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Logical Structure School I (Five Fundamental Theories)

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Abstract

Based on The Purpose of Logical Structure School, Logic Structure, Logical Engineering, Theory of Logical Equation Structure Diagrams, and Bionic Logic Theory, this paper proposes five foundational classical theories (The Purpose of the Logical Structure School, Subjective Initiative Structure, Subjective Initiative Structure Engineering, The Life-Giving Logical Equation Structure Diagram, and Bionic Logic), providing directions, methods, and criteria for foundational research on artificial intelligence, robotics and the age of intelligence.

Keywords

Purpose, Subjective Initiative, Life-Giving Logical Equation Structure Diagram, Bionic Logic

1. Purpose of the Logical Structure School

Introducing the "School of Logic and Structure".

As an introduction, I will provide an overview of the Logical Structure School. It is becoming increasingly clear that intelligent technology will be the driving force behind all human endeavors in the future, and determine the development of any country. Intelligent technology will usher in a new revolution for humanity—the Intelligence Revolution—fundamentally transforming the entire foundation of human survival and development. Within this revolution, I have proposed the "Logical Structure School", a self-contained academic system of thought, featuring the following ideas:

① The invention of the "Life-giving Logical Equation Structural Diagram" and a complete theoretical framework.

This is the first revolutionary tool in the intelligent technology revolution, and

is of paramount importance. It can be said that the transformation of humanity by intelligent technology will begin with the life-giving logical equation diagram.

② Serving as the foundation for next-generation software operating platforms.

③ Serving as the foundation for next-generation network software operating platforms.

④ Serving as the organizational model for next-generation network structures.

⑤ Serving as the organizational model for next-generation integrated circuit chips.

For over half a century, humanity has relied on the John von Neumann architecture to design central processing units, but I now propose a new concept: While developing the software operating system using the life-giving logical equation diagram, we can simultaneously redesign the central processing units with the same structure; The software operating platform's logic equation structure diagram, including its equation unit generator, clock system, mailbox, address system, registers, and other essential components, would be integrated into the central processing unit. The equation unit generator, clock system, communication system, address manager, and registers would replace the traditional controllers and arithmetic logic units, with auxiliary facilities in diagram form, enabling a collaborative approach between hardware and software to realize the Life-giving Logical Equation Diagram; The equation generator would replace the arithmetic unit, redesigning computation methods. Instead of conventional arithmetic operations, the equation generator's ability to analyze, reason, and generate new equations would enable intelligent computation; The clock system would issue clock variables to control all equations and hardware devices, creating intelligent control in place of more traditional control mechanisms. The equation unit generator would manage the clock system, dynamically generating or eliminating clock equations as needed; The communication system would continue to utilize communication variables to manage the mailbox for all structure diagrams. However, the equation unit generator would control the communication system by generating or eliminating communication equations in a dynamic manner; The address manager would continue to issue address variables using address equations to allocate new equation units and variable sets. The equation unit generator would then control the address manager by generating or eliminating address equations. Additionally, the address manager would also oversee the management of the central processing unit's registers; Auxiliary facilities would exist in the form of logical equations, and be managed by the equation unit generator.

I will continue to refine this research! If feasible, this will mark the beginning of a revolution in software, hardware, and networks driven by the equation structure diagram, as well as the transformation of the Von Neumann architecture. This can be achieved by combining the equation diagram with quantum and biological computing.

⑥ Utilizing the equation structure diagram as the organizational framework for chips, forming the hardware infrastructure of intelligent machines and intelligent

networks.

⑦ Utilizing the equation structure diagram to implement intelligent analysis, intelligent information reasoning, and intelligent structural reasoning; utilizing the equation structure diagram-based reasoning to create artificial intelligence and robotics; and utilizing the equation structure diagram-based intelligent network analysis, intelligent network information reasoning, and intelligent network structure reasoning to build an intelligent society.

⑧ Transforming traditional mathematics by replacing its research tools with equation diagrams; traditional mathematical results will be used to construct the relationships between numbers in logical equations, while new mathematical research will adopt the equation diagram as both working and descriptive languages.

⑨ Transforming traditional physics by re-framing existing physical research results using the equation diagrams; new research in the world of physics will also use the equation diagram as both working and descriptive languages.

⑩ Revolutionizing all fields of human academic research.

The equation structure diagram transforms mathematics into Logical Mathematics, and physics into Logical Physics. In turn, Logical Mathematics and Logical Physics create Logical Space-Time. The difference between Logical Space-Time and traditional space-time is that the former exists in the form of the equation structure diagram.

By revolutionizing all human academic research through equation diagrams, bionic logic, logical mathematics, logical physics, and logical space-time, six key points emerge: By re-framing existing research results using the equation structure diagram, the Logical Structure School will ensure the inheritance of established truths, guiding research towards a scientific path and avoiding pseudo-scientific approaches; New academic research will utilize the equation structure diagram as both working and descriptive languages; The life-giving logical equation diagram will be used to model all research objects; Extensive interdisciplinary collaboration and comprehensive research will be fostered across all fields; New research approaches will be created for collaboratively studying academic objects of intelligent society; Intelligent machines and intelligent networks can be extensively applied in the form of equation structure diagrams to conduct academic research.

Transforming all human industrial and agricultural practices.

There are five key points in this section: Utilizing intelligent societies in the form of equation structure diagrams to conduct industrial and agricultural production; Establishing widespread industrial and agricultural models built upon the equation structure diagram; Employing intelligent society control, intelligent society research, intelligent industrial and agricultural models, and intelligent network development to create distributed production units, with logistics organized in a logical network; Adopting a reformed academic approach based on the equation structure diagram for industrial and agricultural research; Extensive use of intelligent machines and intelligent networks, with both their logical structures

based on the equation structure diagrams.

While proposing the equation structure diagram as a transformative tool, the Logical Structure School also advocates for an intelligent society order based on civil rights, human rights, and the rule of law, aiming to prevent potential disasters caused by intelligent warfare and intelligent authoritarianism.

The majority of these ideas have been addressed in the first and second papers, while the remaining parts will be developed and presented in the upcoming third paper.

The first paper introduced five foundational theories: The Purpose of the Logical Structure School, The Subjective Initiative Structure, Subjective Initiative Structure Engineering, The Life-Giving Logical Equation Structural Diagram, and Bionic Logic. These theories provide direction, methodology, and evaluation criteria for the foundational research of artificial intelligence, robotics, and intelligent societies.

The second paper introduced nine applied classical theories: Logical Spacetime and Logical Mathematics and Physics, Logical Fields, Logical Networks, Life Communication, Life Reasoning Activity, Life Cycles, Life Data, Life Programming and Life Learning Strategies. These theories, which are based upon the five foundational classical theories from the first paper, provide a comprehensive overview of the technological development of the three key subjects, namely artificial intelligence, robotics and intelligent societies, from the perspective of an entire academic school.

The third paper, The Logical Structure School III (Five Working Steps) will build upon the five foundational classical theories from the first paper and the nine applied classical theories from the second paper. It will introduce five working methods for the intelligent era, namely Hermeneutics, Development, Normativity, Intersectionality and Foundations, which are intended to serve as a starting point for further exploration. Hermeneutics will focus on the intelligent analysis of the Logical Equation Diagram; Development will explore the paths to realizing the ideals of the Logical Structure School; Normativity will examine how to establish an intelligent social order based on civil rights, human rights, and the rule of law; Intersectionality will investigate academic, industrial and agricultural intersections; and Foundations will study how to translate the theories of the Logical Structure School into practical applications.

Origin of this Research

Prior research

Humans establish subjective order based on subjective laws, such as using politics to regulate social order. Similarly, they also established objective order based on objective rules; for instance, ancient agriculture scheduled farming based on the growth patterns of crops, while ancient animal herders regulated the order of their lives from the availability of water and grass based on the growth patterns of livestock. Early industrial civilization was governed by Newtonian mechanics, an objective set of rules that dictated the industrial order, including the order of

machinery, the order of factory production, the technological order for nations and humanity, and the order of agriculture and industry. Later, the order of energy automation and industry was regulated by the objective rule of relativity. With the invention of the computer, John von Neumann proposed the von Neumann architecture, which established the objective rules and order for the composition of computers. As humanity stands on the brink of the intelligent era, we find ourselves ignorant of the objective rules and order that will govern this new age. Current intelligent technologies merely scratch the surface using the outdated technology of the industrial era. Without understanding the objective rules of the intelligent era, we cannot explore its new order, find the right path to developing artificial intelligence, robotics, and intelligent society, or avoid ethical risks. In light of this, the Logical Structure School has pioneered the exploration of the objective rules and order of the intelligent era.

