

2. Method

In the field of Cybernetic applications of various sciences in the metaverse space, it has been carried out in a library method to determine the limits of this issue. For this purpose, the keywords metaverse, cybernetics, Cybernetic applications, cybernetics and metaverse were searched in Sid, Magiran, Noormagz, Google and Google Scholar databases and the retrieved results were studied. In addition to raising awareness and emphasizing the importance of the metaverse from a Cybernetic point of view for the study of the future developments of humanity, this issue can create the basis for creating a model of the Cybernetic application of science in the metaverse in future research, so that after that every science that requires stability and stability, to be able to use the Cybernetic application model within itself in the metaverse space. The importance of this issue originates from the fact that cybernetics is considered as a science to solve the problems of science and humanitarian affairs, and awareness in this field can play a helpful role.

3. Literature Review

3.1 Metaverse

The term metaverse was first coined by Neal Stephenson in his 1992 science fiction novel Snowfall. In this novel, Metaverse is described as a world parallel to the real world, which users enter as an avatar by putting on the Oculus hat. The peak of activities in the field of metaverse was in 2021, when the concept of metaverse was expressed as stable 3D virtual spaces (Abbasi, Zarei Zawarki & Nili Ahmadabadi, 2023).

From a historical point of view, the first studies presented regarding the metaverse and how it is managed are related to the end of August 2022. In this report, the potential and scope of the impact of Metaverse in various areas, including the content of the Metaverse space, data privacy, and finally opportunities and challenges have been discussed (Darabpour, 2023). Metaverse is a combination of two distinct words, Meta and Vers, meaning virtual world (Mohammad Hasani, 2023). On October 28, 2021, Mark Zuckerberg made a global announcement about the restructuring of the Facebook technology company and named it Meta (Abbasi et al., 2023). Metaverse is the next generation of the Internet and a digital environment where users can have new and attractive experiences together without restrictions from an economic and social perspective, which is not possible in the real world (Mohammad Hasani, 2023).

It should be noted that Metaverse does not exist externally, but it can be accessed through headsets and other visual tools. For this reason, it is also called virtual reality. Metaverse will be the agent of combining Augmented Reality (AR), Extended Reality (XR) and Virtual Reality (VR) with our physical world (Amerian et al., 2023). In Metaverse, based on creativity and imagination and using technology, spaces are designed that go beyond the space of physical reality and put the real and virtual worlds together in new ways. On the basis that all existing and current interactions in the physical world can be transferred to the virtual space. Metaverse entities are divided into native and non-native categories. Natives are formed from the base in the virtual space, but non-natives enter the metaverse from the physical space. (Mohammad Hasani, 2023).

3.2 Cybernetic definitions

So far, several definitions of cybernetics have been presented both in the theoretical and practical fields. Cybernetics was first mentioned in Plato's writings in ancient times and also in Ampere's writings in the 19th century as effective government science. Khaki (1991) also believes that Ampere introduced cybernetics as a science that should discuss the regulation

of society. He expressed the motto of this science in Ampere's language as follows: "Creating comfort under the shelter of peace for citizens." Khaki continues that Cybernetics was forgotten for a while until it was revived in 1948 by Nobert Wiener in his book (Khaki, 1991). Wiener (1948) used cybernetics derived from the Greek word "κυβνητης = cybernetic" and meaning "governor, pilot or helmsman". He defined cybernetics as the science of monitoring, control and communication in animals, machines and humans (Zahedi Asadpour & Haji Nouri, 2009). After him, William Ashby entered this field in 1957 with the publication of his book Introduction to Cybernetics (Ashby, 1954).

Stafford Beer, who is one of the pioneers of this field, believes that Norbert Wiener chose this name and took it from the word Streisman, which means Greek ships and their steering (Jamali Mehmoui & Asadi, 2004). The term Cybernetic is reminiscent of the concepts of information, communication and monitoring, and the concept of control and feedback loops forms its core (Zouwen & Smit, 2003). In other words, Cybernetic knowledge is considered a tool for solving social, economic, biological, medical and humanitarian problems (Bowles, 2008). In terms of theory, cybernetics is the general theory of controlling mechanisms in mechanical and organic systems, and in terms of a scientific discipline, it is the formal logic of natural and artificial automata that studies the interaction between man and machine, machine and machine, and man and man, in various types of Systems are based on the principles of feedback, control and communication. This science is based on a holistic view and is not only focused on the knowledge of matter and energy, but also includes calculation, information, communication, storage and control (Davrpanah, 2015).