The published paper, The Fundamental Theory of Artificial Intelligence—Logical Structure and Logical Engineering, is the first phase of research in the Logical Structure School, exploring the objective rules of the intelligent era. Taking from The Logical Structure School, the second phase of research shifted the focus from general study to the structure of subjective initiative, exploring the objective rules and order of the intelligent era. Due to the extensive scope, this research is presented in three separate papers. The first paper, Logical Structure School I (Five Fundamental Theories), explores the objective rules of the intelligence era, proposes five fundamental theories for fundamental research into the intelligent era, and provides preliminary insights into the theories and examples. The five theories are ① The Purpose of the Logical Structure School, ② Logical Structure; ③ Logical Engineering, ④ Logical Equation Structure Diagram Theory, and ⑤ Bionic Logic Theory. The second paper, Logical Structure School II (Nine Applied Theories), explores the objective order of the intelligent era, proposes ① Logical Space Theory, ② Logical Field Theory, ③ Logical Network Theory, ④ Life Communication Theory, ⑤ Life Reasoning Activity Theory, ⑥ Life Cycle Theory, ⑦ Life Data Theory, ⑧ Life Programming Theory, and ⑨ Life Learning Strategies for applied research in the intelligent era, and preliminarily explores the theories and cases. The third paper, Logical Structure School III (Five Working Steps and Several Issues to be Explained), proposes five working methods, preliminarily explores the theories and cases, and explains several issues. The five working methods are ① Hermeneutics, ② Development, ③ Normativity, ④ Intersectionality, and ⑤ Fundamentals. These three pioneering works all serve as the foundation for research on the intelligent era.

This Paper

This paper proposes a roadmap for foundational research on intelligence for the intelligent era. ① It determines that the research object is the subjective initiative structure, which is presented through Logical Structure. The objective rules of the intelligent era are determined by the subjective initiative structure, as is the objective order of the intelligent era. ② It proposes the purpose of the Logical

Structure School to explore the development paths of subjective initiative structures that benefit humanity and prevent harm. ③ It studies the process of subjective initiative structure construction and production using Logical Engineering. ④ It proposes the Theory of Logical Equation Structure Diagram and the Theory of Bionic Logic as basic tools for researching subjective initiative structure. These bionic logic methods breathe life into the logical equation structure diagram and create the first living graph theory in academia, thereby adapting to the description of living subjective initiative structures and creating a society of artificial intelligence, robotics, and intelligence.

1.1. Aims

The purpose of the Logical Structure School is to answer two key issues. First, what is the goal of human intelligent technology development? Second, what are its limitations?

1.2. Motivation

1.2.1. The Dimensions of Intelligence

Mathematics and physics have theories of multi-dimensional space as the results of research and the needs for the future development in these fields. Similarly, the Logical Structure School assets that research on intelligence requires clear delineations, otherwise many theoretical and technical issues would lack clear definitions, making it impossible to discuss them thoroughly.

Inspired by the theory of mathematical space, the Logical Structure School proposes a new theory of intelligence dimensions. One-dimensional intelligence refers to the intelligence of primary structures, consisting solely of practical structural elements such as bacteria or single-celled organisms, characterized as the simplest form, yet serving as the foundational unit for all intelligence. Two-dimensional intelligence pertains to intermediate structures with environmental variables. This type of intelligence can interact with and shape its environment, which is a fundamental capability necessary for all higher forms of intelligence, as seen in plants and very primitive animals. Intelligence beyond three dimensions is collectively referred to as multidimensional intelligence, which is characterized by the presence of subjective initiative variables, also known as subjective initiative structures. This multidimensional intelligence is classified based on the complexity of its subjective initiative structures. For instance, single-digit degrees of complexity corresponds to three-dimensional intelligence, two-digit degrees of complexity to four-dimensional intelligence, and triple-digit degree of complexity to five-dimensional intelligence, and so on. To determine the complexity of subjective initiative, it is necessary to identify several indices of subjective initiative structures, which are derived using functions similar to those used for empirically calculating financial indices; the weighted sum of these indices yields the complexity of the subjective initiative structure. The following indices are initially proposed, all of which can be adjusted according to specific needs: Cellular Size Index

(general weight), Cognitive Difficulty Index (heavy weight), Communication Scale Index (general weight), Engineering Scale Index (general weight), and Moral and Legal Index (heavy weight). The Moral and Legal Index is particularly important, as it is the most crucial method for controlling intelligence.

In this way, intelligence is divided into different dimensions, similar to mathematical spaces. However, is there a connection between multidimensional intelligence and multidimensional space? Indeed, the answer is yes. The more dimensions a space has, the more complex the highest forms of thought it can generate, and the higher the dimensions of its intelligence will be. Future interdisciplinary research in mathematics and intelligence will likely confirm that multidimensional space and intelligence correspond to each other.

1.2.2. The Purpose of Intelligent Technology Development

1) Objective

The objective of intelligent technology is to continuously ascend in dimensions, allowing the complexity of subjective initiative structures to rise from lower to higher dimensions of intelligence, and enabling subjective initiative structures to progress from lower to higher dimensional mathematical spaces and acquire the capabilities inherent within them, thereby creating immense abilities in subjective initiative structures.

2) Limitations

The Logical Structure School ultimately creates engineering theories and products based on subjective initiative through research on and construction of a three-level structure, namely the elements of various practical structures, environmental variables, and subjective initiative variables. Subjective initiative is a structure that acts on all kinds of logic, with capabilities that can be almost unimaginable, representing the first-dimensional reduction capability that humans have encountered. In other words, subjective initiative can exist in higher dimensions and exert influence on objects in lower dimensions. With the development of subjective initiative structures, the phenomenon seen in science fiction whereby four-dimensional objects control three-dimensional or even two-dimensional subjects will gradually become a reality. This advancement raises a crucial issue. While the subjective initiative is ideally used for good, what happens if it is used for malicious purposes? The application of subjective initiative involves three main subjects: artificial intelligence, which generates evil thoughts and represents the least severe form of evil; robotics, which combines evil thoughts with evil entities, presenting a more significant threat; and control of intelligent society, where the potential for malevolence becomes frightening. For example, subjective initiative weapons used in warfare could surpass all existing weapons and potentially devastate humanity on an unprecedented scale across all areas of human activity in an instant through the logic of dimensional reduction. Moreover, tools used for human domination could create dimensional reduction domination, similar to how humans dominate dogs, cats and livestock. This new form of domination would likely obliterate human rights, rule of law, democracy, and freedom. The

rulers would evolve into a new species, while the populace would be forcibly transformed into a new species. Simply put, rulers and people would no longer exist in the same dimension, with rulers governing and enslaving the lower-dimensional populace from a higher dimension. The Logical Structure School is deeply opposed to these potential new forms of warfare and domination that subjective initiative structures might create. The Logical Structure School puts forward its own purposes, both to explore the principles of creating high-dimensional subjective initiative structures, and to firmly prevent the destruction of human civilization through emergency high and low dimensional divides. In order to prevent evil situations like the coexistence of nuclear weapons and nuclear energy, in the same way that industrial civilization elevated its purposes to industrial ethics and then to industrial laws, the Logical Structure School is researching how to ensure that the development paths of artificial intelligence, robotics, and intelligent societies adhere to its purposes.

Limitation refers to opposing the potential evils that intelligent technology may produce. The methods of limitation include ethics, law, international treaties and supervision, and checks and balances through balance of power.

1.3. Case Studies

Even if the Logical Structure School does not advocate for intelligent warfare and intelligent domination, major powers will inevitably pursue research in these areas, which will likely take shape over about 100 years. In this context, the Logical Structure School outlines its stance on intelligent warfare and intelligent domination.

The roadmap for the development of intelligent warfare armies progresses from human-only armies into integrated human-machine armies, and ultimately to fully machine armies. The command structure of unmanned armies is entirely composed of machines with subjective initiative structures. The top-level machines are controlled by the human command center, and the army under this command structure is equipped with intelligent weapons that can be deployed throughout the entire universe. Both the subjective initiative machines and intelligent weapons are developed using bionic logic methods and life-giving logical equation structure diagrams. The intelligent unmanned army represents a form of autonomous strike capability. As the complexity of subjective initiative structures reaches a certain level, the intelligence dimension of the army is enhanced, allowing it to access higher-dimensional mathematical spaces, and enabling the command system to control all intelligent weapons to suppress people and attack enemies. This is a form of logical warfare rather than conventional warfare. War with an uneven adversary is akin to a war between humans and chickens, ducks, pigs, or dogs – a form of dimensional reduction warfare. In practice, it would result in a massacre, with a scale and cruelty thousands of times greater than any war in human history.

The development roadmap for intelligent domination progresses from human rule to human-machine rule, and eventually to machine rule. In the era of machine

rule, the entire governance system will consist of machines with subjective initiative structures and intelligent front-line enforcement machines. At the highest level, the governing machines will be controlled by a ruling group of humans, while traditional front-line enforcement officers will be replaced by intelligent machines. Those ruling and enforcement machines will be developed using bionic logic methods and life-giving logical equation diagrams, representing a form of unmanned domination, where the dimensional elevation of subjective initiative structures creates higher dimensional mathematical spaces, thus stripping people of all civil rights and human rights. For instance, individuals will lose all privacy, and will never have the power to say "no," akin to the domination of humans over chickens, ducks, pigs, and dogs.

The conscience of scientists reveals that both intelligent warfare and intelligent domination carry the potential to evolve into forms of evil a thousand times more severe than nuclear weapons. The Logical Structure School calls on humanity to extensively research the prevention of the evils caused by intelligent warfare and intelligent domination. It particularly emphasizes the political theories of Thomas Jefferson, the third president of the United States, who advocated for civil rights, human rights, and the rule of law, all of which can serve as crucial guiding ideologies for a just and equitable order in the intelligent era.

1.4. First Foundational Classical Theory

The first foundational classical theory of the Logical Structure School is The Purpose of the Logical Structure School.

Over the course of human history, two types of logic have emerged: subjective and objective logic. Subjective logic has evolved into beliefs and religions, but its shortcomings are evident, as it cannot produce technologies like automobiles, high-speed trains, or penicillin. Moreover, it is often used to build malevolent ideologies. Objective logic has developed into modern academia, science, and technology, on the other hand, and guided humanity in developing advanced technologies and civilized societies, but its limitation is that it is only suited for industrial society, and is evidently inadequate for the intelligent society. For example, it cannot provide new perspectives on the universe, new outlooks on life, and new methodologies required by the intelligent society. Additionally, individualism, one of its key attributes, could become the greatest threat to the intelligent society. Given these circumstances, the Logical Structure School proposes its own purposes and invents a new subjective logic to replace both traditional subjective and objective logic.

In brief, the new subjective logic uses objective logic to research problems and subjective logic to solve problems. This objective logic however refers not to the traditional form, but to a new objective logical theory provided by the new subjective logic, replacing the objective material world with a new world of objective logic, and also to substituting traditional perspectives on the universe, outlook on life, and methodologies with new perspectives derived from this new objective

logic. Moreover, subjective logic here refers to neither traditional belief or religion, nor individualism, but rather subjective logic constructed by beliefs in human rights and rule of law that an intelligent society should possess. Its primary function is to exclude individualism that could harm the intelligent society. The logical structure provides both the objective logic for researching problems and the subjective logic for solving problems, thus forming the perspective of the universe and outlook on life of an intelligent society. The Logical Structure School aims to replace traditional subjective and objective logic with this new form of subjective logic, which will be used as the future fundamental logic for artificial intelligence technology, robotics technology and the intelligent society.

2. Logical Structure

2.1. Macroforms of Logical Structure

2.1.1. Using Mathematics to Build Logical Structures

The Logical Structure School employs a three-layer structure: advanced, intermediate, and primary logical structures. This three-layer structure was first proposed by Dong H. Liu in 3D Social Engineering (Chinese Version) (Guangzhou: Jinan University Press, 2012).

Primary Logical Structure = Elements of Various Practical Structures + Inherent Logical Associations (Formula 1).

Intermediate Logical Structure = Primary Logical Structure + Environmental Variables + Inherent Logical Associations (Environmental variables are derived from the logical equations of the logical field) (Formula 2).

Advanced Logical Structure = Intermediate Logical Structure + Subjective Initiative Variables + Inherent Logical Associations (Subjective initiative variables are derived from the logical equations for brain tissue) (Formula 3).

① Lifeless Objective Structure

Primary Logical Structure = Intermediate Logical Structure = Advanced Logical Structure (Formula 4).

② Subjective Structure of Plants and Animals

Intermediate Logical Structure = Advanced Logical Structure (Formula 5).

③ Subjective Structure of Humans

Advanced logical structure, composed of three hierarchical structures: primary structure, intermediate structure and advanced structure.

Advanced Logical Structure = Primary Logical Structure + Intermediate Logical Structure + Advanced Logical Structure (Formula 6).

2.1.2. Primary Structure

Primary Logical Structure = Elements of Various Practical Structures + Inherent Logical Associations.

The primary structure uses basic elements and a basic element collection (referred to as the basic element set) based on the scientific theory of granularity. Here, the elements are described by the concept of element logical classes, which

is defined as follows:

Element Logical Class = Element Description Collection (Description Set) + Element Attribute Operation Collection (Attribute Set) + Element Function Operation Collection (Functional Set) (Formula 7).

Thus, the basic element set is the collection of element logical classes.

Primary Structure = {All Element Logical Classes + Integration of All Element Logical Classes with Other Element Logical Classes + Integration of All Element Logical Classes with Integrated Logical Classes + Integration of All Integrated Logical Classes with Other Integrated Logical Classes} (Formula 8).

The elements of the various practical structures refer to the two objects involved in all participating integrations. Inherent logical association refers to the method of integrated operation, which can be function theory, algebraic structure theory (algebraic systems, semi-groups, groups and subgroups, Abelian groups and cyclic groups, homomorphisms and isomorphisms of algebraic systems, rings and fields), lattices and Boolean algebra, or graph theory, etc. Innovative methods can also be introduced.

Primary structures, or objective structures, are the foundational structures of life that realize life activities and life cycles, such as single-celled organisms; the main components of these structures are the various elements of practical structures.

2.1.3. Intermediate Structure

Intermediate Logical Structure = Primary Logical Structure + Environmental Variables + Inherent Logical Associations.

The structure of the primary logical structure is as follows:

Primary Structure = {All Element Logical Classes + Integration of All Element Logical Classes with Other Element Logical Classes + Integration of All Element Logical Classes with Integrated Logical Classes + Integration of All Integrated Logical Classes with Other Integrated Logical Classes};

Environmental variables generate logical fields, which in turn generate a collection of filtering conditions for the elements of the primary structure collection. The filtered primary element classes become the tissues and organs of the primary element classes, considering a logical structure that adapts to the environment for survival. Filtering takes the form of logical equations, which are filtered by variable values.

Inherent logical associations refer to the filtering operations.

Intermediate Structure = Collection of Filtered Primary Structures (Formula 9)

Intermediate structures, or survival structures, are the basic structures of life that can mutually shape life and its environment, such as single plants and lower forms of life; the main components of these structures are environmental variables.

2.1.4. Advanced Structure

Advanced Logical Structure = Intermediate Logical Structure + Subjective Initiative Variables + Inherent Logical Associations.

The intermediate logical structure is as follows:

Intermediate Structure = Collection of Filtered Primary Structures.

Subjective initiative variables are generated by the logical equations for brain tissue, and then become filtering conditions for the intermediate structure collection. During execution, intermediate filtering is performed before advanced filtering, a requirement for brain tissue to filter intermediate tissue structures in order to perform subjective and objective activities. The filtered intermediate tissues participate in current life activity. The advanced structures select intermediate tissues for subjective initiative, using the variable values of the logical equations of the brain tissue for filtering.