According to Myers (2001), in addition to paying attention to artificial systems, cybernetics also includes natural systems such as organisms and does not only discuss what the systems are made of, but also discusses how they work and studies the role of humans. It is also of special interest in systems (Zahedi Asadpour & Haji Nouri, 2009). Beer brought the natural laws of control to organizations and called it the knowledge of an efficient organization (Jamali Mehmoui & Asadi, 2004). This knowledge, with a systematic approach and insight, examines control and regulation processes in complex systems that are almost closed in terms of energy exchange with the environment and almost open in terms of information exchange between the elements that make up the system. The main goal of cybernetics is to find the fastest, most appropriate and effective methods of control and regulation in complex organizations (Mirzaei Ahranjani, 1988).

3.3 Cybernetics and Metaverse

Figure 1 shows the results of Cybernetic and metaverse search in Scopus database.

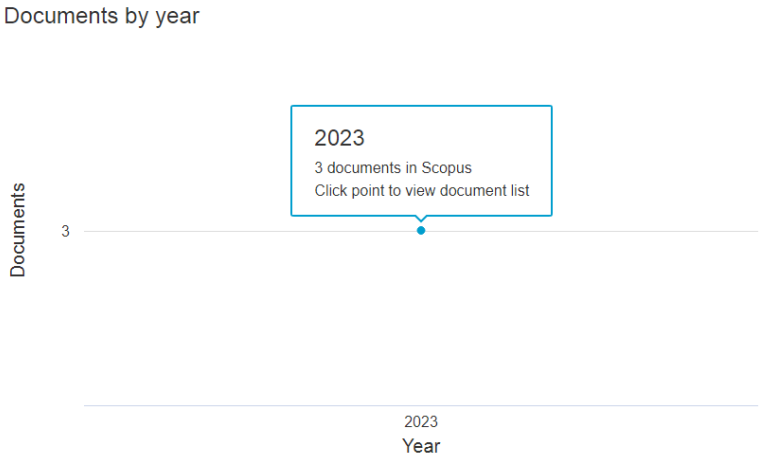

Figure 1. Cybernetics and metaverse in the Scopus

A search in the Scopus citation database shows that only three documents are retrieved by searching the terms cybernetics and metaverse, all three of which belong to 2023. The reason for this issue is due to the very short history of the concept of metaverse and it shows that

the topic raised is a very new issue and the existence of three sources is the starting point for conducting research in the relationship between the two fields**.**

3.4 Cybernetics applications

As mentioned, cybernetics is used in various sciences that it is not possible to mention all of them, and according to Esmailpour & Nezamuddin (2015), cybernetics knowledge is used wherever there is talk of feedback and control. In fact, the application of cybernetics in each specialized field deserves to be considered separately (Esmailpour & Faqih, 2015). The main topic of cybernetics is to investigate the nature of control in humans, animals and machines, and therefore it is correlated with biology, medical sciences, psychology, mechanics, engineering, management and many other sciences. Cybernetics has been able to emerge as an independent and at the same time interdisciplinary knowledge. In this science, much attention is paid to the classification and organization of information (Albaji, 2014).

Cybernetics looks for how humans can control machines, or in other words, how they can use machines to achieve their goals. From another point of view, cybernetics can be defined as the science of communication and control in humans and technologies as well as the Internet (Esmailpour & Faqih, 2015). With these words, it can be claimed that there is a Cybernetic approach to control in Metaverse. Because in this context, cybernetics in the Internet environment deals with communication and control between humans and machines through technology.

In this regard, cybernetics is also used in the construction of electronic computing machines, microprocessors, electronic brains of robots in the military, manufacturing and agricultural industries. In the system approach, it acts as an automatic corrector in recognizing obstacles and deficiencies through receiving feedback, and it has also been effective as a communicator, informer, storer, and information transferer in the direction of automating control processes (Davrpanah,2015).

Cybernetics is a method that can be used to distinguish a biological system from a non-biological system (Morselli & Maltz, 2008). Also, according to Giti, with technical and engineering sciences such as electronics, machine and communication, biological and medical sciences such as physiology and homeostasis, electrophysiology, neurophysiology, biophysics of muscles and nerves, neuropathology, endocrinology and human sciences such as behaviorism, psychology, anthropology, economics and sociology is related (Giti, 1971). Davar Panah also believes that cybernetics is a mixture of cosmology, biology, applied mathematics, logic, philosophy, control science, communication and computing and information transfer and is effective in all fields of theoretical, social and applied sciences. Its wide range in medicine and psychotherapy and psychiatry, organizational psychology and genetic engineering and physiology of psychopathology and in making artificial organs for humans (heart, hands and feet, etc.) and oncology (pathology) and understanding the causes of exponential expansion (Geometric expansion) cells of cancer patients have achieved surprising results. It has made tremendous progress in the stage of diagnosing pains, in the stage of prediction and foresight, and in the stage of thinking therapy, dimension measurement theory, and similarity theory (Davrpanah, 2015). All the mentioned cases can be controlled in the metaverse through a Cybernetic approach. In the following, some applications of cybernetics in the field of different sciences in Metaverse are mentioned case by case.