Inherent logical association refers to the filtering operation.

Advanced Structure = Filtered Intermediate Structure Collection (Formula 10);

Advanced structures, also known as subjective structures, are the advanced structures of life that realize life activities and life cycles, mutually shape life and its environment, and create intelligence. Their main components are subjective initiative variables.

2.1.5. Subjective Initiative

Subjective initiative is the collection of filtering conditions for intermediate structures generated by the values of subjective initiative variable. These values are generated by the logical equations of brain tissue, including all operations needed for subjective initiative. The filtering conditions first determine the required attributes or functions, and then identify logical classes based on these attributes or functions, which then complete the filtering of logical classes and form the intermediate tissues required for advanced structural activities. Filtering is carried out by the logical equations of the brain tissue using the variable values.

2.1.6. Logical Thinking to Recognize Problems

① Objective material thinking which recognizes problems with primary structures

The subject of cognition is objective structures without life

Primary Logical Structure = Intermediate Logical Structure = Advanced Logical Structure (Formula 4).

Primary Logical Structure = Elements of Various Practical Structures + Inherent Logical Associations (Formula 1).

Thus, this kind of thinking is the same as the academic thinking of the existing industrial society.

② Low-level objective logical world thinking which recognizes problems with intermediate structures

The main subject of recognition is the subjective structures of plants and animals.

Intermediate Logical Structure = Advanced Logical Structure (Formula 5).

Intermediate Logical Structure = Primary Logical Structure + Environmental Variables + Inherent Logical Associations (environmental variables are derived from the logical equations of the logical field) (Formula 2).

In contrast the traditional academic thinking of industrial society, this kind of thinking uses environmental variables to recognize problems. It begins to transform

material thinking with logic, serves as the foundational thinking for artificial intelligence and robotics in recognizing problems, and is also the foundation of all academic disciplines in an intelligent society.

③ High level objective logical thinking which recognizes problems with advanced structures

The subject of cognition is the subjective structure of human beings.

Advanced logical structure, composed of three structure levels: primary, intermediate, and advanced structures.

Advanced Logical Structure = Primary Logical Structure + Intermediate Logical Structure + Advanced Logical Structure (Formula 6).

Advanced Logical Structure = Intermediate Logical Structure + Subjective Initiative Variables + Inherent Logical Associations (Subjective initiative variables are derived from the logical equation for brain tissue) (Formula 3).

This type of thinking uses subjective initiative variables to recognize problems. Subjective initiative can embody human beliefs in rights and rule of law, playing a dominant role in the advanced logic for artificial intelligence, robotics, and the intelligent society, realizing the goals of the Logical Structure School by controlling the transformation of basic logical thinking from traditional material thinking, and leading humanity from the era of material thinking into logical thinking.

2.1.7. Logical Thinking for Problem Solving

① Objective material thinking that solves problems with primary structures

This is the traditional approach of industrial society to problem solving using traditional material thinking.

② Low-level subjective logical world thinking that solves problems with intermediate structures

This method uses environmental variables to solve problems, employing basic logical thinking instead of traditional material thinking.

③ High-level subjective logical world thinking that recognizes problems with advanced structures

This approach uses subjective initiative variables to solve problems. Subjective initiative variables can generate advanced logical thinking guided by beliefs in human rights and rule of law. This advanced logical thinking controls and transforms basic logic and traditional material thinking, allowing human problem recognition and solving to evolve from material thinking into logical. This forms a new way of thinking suited to the needs of artificial intelligence, robotics, and intelligent society, thereby establishing a new world of human thought, akin to the intellectual revolution brought about by theocratic Europe and the heliocentric model, creating a revolution in thought.

2.2. Microforms of Logical Structures

2.2.1. Theories of Simulating Life and Humans

The microscopic forms of logical structures based on the theory of simulating life and humans include elements such as composition featuring learning, memory,

signal transmission and reception, and a clock. For instance, both animals and humans have nerve cells and brain cells, and the brain possessing capabilities such as learning and memory, among others.

2.2.2. Microscopic Forms of Primary Structure

In the macroscopic form of primary structures, the logical class of elements can be represented as:

Element Logical Class = Element Description Collection (Description Set) + Element Attribute Operation Collection (Attribute Set) + Element Functional Operation Collection (Function set).

After introducing the theory of cell structures, the element logical class can be represented as follows:

Element Logical class = {Element Description Collection (Description Set) + Element Attribute Operation Collection (Attribute Set) + Element Functional Operation Collection (Function Set)} + {Storage Set + Mailbox + Logical Equation Structure Diagram of the Element Storage Set + Clock Equation Structure Diagram of the Element Storage Set} (Formula 11).

Here, the description set, attribute set and function set are all structure diagrams of logical equations. Data is stored in the variables of the logic equations, all consisting of logical data classes. The description set, attribute set and function set can all store data. The data itself is also a data logical class.

The mailbox can send and receive both logical messages and other logic, including substance. During the integration, the storage set, mailbox and clock can all be integrated according to given rules.

Notes:

① The primary structure of the logical structure is composed of elements, guided by a scientific granularity theory. Elements constitute an element set, which represents the collection of these elements.

② Data logical class = Description Set + Attribute Set + Function set (Formula 12).

The description set is a collection of various descriptions for the elements. The attribute set for the elements is derived from the attribute operations, while the function set is derived from the functional operations. For example, the description set could represent a person, then the attribute set represents the life of this person, and the function set represents their work.

③ To establish a theory that encompasses elements, element integration, and integrated element integration, the mathematical logic of the set theory is used to establish the element sets, then a rational theory is built on the foundation of the set theory and used to integrate the elements and integrated elements, to finally form a whole. Function theory, algebraic structure theory, various group theories, homorphism and isomorphism theories, ring and field theories, lattice and Boolean algebra theories, and other algebraic system theories based on rational theory are used to investigate the properties of the structure. The ultimate result is represented by a structure diagram of the logical equation.

④ Understanding the primary structure requires attribute sets and function sets. The attribute set is a collection of attribute operations for elements, integrated elements, integrated element integration and the whole set; the function set is a collection of function operations for elements, integrated elements, integrated element integration and the whole set. Both are represented by the structure diagram of the logical equation, laying the foundation for the establishment of intermediate structures.

⑤ The microscopic primary structure is often an objective component of a logical structure. This objective component then undergoes filtering through a logical field to become a microscopic intermediate structure. The microscopic intermediate structure is in turn, refined into a microscopic advanced structure through subjective initiative. The filtering of subjective initiative is akin to how plant tissues organize themselves for photosynthesis, or how a person's visit to a restaurant involves the organization and utilization of various bodily structures.

2.2.3. Microscopic Forms of Intermediate Structure

The macroscopic form of the intermediate structure is as follows:

Intermediate Structure = Collection of Filtered Primary Structures

The microscopic form of an intermediate structure tissue is as follows:

Intermediate Tissue = {Tissue Description Set + Tissue Attribute Set + Tissue Function set} + {Memory + Mailbox + Logical Equation Structure Diagram of the Memory + Clock Equation Structure Diagram of Memory} (Formula 13)

The forms of the description set, attribute set, and function set are structure diagrams of the logical equations. Data is stored in the variables of the logic equations, which are all logical data classes. The description set, attribute set and function set can all store data within these classes.

The microscopic form of the logical fields is that of a primary structure filtered by the microscopic form of the environment. The filtering here can be applied to the description set, attribute set, function set, storage set, mailbox, and clock, or any combination of the above.

The microscopic form of the intermediate structure depends on the microscopic logical fields and microscope primary structures, and is the result of the environmental filtering produced by the logical field on the microscopic primary structure. After filtering, the primary structure becomes the intermediate structure.

2.2.4. Advanced Logical Structure

Macroscopic Form:

Advanced Logical Structure = Intermediate Logical Structure + Subjective Initiative Variables + Inherent Logical Associations.

Microscopic Form:

Advanced Structure of Life Activity = Brain Tissue + Nerves + Filtered Intermediate Tissue (Formula 14).

Brain Tissue = {Description Set + Attribute Set + Function set} + {Brain Memory + Nerves + Logical Equation Structure Diagram for Brain Memory +

Clock Equation Structure Diagram for Brain Memory} (Formula 15).

where the forms of the description set, attribute set and function set are all structure diagrams of the logical equations. Data is stored in the variables of the logic equations, and their variables are all data logical classes. The description set, attribute set and function set can all store data within these classes.