3.5 Cybernetics in industry and metaverse

One of the applications of cybernetics is the issues related to the industry, which is known as the dynamics of the industry, and includes the study of the feedback-information structure in the industry in such a way as to determine its impact on the organizational structure and strategies and on the efficiency of the organization. The trends in industry dynamics include theories of information-feedback control systems, the use of models for experimental

decision-making in complex systems, and digital computers. The use of information feedback systems includes siphons, thermal-heating systems, the behavior of blind people and in commerce and economics (Khaki, 1991). All of these things act as input and output, and in these cases, they use the information from the feedback to reach a balance with their environment. For example, a blind person receives information from the environment through touch and balances himself with the environment so that he can move in it. In trading systems, they calculate the information related to the needs of customers in the market as well as the amount of supply and demand and the product so that with its help they can adapt to the environment and actually meet the needs of the environment in a balanced way.

The second application of cybernetics in industry follows the automation of military industries, which led to the invention of new military equipment and new forms for understanding social forces. Its third application included experimental dealing with systems to understand and analyze their behavior, and this led to simulation in order to guess the system's behavior in future situations. Finally, the fourth application included digital electronic computers that emerged in the 20th century, and the first ones were analog, and over time, their feet were opened to complex calculations, and later they were used to control complex operations and systems (Khaki, 1991).

In Metaverse, we are facing a new industry. Industry 4 focuses on the realization of intelligent manufacturing based on cyber-physical systems (CPS). But now the industry and society of the fifth generation and beyond the previous generation is emerging and covers the entire production value chain, but it faces economic, environmental and social challenges. To face such challenges, Industry 5.0 is considered as a socio-technical revolution based on physical-social-cyber system (SCPS) and a socio-technically advanced micro-manufacturing architecture and framework beyond Industry 4.0, especially in Enabling technologies such as artificial intelligence, social internet of things (SIoT), big data, machine learning, edge computing, social computing, 3D printing, block chains, digital twins and robots are considered for it (Yao et al., 2022). Cybernetics is very important in such a space as a control and monitoring system.

Figure 2. Cybernetics in industry and metaverse

3.6 Synertics and self-organization in physics, chemistry and computer science in metaverse

One of the basic concepts in cybernetics is self-organization. Its applications in physics include phase transitions and spontaneous symmetry breaking such as spontaneous magnetization and crystal growth in classical physics and lasers, superconductivity and Bose-Einstein condensation in quantum physics. This concept is found in dynamic systems, in pathology, in foam rotation systems and in ring quantum gravity, river basins and deltas, in dendritic strength (snowflakes) and in chaotic structure, in self-organized sensitivity". Strong (2006) describes the application of Cybernetic self-organization in chemistry "including molecular self-assembly, diffusion reaction systems and oscillatory reactions, autocatalytic networks, liquid crystals, network complexes, colloidal crystals, self-assembled monolayers, micelles, microphage isolation, block copolymers, and Longmire-Bloudette films" (Zandian, 2019).

X. Si (2014) describes the application of Cybernetic self-organization in computer science as "phenomena related to mathematics and computer science such as cellular automation, random graphs, and some cases of evolutionary computation and artificial life show self-

organization characteristics. In robotics, self-organization is used to generate emergent behaviors. In particular, random graph theory has been used as a general principle for complex systems as a justification for self-organization. In the field of multi-agent systems, understanding how to engineer systems capable of providing self-organized behavior is an active research field" (Zandian, 2019).

The feature of Cybernetic self-organization in the metaverse space can be used for machine learning and in computer science. In fact, machine learning can lead to self-organization of the system, which is evident in the metaverse. So, it can be concluded that the metaverse with the self-organizing feature of systems can be included in physics, chemistry and computer science and cover this aspect of human life in virtual space and second life.

3.7 Cybernetics and knowledge management in Metaverse

Since cybernetics pays attention to the organization of information, it is also of special importance in information management and information systems design. Beer is known as one of the most important theorists in the field of cybernetics in management. His theories have received many influences from computer science, communication, logic, philosophy and neurophysiology and are therefore unique (Jamali Mehmoui & Asadi, 2004).