According to the theory of human simulation, the advanced logical structure is composed of brain and memory structures, generated using subjective initiative variables. Learning functions are produced by editing the memory structure produces, while the intrinsic logical relationships of the advanced structure generate the nerves and their functions.

The microscopic form of advanced structures primarily consists of subjective initiative structures, referred to as brain tissue or intelligence.

2.3. Logical Mechanics

2.3.1. Logical Force

Natural logical fields refer to the interaction of matter as a logical force, while social logical fields refer to the interaction between humans as logical forces. Logical forces also encompass the combined effects of natural and social logical fields, including the resulting logical forces. The impact of logical forces on logical structures is reflected in logical changes and modification transmission within the logical structure. Logical changes refer to changes in logical equations related to logical structures, while modification transmission reflects the impact of logical forces on logical equations related to logical structures.

2.3.2. Logical Mechanics

Logical mechanics are generated by introducing logical truth values (1 or 0) into logic structure or logic engineering, which is equivalent to the principles of mechanics in construction engineering. If the truth value of a structure diagram of the logical equation is true (1), this indicates that the diagram can be implemented, while if the truth value is false (0), the diagram cannot be implemented. To establish and develop this theory of logical mechanics, we must summarize the subjective and objective laws that can be built from the structure diagram of the logical equations. These principles are referred to as mathematical logic, serving as the objective foundation for the existence, operation and development of structure diagrams of the logical equations. It plays the same role as the physical mechanics or construction mechanics which support building safety, and therefore can be called logical mechanics. The process of creating the structure diagram of logical equations has an optimal path, or logical process, the study of which is logic engineering.

Logical mechanics can be used to determine the truth values and life and death of structure diagrams of logical equations.

2.4. Mathematical Forms of Logical Structures

Logical equation structure diagrams describe the various logical equations in

mathematical form, serving two purposes. First, it aligns with the principles of von Neumann computers and adapts to the principles of future quantum and biological computers. Second, it meets the need to express logical relationships using mathematical logic, facilitating computation and truth value judgment.

2.5. Logical Structures and Logical Mechanics

Considering all objects as logical structures, some as objective objects with only a primary structure, some as low-level subjective objects with intermediate structures, and some as advanced subject objects with advanced structures, this approach studies the subjective and objective logical laws of logical structures, which constitutes the essence of logical structures.

There are two paths to establish a logical structure.

First, establish the primary structures, then create a set of filtering conditions for the logical field. Intermediate structures are formed by filtering the primary structures. Next, establish a set of filtering conditions for subjective initiative, which filters the intermediate structures to form advanced structures. This represents a growth logic.

Second, the functional requirements of advanced structures must be determined. These requirements generate a set of filtering conditions for subjective initiative. The functional requirements of intermediate structures can then be established based on the subjective initiative filtering set. The intermediate requirements can then set up the primary structure through the logical field filtering conditions. The primary structures can be established by using attributes or functions to search for logical classes, and then the intermediate and advanced structures are established by following the first path. This is a form of devolution logic.

These two paths are ways to study logical structures and logical engineering, and this research approach represents the philosophy guiding logical structures.

The use of logical mechanics to study the interactions between logical structures involves examining how logical structures and logical fields shape each other. It entails determining the truth values of all logical equation structure diagrams, and assessing whether they can exist or be realized. This approach represents logical mechanics.

2.6. Subjective Initiative Structure

2.6.1. Subjective Initiative of Logical Structures

The subjective initiative of logical structures forms the tissues of organs like the brain. The brain generates intelligence, the fundamental goal of which is to solve the logical equation variables in the logical equation structure diagram. These variable values are then used for information reasoning and structural reasoning, ultimately facilitating the activities of life.

Here, we put forward a theory. The brain's memory contains objective logical equations, including both matter equations and biological equations, along with subjective logical equations. These generate subjective variable values, such as

subjective variable values for happiness and unhappiness. Both objective and subjective variables can facilitate information reasoning and structural reasoning.

We then propose another theory: that learning is the ability to construct the structure diagram of the logical equation in the brain's memory, and the capacity to solve logical equations. Since logical equations are divided into objective and subjective equations, learning can be categorized into objective and subjective learning. For example, learning to operate a lathe represents objective learning, while reading a novel is a form of subjective learning. The emergence of new logical equations results in new logical variables, creating opportunities for new information and structural reasoning, thereby generating new life activities and life cycles.

2.6.2. Producing Intelligence in Subjective Initiative Structures

Intelligence has two process requirements: equation solving and communication. The detailed procedure is as follows. First, the sensory organs receive sensory data logic, which is then transmitted to the brain through nerves. Second, the brain uses the data logic to assign values to variables in the memory. Structures are then used to solve the equations and determine the values of certain variables, which may cause logical structural changes. Next, new variable values are used to create information reasoning and structural information, generating activities or life cycles. Finally, the modified logical structures send out modification transmissions.

2.6.3. The Complexity of Subjective Initiative Structures

The more complex a subjective initiative structure is, the higher its intelligence tends to be, which necessitates the study of complexity in subjective initiative structures. There may be more than one method to measure the complexity of subjective initiative structures.

A student seeking only enhancement in intelligence is pursuing simple wisdom, and the process will be straightforward. However, if the student aims for moral, intellectual, and physical development, complexity arises. The goal is comprehensive, while the realization process is a combination of simple processes, leading to complexity.

To create complex subjective initiative structures, therefore, it is necessary to train intelligent machines in methods and capabilities to achieve comprehensive goals. This involves integrating several simple methods and processes to create a mixed synthesis methods and processes. Additionally, this approach can also be extended to a large quantity of simple methods and processes, leading to a theory for process integration, and ultimately achieving complexity in intelligent technology.

2.6.4. Directed Graphs in Graph Theory—A Tool for Studying Hybrid Comprehensive Intelligence

Tools are required to develop complex intelligent technology, and here we propose Directed Graphs in Graph Theory. First, establish a logical equation structure diagram for the functional nodes of intelligent machines, similar to marking

cities on a map and determining starting and ending points. In cases where certain nodes are missing, they can be created based on logical structure theory. Then, determine the optimal path from the starting point to the ending point. Nodes or paths missing from the optimal path can be created based on logical structure theory. The optimal path then represents the logical structure of the mixed integrated method. This directed graph tool can be used for both structural and information reasoning.

2.7. Case Studies

The most important method to enhance intelligence is to increase the complexity of the subjective initiative structure. This involves increasing the complexity of all equations within the subjective initiative structure, the relationships between equations, and the scale of equations. The complexity of equations includes innovative equations discovered through mathematical and physical research, biological discoveries, quantum computing, biocomputing, and other technologies, and equations trained using current big data training techniques. The complexity of equation relationships lies in the extensive referencing of variable values among equations - the more references, the more complex and better. Scale complexity naturally involves having more equations.

2.8. The Second Fundamental Classical Theory

The second foundational classical theory of the Logical Structure School is the Subjective Initiative Structure.

2.8.1. The Subjective Initiative Structure is the Object of Study for the Purposes of the Logical Structure School

In order to study how to prevent potential evils arising from intelligent warfare and intelligent rule, the Logical Structure School has proposed the objectives of civil rights, human rights and rule of law for the intelligent era. The focus is on how to realize these principles in the three main subjects: artificial intelligence, robotics, and intelligent society. The objects of study are the subjective initiative structure and groups thereof.

2.8.2. Subjective Initiative Structure is the Object of Study for All Foundation Theories

The Logical Structure School studies how to achieve the purposes of civil rights, human rights, and rule of law in the three main subjects composed of subjective initiative structures: artificial intelligence, robotics, and intelligent society. The Logical Structure School also investigates methods to increase the complexity of subjective initiative structures, thereby enhancing the level of intelligence. Logical Engineering studies how to carry out and improve the process of designing and producing subjective initiative structures. The life-giving logical equation structure diagram represents the subjective initiative structure. Bionic logic theory is used to build logical equation structure diagrams when representing subjective initiative structures.