The three main elements of cybernetics, namely communication, control and feedback, are used in organizational knowledge management. In fact, the role of communication is evident in establishing a relationship between the employees of the organization in order to transfer the information and knowledge needed by the organization (Zandian, Jabari & Mantegh, 2018). Communication causes the transmission and dissemination of information, which is a vital issue in cybernetics and systematic management, and without it, the output for the system and organization cannot be achieved, and in this regard, it is necessary to receive feedback to control and review the input (Esmailpour & Faqih, 2015). Feedback helps the organization to measure the usefulness of the organized knowledge to estimate the achievement of the organization's goals, which is possible through receiving information from the feedback. Finally, control helps to improve the functioning and development of the organization by receiving actions based on information; It also prevents deviation and disorganization so that the knowledge needed by the organization can be collected, organized and used in an optimal way (Zandian, Jabari & Mantegh, 2018).

Metaverse can use cybernetics to study communication in order to receive feedback from its inputs for systematic management. Receiving information from feedback helps the Metaverse to control its environment and avoid deviations. In this regard, Metaverse can gather the knowledge it needs in an optimal way through cybernetics, so that it can flow effectively in the application space when needed.

3.8 Cybernetics in information storage and retrieval systems and metaverse

Cybernetics is also used in information storage and retrieval systems. Because storage and retrieval systems are considered control systems. In this way, when the indexing process is performed and the user searches in that system, if he does not achieve his needs, it means that the indexing was not effective and therefore he sends feedback to the system. Therefore, the indexing section creates a change in the recovery system and causes the dynamics of the system, which is one of the main concepts of Cybernetic and is a Cybernetic system. Cybernetics studies, investigates and predicts systems in information storage and retrieval systems using mathematics and statistical methods. Also, cybernetics and systematic management in information storage and retrieval systems, including libraries and information centers, can help control and optimal use of technologies and the progress of organizations. Information theory is also one of the main foundations of cybernetics, which is used in libraries and information centers to discover the rules governing communication and information exchange, in order to reduce the effects of noise and improve the flow of information so that information. The optimal form reaches the users. The use of artificial

intelligence is also the pinnacle of the use of cybernetics in order to simulate the human mind in these systems so that they can think like humans, understand the user's intent and process information, and even improve their performance like self-organizing systems (Esmailpour and Faqih, 2015). Using artificial intelligence instead of human mind can be exactly the manifestation of metaverse. Artificial intelligence is actually supposed to live in the position of human avatar in virtual space, and therefore, by using cybernetics, it can receive, process, learn and act on information.

3.9 Metaverse cybernetics and cyber security

In the field of cyber security, the reactive and applied nature of cybernetics leads to a "cyber cycle" from attackers who abuse and attack systems; The lack of basic principles for developing more secure systems has led to the creation of the science of "cyber security". Cybernetics introduces a fundamental approach to the development of cyber security principles and examines its application from a defense perspective. In fact, control theory, game theory, system theory and information theory, when considered through cybernetics, are effective in breaking the cycle of cyber-attacks. Cyber security research should have a significant focus on breaking the continuous cycle of cyber-attacks. The application of cybernetics and control is such that initially, when a foreign attacker tries to enter a defense system and negatively affect it, it creates some kind of disruption in the defense system. In this case, the defender system tries to reduce those inputs through methods such as resetting the system, adding network access control (firewalls) or patching, so that the system returns to a balanced state. Cybernetics aims to create system stability in identifying the attacker and helping the system to adjust the system and achieve stability (Adams, Hitefield, Hoy, Fowler and Clancy, 2013). This feature and application of cybernetics in cyber security in the metaverse space can be helpful in maintaining the confidentiality and security of users' information.

Figure 3. Metaverse cybernetics and cyber security

3.10 Cybernetics and the science of mind control (Psych cybernetics) in the metaverse

Ashby (1954) believed that the part of cybernetics that studies the human brain is used in psychiatric science to create stability and stability by using feedback. By describing how the brain works, he tried to provide evidence regarding the use of cybernetics in the science of psychology and psychiatry, and he believed that therapeutic advances could be achieved through it. In this regard, several years after him, Psycho-Cybernetic was proposed (Ashby, 1954).

Psycho Cybernetic means directing the mind towards a useful goal and is a method that allows a person to guide and control himself. That is, in order to achieve self-esteem, a person should use inner success and not allow negative emotions to enter his mind. This concept introduces two mechanisms for governing human instructions, including success and failure. The mechanism of failure originates from negative and disappointing feelings and by remembering past failures, it prevents a person from reaching his goal. The mechanism of success is created through the development of positive mental images that lead to greater well-being and also the production of real and achievable goals (Doran, 2008). Maltz (2013)

believes that cybernetics was the result of the efforts of physicists and mathematicians, not psychologists; Especially since cybernetics deals with theology (behavioral goal-seeking of mechanical systems). In relation to machine operation, cybernetics compares what is done and what should be done. Cybernetics has also created a revolution in the science of psychology (Maltz, 2011).

The discussion of how to create a mental image in people has been discussed in psychology since 1930. Maltz found its roots in cybernetics. Since Cybernetic refers to an automatic guidance system, Maltz concluded that the nervous system and the human brain act like a kind of mechanism; Atmospheric targeting devices like those that guide drones, which is why he called his original idea psychocybernetic. Maltz's psychoCybernetic book was published in 1960, and the ideas in that book were developed in the 1940s and 1950s. Although that information is still valuable, the format of their references is from another era. Maltz believed that the mental image is the key factor that makes decisions. It acts like a human's internal guide system for success or failure and determines the size and scope of the goals that should be pursued by the human's objective mind (Samer, 1996).

In mental image psychology, the human brain and nervous system work according to the well-known principles of cybernetics to achieve one's goals. Cybernetics was first presented in the form of studying machines and mechanical principles. Today it has gone so far as to renew the dignity of man as a unique creative being. In the science of cybernetics, which started with the study of physical machines, man is not a machine, but the owner of the machine and uses it (Maltz, 2011). Discoveries in cybernetics generally indicate that the brain and the nervous system make the mechanism that humans use. Its function is similar to an electronic computer and a mechanical targeting device. The human brain and nervous system have a goal-seeking mechanism that works automatically to reach a specific goal; Like a missile that moves towards the target. (Samer, 1996).

Psychocybernetics is the science of mind control and it means that every human being has a mental image or blueprint with him and he may not be aware of it or even not have the possibility to leave it consciously (Morselli & Maltz, 2008). In fact, it is believed that every human action begins with a thought, concept, idea, intuition, inspiration or mental image and leads to creativity. In other words, there is a sublime and invisible intelligence that is the intellectual support of all things, which some consider as the power of God Almighty, some consider it as the power of life, some as supreme intelligence, and others as God the Holy Spirit, and the main and ultimate goal of communication with this power (Azimi, Naghdeali & Sabbaghi Valashani, 2013).

With two preconditions, this issue can become the key to a better life. First, it should be known that all actions, feelings and behaviors of a person are formed based on the mental image, and secondly, the mental image can be changed, and age does not matter for this change, and it is never too late. This type of cybernetics with mind control can be very effective in changing life and creating a better life. For example, in order to have a better life, for 21 nights in bed, you should express the good events of life in the form of positive sentences because studies have shown that it usually takes 21 days to make a change in your mental image (Jafari, 2010). In fact, this period of 21 days was obtained from the research of Dr. Maltz, who was the first to use cybernetics in a psychological field and introduced the term "psycho-cybernetics" as a way to explain aspects of human thinking and behavior. His 1960 book Psychocybernetics is based on people's self-image. In his book, he mentioned that when a person's face is changed, for example, during a surgery, his personality, behavior, and sometimes even his basic talents and abilities also change. He observed that some patients who had facial appearance problems usually experienced an increase in self-esteem within 21 days after surgery because they changed their self-image in a positive way by seeing the new face. Maltz went on to study other patients who had a successful surgery but were not satisfied with the outcome. He believed that the way we perceive ourselves is the basis of our behavior and decisions (Morselli & Maltz, 2008).

So Metaverse can benefit from psycho Cybernetic science to transfer it to his avatar by studying the human mind. This makes it possible for the human avatar to act based on the learnings it has acquired from recognizing the mind of its physical counterpart, just like drones and self-driving systems. Of course, it should be noted that this issue is a very challenging discussion. Because artificial intelligence should not be out of human control, and this is an issue that can greatly achieve this.