2.8.3. Subjective Initiative Structure is the Research Object for All Applied Theories

To study applied theories of artificial intelligence, robotics, and intelligent society, it is essential to explore the cosmic logical space and environmental logical field of subjective initiative structures, and the external communication channel logical network. Additionally, research should focus on the internal life communication of subjective initiative structures, as well as their life reasoning activities, life cycles, life data, life programming, and life learning.

2.8.4. Subjective Initiative Structure is the Research Object for All Working Theories

Research on subjective initiative structure involves exploring how to use logical equation structure diagrams to explain the various intelligences of the subjective initiative structure. This includes developing and standardizing artificial intelligence, robotics, and intelligent society using bionic logic and logical equation structure diagrams. The intersections that the subjective initiative structure can achieve create the intersections of human thoughts, research, and behavior. The foundational research needed to develop the intelligence of the subjective initiative structure underpins the development of artificial intelligence, robotics, and intelligent society. (Citing references [1]-[4])

3. Logical Engineering

3.1. Objects of Logical Engineering

The main objects of logical engineering are artificial intelligence, robotics, and intelligent society. The key to artificial intelligence engineering is the construction of subjective initiative structures. For robotics, the key is to build subjective initiative structures and the intelligent machinery controlled by these structures. An intelligent society involves groups of robots, communication between robot, and communication between humans and robots.

3.2. Tools for Logical Engineering

There are two tools for logical engineering: the life-giving logical equation structure diagram and the theory of bionic logic. The equation units of the logical equation structure diagram and the equation unit generator of the logical equation structure diagram are established based on bionic logic. The life-giving logical equation structure diagram is a tool for constructing subjective initiative structures, and the equation unit generator is the tool for building their cognitive functions.

3.3. Engineering of Bionic Logic

3.3.1. Bionic Logic

Bionic logic establishes logical structures and logical engineering through biomimicry. There are two types of biomimicry. The first is Growth Logic Biomimicry. Trees, most animals, and humans, for example, first form logical equation

structure diagrams for their primary structures, and then develop intermediate and advanced structure diagrams. The other is Metamorphic Logic Biomimicry, which first forms an advanced structure diagram and then develops intermediate and primary structure diagrams based on the needs of the advanced structure. An example is the transformation of a tadpole into a frog. This theory primarily focuses on growth logic biomimicry.

3.3.2. Simulating Life

Logic engineering simulating the life of growth logic, with a focus on simulating the growth process of life and the growth of its primary and intermediate structures.

3.3.3. Simulating Humans

Logic engineering simulates the advanced structure of humans, replicating the process of brain tissue and nerve growth. It primarily focuses on simulating the development of human intelligence, including the growth of learning abilities, as well as simulating the activities and life cycle processes of brain tissue and nerves.

3.3.4. Simulating Society

Logical engineering simulates the generation and development of society by generating and developing the logical fields of logical structures. The focus is on studying the logical fields of subjective initiative structure machines. This includes studying the environment of these machines – a society in which humans and subjective initiative structure machines coexist – by examining the generation and development of such a society, and its needs and control methods.

3.3.5. Simulating Human Life

The simulation of human life involves an engineering process for subjective initiative structure machines, which like humans, are born through the marriage of parents. They learn, work, pursue further education, retire, and experience their later years, just like humans.

3.4. Logical Engineering Process

3.4.1. Logical Structures

According to this methodology, the objects and goals of logical engineering are both logical structures, with two research paths. One is growth logic, starting with primary structures, followed by intermediate and advanced structures. The other is metamorphic logic, where the advanced structure diagram is formed first. After this, the intermediate and primary structure diagrams are developed based on the needs of the advanced structure.

3.4.2. Logical Mechanics

According to this methodology, drawing inspiration from safety assessment in construction, by introducing 1 and 0 into the logical structure and logical engineering to determine the truth of mathematical logic, a truth value judgment is applied to the results. Logical laws deemed true can be realized, while those

deemed false cannot, thereby establishing standards of feasibility.

3.4.3. Subjective Initiative Structure Engineering for Simulating Human Life

① Parents and Family

In the theory of human life simulation, the birth of subjective initiative structural machines requires parents and a family. The father represents the demand side, and the mother represents the supply side. Based on control of the social logic field, the parents form a family. Like humans, machine families need to obtain a marriage certificate for supervision and monitoring purposes.

② Legal Status at Birth

Similarly, following the theory of human life simulation, the first stage for subjective initiative structural machines is the fetal stage, which features a primary structure, immature intermediate structures, and the potential to develop advanced structures. With growth based on their growth logic, machine fetuses must be registered, facilitating their supervision and monitoring.

③ Growth

The growth stage of machine fetuses primarily involves enriching and completing their intermediate structures. The developmental logic still involves building the required logic equation diagrams for both the primary and intermediate structures.

④ Learning

After entering the learning stage, the machine fetuses enrich and perfect advanced structures, becoming machine students. They exercise their ability for metamorphic logic, developing logic equation diagrams for life activities, and enriching the variable dataset of those diagrams.

⑤ Work

Upon completing their learning process, the subjective initiative structural machines possess primary, intermediate, and advanced structures. Concluding their primary growth logic, they then begin applying metamorphic logic in their work, thus transitioning into machine workers.

⑥ Ongoing Education

Machine workers do not completely depart from growth logic; like humans, they require ongoing education to enhance logic equation diagrams for various levels of structures, and equip themselves with updated variable data for their equations.

⑦ Retirement

Like humans, machine workers also go through a period of retirement, and can lead retired lives similar to those of humans. They also retain the option of reusing traditional engineering.

⑧ Old Age

Like humans, subjective initiative structural machines also have a concluding stage of old age. The social logic field can manage elderly machines in a manner similar to managing elderly humans.

3.5. Application of Logical Engineering

3.5.1. Process of Establishing the Structure Diagram of the Logical Equation

① Growth Logic

First, for the primary structure, the structure diagrams of the logical equation and clock equation are established, following the order of elements before integration. Then, the structure diagrams for the two equations are established for the intermediate structure. The filtering equation structure diagram is used to filter the primary structure to form intermediate tissues, after which the logical equation structure diagram for the intermediate structure is established. Finally, an advanced structure is created, along with the structure diagram of the logical equation and clock equation for brain tissues.

② Metamorphic Logic

First, the structure diagrams of the logical equation and clock equation are established for the advanced structure. Then, the same diagrams for the intermediate structure are created based on the requirements of advanced structure. Finally, the structure diagrams of these logical equations are established for the primary structure.

3.5.2. Establishing Data Structures

① Growth Logic

Data structures are established for the primary, intermediate and advanced structures, in that order. The data is attached to the logical equations and clock equations, and distributed across the corresponding variable sets, including description sets and attribute sets, as well as various levels of mailboxes, post offices, memory communications, and changing data.

② Metamorphic Logic

Data structures are established for advanced, intermediate, and primary structures, in that order. The data is attached to the logical equations and clock equations, and distributed in corresponding variable sets, including description sets and attribute sets, as well as various levels of mailboxes, post offices, memory communications, and changing data.

3.5.3. Establishing Communication Structures

① Growth Logic

First, primary structures are established by creating mailboxes for each element: first elements, and then integration. Second, the intermediate structure is established by using filtering equation diagrams to select primary structures and form intermediate tissues. Then, the intermediate structure is established, post offices created for each tissue, and communication is established with the primary structure. Third, advanced structures are established by creating nerves and sensory systems controlled by brain tissue, and establishing communication with the intermediate and primary structures.

② Metamorphic Logic

First, the subjective initiative of the advanced structure is formed, and then the

nerves and sensory systems are established based on it. Second, tissues and their post offices are established based on the subjective initiative, nerves, and sensory systems, and communication set up between the tissues and the brain. Finally, based on the needs of the tissues, the primary structures and mailboxes for the elements are established, and communication set up between them and the tissues, as well as with the brain.

3.5.4. Life Activities

① Process of a Single Life Activity

A life activity is often controlled by the various structure diagrams of the logical equation. When variable data in the logical equations changes, it can trigger changes in other variable data, leading to information reasoning. These changes can alter logical equations, such as by adjusting the logic of their structure, resulting in information control. The logic of the structural transition from one state to another generates structural reasoning, which is essentially a life activity.