3.11 Cybernetics in physiology and metaverse

By means of feedback, control and statistics, cybernetics has played an important role in understanding the phenomena of physiology and physiopathology and central nervous systems based on physical and engineering laws. This science in physiology, along with information theory, is in identifying the amount of information, and its application in physiology is similar to the application of algebra in mathematics. It is used with mechanisms of automatic regulation and feedback to cause stability in the physiology of living organisms or homeostasis (Laborit, 1961), which causes adaptation of the living organism to automatically regulate physical phenomena against internal and external changes in the environment. For example, the homeostasis of blood sugar regulation has such a system. Even in medicine, there are diseases called Cybernetic disease, which is known as cybernosis, and is caused by the disorder of the body's adaptive reactions in a regulatory manner in physical, psychological, and social actions, and is generally referred to as diseases that are caused by a disturbance in homeostasis (Giti,1971). This issue has a different appearance in Metaverse. Because the human avatar usually does not have vital signs. However, due to the emergence of remote medicine, through smart wearable systems, it is possible to provide a basis for avatars to have vital signs and in times of danger when the physical human loses consciousness and is unable to react. His avatar will contact the medical centers by recognizing the danger signs and provide the necessary information.

Figure 4. Cybernetics in physiology and metaverse

3.12 Cybernetics and bioelectrical control in the metaverse

The transmission of orders in the nervous system of animals is carried out by means of electrical pulses. For example, when a person wants to clench his fist, the electrical pulses of his hand muscles flow to perform this movement. The more a person tries to clench his fist, the more frequent these pulses will be. It turned out that such bioelectric signals, which are used by the body to control muscle movements, can also be used to control artificial devices. The necessity of such an interaction between the nervous system of the body and the means of human construction is raised, for example, in the design of actuators and artificial limbs. An actuator is a mechanism that imitates the movements of a human operator. Such mechanisms are used when the work must be done under dangerous conditions for humans (for example, work under radioactive radiation, or under high temperature and pressure and under water), as well as when force beyond human strength is used. Bioelectronic control systems intended for artificial limbs are very important. A group of engineers, physiologists and doctors have created an artificial hand that is controlled by biological currents (Zandian, 2019). Recently, the mechanism of the artificial hand, which is controlled through bioelectricity, has been perfected to such an extent that it performs the required movements of the fist and acts

according to the desire and will of the human who uses it, and its mechanism can be Set as desired. Today, artificial parts of the body that are controlled through electrical interconnections are produced on an industrial scale and have proven their invaluable value to many victims of accidents, enabling them to almost completely embrace their normal daily life and work. come back (Lerner, 1987). This topic can be used in Metaverse to establish a link between a person and his avatar. In fact, through Cybernetic principles, human movements can be transferred to his avatar so that the avatar learns to resemble its counterpart. This makes his avatar continue to live the same life as his counterpart after his death. Or that this topic can be used in the future when accidents happen to humans in order to bring them back to their previous life through the transfer of information from the avatar to the human nervous system.

Figure 5. Cybernetics and bioelectrical control in the metaverse

3.13 Cybernetics in medicine and metaverse

Medical cybernetics is a branch of cybernetics that is greatly influenced by the development of computer science and uses cybernetics concepts for medical research and planning. This science covers the application of communication systems theory, decision-making and linkage theory in the field of biomedical and health research. It also examines causal networks typical of human biology, medical decision-making, and the structure of data processing in living organisms. In terms of terminology, medical cybernetics is derived from medical informatics, simulation of medical biology systems and biosignal analysis. The history of medical cybernetics and its theoretical foundations are strongly related to biological cybernetics. The emergence and development of biological cybernetics is also related to the evolution of the concept of feedback in living systems and the efforts made to simulate the structural and operational coordinates of systems. In the early 1990s, the Cybernetics Association was established in the Czechoslovak Academy of Sciences, and in 1992, the Committee on Medical Cybernetics Formed in the Department of Health. This committee managed most of the research programs in medical cybernetics and informatics. In 1997-1999, this committee prepared an extensive project on medical information system. The first official lectures on medical cybernetics and biocybernetics were held at the University of Czechoslovakia in the late 1990s for students (Albaji, 2014).

In Iran, due to the establishment and establishment of various fields of basic sciences, the department of engineering and medical sciences, and the increasing dependence on modern medical technology and the increasing complexity of various technologies in the fields of health and medical care, and of course, their application, establishment and maintenance. In general, it has caused the medical and therapeutic community to find more need for the field of medical cybernetics, and the country's need for graduates of this field should increase greatly (Albaji, 2014).

The field of medical cybernetics is a very strategic field that was presented to the Ministry of Health in late 2014 after its formulation and was announced to all universities and higher education centers of the country with the approval of the Supreme Planning Council of Medical Sciences. With the establishment of this course at the master's level in the country's

universities, the Islamic Republic of Iran is the fourth country in the world after the United States, England and Finland to have this course in its higher education. Cybernetics graduates and specialists can design advanced and modern medical software and equipment such as endoscopy, MRI, fMRI, autoanalyzers, lasers, surgeon robots and smart rehabilitation aids for patients. According to Kovari, if this field and its application are well explained to universities and higher education centers across the country, it can lead to the production of ultra-advanced and valuable products and equipment for medical and rehabilitation activities, along with the field of nanotechnology (Kowari, 2015).

Regarding the application of medical cybernetics in Metaverse, we can refer to the previous example in the field of monitoring and controlling human symptoms. In fact, since the advent of telemedicine, it has been possible for people to communicate in different places at local, national and international levels. So Metaverse can use this issue to monitor and control human health using Cybernetic principles and by their avatar.

Figure 6. Cybernetics in medicine and metaverse

Lerner (1987) believes that "cybernetics, if not a key science on which our future social and organic evolution depends to a great extent, is a key science in many ways" (Davrpanah, 2015). Cybernetics is an interdisciplinary science and is used in all sciences, and it can be called the science of control systems (Esmailpour and Faqih, 2015).

4. Conclusion

Studying sources shows the importance and applications of cybernetics in human life and various sciences. As mentioned, cybernetics is an interdisciplinary science and is used in all sciences. If not, at least it has shown its use in most sciences. Cybernetics, in the sense of guidance and control, is based on the principles of feedback, control and communication, and is used in any science and field that studies the interaction between man and machine, man and man, and machine and machine.

Metaverse, which is a new concept with a history of about 2 years, is one of the topics that can find its way in cybernetic literature. Because Metaverse can benefit from cybernetics to control the three interactions between man and machine. In the present text, some of the applications of cybernetics in various fields were mentioned in a general way, and their importance and application in the metaverse space was also briefly mentioned. The study of sources showed that the major and main function of cybernetics in various sciences is to create stability, stability, control and improvement of the system using information and feedback. In fact, using feedback, cybernetics helps to create a flow of information in the system and communicate between its components to control the system in order to create stability and stability in order to improve and improve the system, and this is the model that Metaverse can benefit from. Because if Metaverse is going to create avatars of him as the second life of man, he should benefit from this model so that this work can be done as perfectly as possible. This basic model can be expanded in such a way that it can be used in any system and science where excellence and stability are discussed, to help this important issue in improving human life.

5. Suggestion

In this regard, it is suggested for future research that:
- A research should be carried out to clarify the connection between metaverse and cybernetic science.
- A research should be conducted that examines the metaverse as a cybernetic system,
- Conduct a research in the form of a systematic review to extract the common components between metaverse and cybernetics.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

References

Abbasi, Hamed, Zarei Zawarki, Ismail, & Nili Ahmadabadi, Mohammad Reza. (2023). Investigating the use of new metaverse technology in teaching and learning: a systematic review. *Education Technology* https://doi.org/10.22061/tej.2023.9818.2904

Adams, M. D., Hitefield, S. D., Hoy, B., Fowler, M. C., & Clancy, T. C. (2013). Application of cybernetics and control theory for a new paradigm in cybersecurity. *arXiv preprint arXiv:1311.0257*..https://doi.org/10.48550/arXiv.1311.0257.

Albaji, A. O. *Machine Learning for Environmental Noise Classification in Smart Cities*. Springer Nature.

Amerian, Shaghaig, Kikha, Mohammad Hosseinzadeh, & Mokhtari Afrakti. (2023). Sanctioning and extending the rule of "loss of goods before receipt" with the approach of buying in the Metaverse space. *Fiqh*, 30 (No. 3 (Autumn Season-115)), 40-69 (in Persian).

Ashby, W. R. (1954). The application of cybernetics to psychiatry. *Journal of mental science*, *100*(418), 114-124.https://doi.org/10.1192/bjp.100.418.114.

Azimi S, Naghdeali M, Sabbaghi Valashani R (2013). Unity of existence in cybernetic science. *J Basic Appl Sci Res* 3(3):16–20.

Davrpanah, Mohammad Reza (2015). *Cybernetics, the general theory of controlling mechanisms in mechanical and organic systems*. Tehran: Dabizesh (in Persian).

Darabpour, Mohammadreza. (2023). Metaverse; its nature and legal challenges (administration, persons and property), *New Technologies Law*, 4(7), 65-81. https://doi.org/10.22133/mtlj.2023.366623.1130 (in Persian).