② Organizing a Life Activity

The starting point for a tissue's life activity is a change in variable data. This change may originate from the alteration of the logical equation structure diagram of the brain tissue, *i.e.*, thoughts, or it could arise from data updates obtained through communication. A change in variable data triggers the change of other data in related equations, leading to information reasoning, information control, and structural reasoning.

3.5.5. Life Cycle Process

The structure diagram of the clock equation controls the lifecycle of logical structures. Establishing the life cycle enables the clock equation structure diagrams to be created at various levels, and subsequently used for different elements, body tissues and brain tissue. Subsequently, changes in variable data in the structure diagram of the clock equation lead to information reasoning, information control and structural reasoning, resulting in control over the life cycle.

3.5.6. Mathematical Form of the Process

The representation of logical structures is a form of mathematical logic, and the results of the various stages of logical processing on logical structures must also be expressed in mathematical logic. This allows for evaluation and judgment using logical mechanics.

3.6. Logical Fields in Engineering

Logical fields in logical engineering represent the environment of the engineering process. The feasibility, control, and requirements of the engineering all originate from these fields, arising from their mutual shaping with logical structures.

3.7. Case Studies

The development target of logical engineering is the subjective initiative structure. The key to developing the subjective initiative structure is life-giving logical

equation structure diagrams. The quality of these diagrams is determined by the equation unit generator. Therefore, the equation unit generator determines the quality of the subjective initiative structure and the quality of logical engineering. The equation unit generator is a cognitive machine that determines the cognitive abilities of the subjective initiative structure. The more advanced it is, the more complex the subjective initiative structure is, and the higher the dimension of intelligence. The equation unit generator relies on bionic logic, along with real scientific logic, life logic, and subjective logic. The next chapter will discuss the equation unit generator in detail.

3.8. 3rd Foundational Classical Theory

The third foundational classical theory is Subjective Initiative Structure Engineering. The task of logical engineering in the intelligence era is to advance this field.

3.8.1. Using Bionic Logic to Study Subjective Initiative Structure Engineering

The theory of bionic logic is used to simulate subjective initiative structure machines as humans, establish social logic fields in which humans and subjective initiative structure machines coexist, and simulate subjective initiative structure engineering as human life.

3.8.2. Simulating the Logical Fields of Society

When establishing the social logic fields of human coexistence with subjective initiative structure machines, this society forms the environment for subjective initiative structure engineering, providing feasibility, control, and demand for subjective initiative structure engineering. Subjective initiative structure engineering shapes this society, and vice versa. (Citing references [2] [5])

4. Logical Equation Structure Diagram Theory

4.1. Logical Equations

Logical equations are built upon the foundation of physicochemical and biological equations. These equations or sets thereof demonstrate the decisive effects of certain variables on others. In these equations, assigning values to certain variables allows the values of other variables to be derived. In physicochemical and biological equations, these variables describe the structure, activity and lifecycle of matter or life. When elevated to logical equations, they elucidate the structure, activity, and lifecycle of logical structures, and when applied to artificial intelligence, they expound upon the structure, activity, and lifecycle of intelligent machines. Therefore, logical equations serve as the basic logic for both logical structures and intelligent machines.

Note that logical equations encompass not only objective equations, such as physicochemical and biological equations, but also subjective equations, such as belief and emotion equations generated by means of subjective initiative. Subjective equations reflect the logic of the human brain, and can also become the logic

of advanced logical structures and intelligent machine consciousness.

Logical equations constitute a variable set, in which possible values of the variables are stored. These values form data classes, consisting of the description set, attribute set, and function set. The data class associated with the variable set undergoes changes resulting from communication of the logical equations.

4.1.1. Objective Equations of Matter

All lifeless matter is described by matter equations, either physical or chemical equations. These equations utilize a variety of mathematical theories. Objective matter possesses a memory capacity for matter equations, storing the memory of universal laws. Matter equations account for the existence, movement and time of all objective matter.

4.1.2. Biological Equations of Life

Biological equations include plant and animal equations. Here, we discuss the biological equations of humans, which are divided into three levels. The most basic level is the biological equations of cells, including those present in cellular memory. The biological equations realize all life activities and life cycles of cells. All properties and functions of DNA can be turned into biological equations. The intermediate level is the biological equation of tissues and organs, including both cell base layers, and tissue and organ layers. For instance, hunger and fullness of the stomach can be considered as two values of the same variable, which can be determined by some biological equation or set thereof. The biological equations of tissues and organs include biological equations in both the cell base layer and tissue or organ layer, and can realize all the life activities and life cycles of tissues or organs. Finally, the advanced biological equations of humans are divided into the cellular layer, tissue or organ layer, and brain layer. The first two layers are consistent with the previous discussion. The biological equation of the human body involves the brain, nerves and various tissues and organs, which together enable the activities and life cycles of the human body.

The biological equations are also known as the equations of life.

4.1.3. Subjective Logical Equations

Logical equations include not only scientific and biological equations, which are objective, but also subjective equations. Subjective equations reflect the logic of the human brain and can form the logic of advanced logical structures and intelligent machine consciousness. Logical equation structure diagrams can be built using subjective equations.

4.1.4. The Logical Equation

Based on the matter equations and biological equations, logical equations can be proposed and categorized into three levels. The primary level of logical equations utilizes the laws of the matter equations and cellular equations; the intermediate level utilizes the laws of the biological equations of tissue or organs; while the advanced level utilizes the laws of the brain's biological equations.

The logical equations, including scientific equations, life equations, and subjective equations, are the fundamental tool for object analysis. In other words, they encompass both the objective and subjective. Research on bionic logic reveals that the equations governing life activities are omnipresent, involving both objective and subjective aspects. Based on this foundation, logical equations are also pervasive in logical structure; all three subsets of element classes (description sets, attribute sets and function sets) have logical equations. The three levels of storage sets, memory, and the brain all have logical equations, which are transmitted through mailboxes, post offices and nerves. Logical equations also include the clock equations, whose logical structure is composed of countless logical equations. Human activities and life cycles are composed of logical equations, and object analysis is used to call relevant logical equations or sets thereof, from which the values of some variables can be calculated from the values of others, while large-scale object analysis calls large-scale equation sets.

4.1.5. Logical Equations of Primary Structures

The logical equations of the primary structure are based on the principles of material equations and cellular equations. In this way, they can describe all activities and life cycles of primary structures.

4.1.6. Logical Equations of Intermediate Structures

Intermediate structures result from the environmental variable logic fields filtering the primary structure to generate tissues or organs. Each tissue or organ has its own laws governed by the primary logical equations. The intermediate structure then establishes intermediate logical equations based on those primary logical equations, which follow the same laws of biological equations as tissues or organs. Together with the primary logical equations, they facilitate the life activities and life cycles of the intermediate logical structure.

4.1.7. Logical Equations of Advanced Structures

To begin with, the advanced logical structures have primary and intermediate logical equations. Then, the advanced logical equations are established based on the laws of the biological equations of human bodies, so that the structure, activities and life cycles of the advanced structures can be described by the primary, intermediate, and advanced logical equations, and various combinations thereof.

4.1.8. Establishing Logical Equations

Logical equations require three components: an equals sign, and the left and right sides of the equation. The equals sign represents the equilibrium process, and its interaction with the left and right sides of the equation determines the variables. This is the fundamental theory of logical equations.

4.1.9. Mathematical Forms of Logical Structures

Logical equation structure diagrams describe various logical equations in mathematical form, adapting to two requirements. One is the principles of von Neumann

computing, and also by extension the principles of future quantum computers and biological computers. The other is the needs of mathematical logical expression, facilitating the calculation and judgement of truth values.

The generation of logical equation structure diagrams represents the development of new types of algorithms. The operation of these diagrams is the working process of the new algorithms, and represents a new form of reasoning. In essence, the work they do involves using known quantities to collaboratively determine unknown quantities. This will become the core of broad foundational theories in artificial intelligence, robotics, and the intelligent era.

4.2. Structure Diagram of Logical Equations

This is a directed graph, with each node representing one or a set of logical equations. If the variables of one logical equation or set thereof determine those of another logical equation or set, then a directed path exists from one node to another. Path weights can be added to indicate the order, and by listing all logical equations and marking the relationships between variables with directed paths, the structure diagram of the logical equation can be completed.