Doran, Behzad (2008). *The impact of cybernetic environment on the social identity*, PhD thesis, Tehran, Tarbiat Modarres University, p. 23.

Esmailpour, Razia; Faqih, Nezamuddin (2015). A cybernetic approach to information storage and retrieval problems. *Library and Information Research Journal*, 6 (1), 5-24. https://doi.org/10.22067/riis.v6i1.44614 (in Persian).

Giti, Nasser (1971). Cybernetics in physiology, cybernoses and pharmacodynamics. *Journal of the Faculty of Medicine*, 29 (6), 221-229 http://tumj.tums.ac.ir/article-1-2208-fa.html (in Persian).

Gholamzadeh, Ahmad and Fathi, Behrooz (1986). *Cybernetics and its role in creating information systems, theoretical foundations of basic logistics information management*. Tehran: Publishing Institute of Imam Hossein University (in Persian). http://lib.ui.ac.ir/dL/search/default.aspx?Term=112310&Field=0&DTC=1.

Jafari, Salem (2010). Psychocybernetic. *Psychology of happiness and success*, 8 (85), 10 (in Persian).

Jamali Mehmoui, Hamidreza and Asadi, Saeed (2004). What is cybernetics? *Tadbir*, (155), 49-53 (in persian).

Khaki, Gholamreza (1991). Cybernetics and its application in management. *Management Studies*, 1(1), 62-88. https://dorl.net/dor/20.1001.1.22518037.1991.1.1.5.8. (in Persian).

Kowari, Habibullah (2015). With the suggestion of a faculty member of the University of Welfare and Rehabilitation Sciences; The field of "Medical Cybernetics" was established for the first time in Iran. Access at https://behdasht.gov.ir (in Persian).

Laborit, H. (1961). *Physiologie humaine: cellulaire et organique*. Masson.

Lerner, A (1987). *Fundamentals of Cybernetics*. Translated by Kiyomarth Periani, Tehran: Daneshpazhoh (in Persian).

Maltz, Maxwell (2011). *Psychology of mental imagery: Psycho-cybernetics, the science of mind control*. Translated by Mehdi Karache Daghi. Tehran: Shabahang (in Persian).

Mirzaei Ahranjani, Hassan (1988). Cybernetics in management (1). *Management knowledge*. 1:17-24 (in Persian).

Mohammad Hasani, Shabnam (2023). Examining the architecture, standards, advantages and challenges of the metaverse field, *the 9th international web research conference*, Tehran, https://civilica.com/doc/1672051 (in persian).

Morselli PG, Maxwell Maltz, (2008). Psychocybernetic plastic surgeon, and personal reflections on dysmorphopathology. *Aesthetic Plast Surg*; 32:485–495. 10.1007/s00266-007-9006-9.

Nuncio, R. V., & Felicilda, J. M. B. (2021). Cybernetics and Simulacra: The Hyperreality of Augmented Reality Games. *KRITIKE: An Online Journal of Philosophy*, *15*(2). doi: 10.25138/15.2/a3.

Samer, Bobby (1996). *Psycho-Cybernetics 2000: The Automatic and Objective System of the Mind*. Translated by Abbas Chaini, Tehran: Alborz (in Persian).

Yao, X., Ma, N., Zhang, J., Wang, K., Yang, E., & Faccio, M. (2022). Enhancing wisdom manufacturing as industrial metaverse for industry and society 5.0. *Journal of Intelligent Manufacturing*, 1-21. 10.1007/s10845-022-02027-7.

Zahedi, Shams al-Sadat, Asadpour, Amin and Haji Nouri, Khatira (2009). The relationship between cybernetics and knowledge management in the organization. *Improvement and Transformation Management Studies*, (63), 1-25. https://dorl.net/dor/20.1001.1.22518037.2010.20.63.1.1 (in Persian).

Zandian, Fatemeh (2019). *Getting to know the concepts, principles and application of cybernetics. Creators*. Leila Jabari, Mila Malkalkalami, Najmeh Nazeri and Hassan Logiq. Tehran: Chapar (in Persian).

Zandian, Fatemeh; Jabari, Leila and Logic, Hassan (2018). Application of cybernetics in *knowledge management in organizations. Science Promotion*, 10 (17), 33-47. https://dorl.net/dor/20.1001.1.22519033.1398.10.2.2.6. (in Persian).

Zouwen, Johannes Vander & Smit, Johannes (2003). Control processes in survey interviews: A cybernetic approach. Paper presented at the Fourth internaϴonal conference on sociocyberneϴcs; *Corfu, Greece*. https://doi.org/10.1108/03684920510595319.