The logical equations are organized as follows.

① Logical Equations

An equation, which can be a scientific, life, or subjective equation, with fixed addresses, clock variables, and a communication system that passes on the variable values.

② Logical Equation Group

A group of equations, which can be scientific, life, or subjective equations, with fixed addresses, clock variables, and a communication system that can pass variable values, equations, and groups of equations.

③ Logical Equation Structure Diagram

A directed graph that includes many equations and systems of equations, with fixed addresses, clock variable system, and a communication system that can pass variable values, equations, groups of equations, and structure diagrams.

④ Logical Equation File

This is a directed graph file, constituting the structural file of the logical equation; each subject has one directed graph file. The directed graphs represents the structure diagrams of the logical equations. Different graphs can illustrate the required relationships, while connections between variables across graphs are denoted using directed paths, and their associated weights indicate the order.

It includes many logical equation structure diagrams with fixed addresses, a clock variable system, and a communication system that can transmit variable values, logical equations, groups of equations, structure diagrams, and files.

⑤ Logical Equation Works

These include many logical equations files with fixed addresses, clock variable systems, and communication systems which can pass variable values, logical equations, groups of equations, structure diagrams, files, and works.

⑥ Collections of Logical Equation Discipline Works

These include many logical equation works with fixed addresses, clock variable systems, and communication systems that can pass variable values, logical equations, groups of equations, structure diagrams, files, works, and collections of works.

⑦ Collections of Logical Equation Discipline System Works

These collections include many collections of logical equation discipline works with fixed addresses, clock variable systems, and communication systems that can transmit variable values, logical equations, groups of equations, structure diagrams, files, works, collections of works, and collections of discipline works.

4.3. Life-Giving Logical Equation Structure Diagrams

The principles and processes of generating logical equation structure diagrams were discussed earlier. Here, three aspects of the theory of life-giving logical equation structure diagrams are presented.

4.3.1. Complexity

The life-giving logical equation structure diagram used to describe life is supported by a vast number of cells, cell tissues, and organ tissues. If one cell requires a logical equation structure diagram work to describe it, then a cell tissue is a collection of works within a discipline, and an organ tissue is a collection of works across all disciplines. The quantities of equations, groups of equations, structure diagrams, files, works, collections of discipline works, and collections of discipline system works are immense. To organize them, each must first be assigned a unique and authentic name. Next, a single-character coding book is established to translate these names into codes. The method for organizing equations imitates the coding system of Chinese identification cards. The code is divided into various segments, from right to left, each respectively representing equations, groups of equations, structure diagrams, files, works, collections of disciplinary works, and collections of discipline system works, forming a fixed address for each equation, and thereby enabling communication and transfer of variable values.

4.3.2. Clock Equation System

To give life to a logical equation structure diagram, each unit of the diagram must establish its own clock equation system. The variables of the system control the corresponding equations, groups of equations, structure diagrams, files, works, collections of disciplinary works, and collections of disciplinary system works. They are coded as "code of the control object + code of the variable", resulting in a massive coding structure.

4.3.3. Communication System

In order to give life to the logical equation structure diagrams, each unit of the diagrams must have its own communication system. The communication system for equations, groups of equations, structure diagrams, files, works, collections of

discipline works, and collections of discipline system works consists of three parts: post office, variable transfer directed routes, and directional line for clock variable transfer. The task of the post office is to input and output all equations, groups of equations, structure diagrams, files, works, collections of discipline works, collections of discipline system works, and the values of the variables. Simulating the collective travel and return of humans, individual units of logical equation structure diagrams can receive and send their own units, as long as they have a clear address. Variable transfer directed routes and clock variable transfer directed routes mean that equations, groups of equations, structure diagrams, files, works, collections of discipline works, and collections of discipline system works are established with respect to the transfer of variables.

4.3.4. Equation Unit Generator

To give life to a logical equation structure diagram, equations, groups of equations, structure diagrams, files, works, collections of disciplinary works, and collections of academic system works must all include a crucial component: the equation unit generator. Its task is to produce new units of equations, endowing the logical equation structure diagrams with the ability to think like a human.

① The process of generating new equation units involves first determining a set of input variables, then identifying the required output variables, and finding the path and logical relationship from the input to the output variable set. Based on this relationship, new logical equation units can be automatically generated, which not only realize the existing input-to-output relationships, but also generate new variables, thereby simulating human thinking and the creation of new knowledge.

② The process of generating new equation units also involves first determining a set of input variable values, then identifying the values of the required output variables, and finding the logical reasoning path that connects these two sets of values. This establishes the logical relationship between the input and output variable sets, allowing for automatic generation of new logical equation units. These units similarly facilitate existing input-to-output relationships and create new variables, thus mimicking human cognition and knowledge generation.

③ The equation unit generator can also work in conjunction with the communication system. It can generate new equation units in collaboration with both newly input and existing equation units, or by using new input variable values to produce new output values, thus facilitating development of innovative independent learning methods.

④ Advanced equation unit generators can even create equation units based on self-defined input and output sets.

⑤ A fixed address, clock equation system, and communication system are set for the new equation unit.

⑥ Bionic logic can be utilized in the construction and development of unit generators for equations.

The technology of equation unit generators thus becomes the cognitive organ

of the subjective initiative structure. The more advanced the technology, the stronger its cognitive abilities. In this way, the logical equation structure diagram attains the thinking ability inherent in human life, marking the birth of the first machine thinking technology.

4.4. Case Studies

Logical equation structure diagrams can represent multimodal information. Equations, groups of equations, structure diagrams, files, works, collections of disciplinary works, and collections of disciplinary system works can all represent information modalities at different scales. Variables are constituents of a modality, and equations combine these constituents into a modality unit. A system of clock equations allows for the control and expression of the life characteristics of a multimodal information display. Different units of multimodal information are organized using mechanisms such as post offices, variable transfer directed routes, and clock variable transfer directed routes. This organization establishes a multimodal communication system, enabling the seamless integration and management of various forms of information.

Realizing these functions, the logical equation structure diagram can represent both the intelligence within the subjective initiative structure, and multimodal intelligence, giving rise to a pioneering graph theory tool for the intelligent era.

When we obtain the logical equation structure diagram of a matter or process, we get its multimodalities. The logical equation structure diagram determines the values, mutual relations, and states of the variables, which in turn determine the modality. This means that it determines the modality of text, images, sound, and video.

The logical equation structure diagram allows for discrete changes in variables to be expressed as text and images, while continuous changes can be expressed as sound and video. The logical process can simultaneously choose discrete and continuous expressions. For instance, a person moving from the Faculty of Science to the Faculty of Arts can be expressed discretely in text and images, or continuously in sound and video. Text-to-video conversion can be achieved by expressing the discrete changes of the text through the logical equation structure diagram, identifying the variable changes, and then expressing these changes continuously. The logical equation structure diagram of the continuous changes of the variables is then converted to video, turning text changes into video changes.

4.5. The Fourth Foundational Classical Theory

The fourth foundational classical theory, The Life-Giving Logical Equation Structure Diagram, is proposed here. Equations, groups of equations, structure diagrams, files, works, collections of disciplinary works, and collections of disciplinary system works are collectively termed structure diagrams. This theory represents the first living diagram theory, and serves as a pioneering diagram theory tool for the intelligent era. This structure diagram encompasses scientific logic,

life logic, and subjective logic, making it the first tool describing intelligent structures and technologies. Intelligent engineering is the process of designing and realizing these structure diagrams, while intelligence itself is defined as the life activity and life cycle of these diagrams. Research, design, operation, monitoring, and modification tools for subjective initiative structures are all based on logical equation structure diagrams endowed with life.

The authenticity of each unit within the logical equation structure diagram is determined using logical mechanics. This means that the principles of logical mechanics determine the truth or falsehood of equations, groups of equations, structure diagrams, files, works, collections of disciplinary works, and collections of academic system works.

5. Bionic Logic Theory

5.1. Bionic Logic

5.1.1. Purpose

To propose new development approaches for artificial intelligence which meet the demands of the current era, it is essential to replace the algorithms and data science derived from the industrial society with innovative ones, address the challenges of massive social resource requirements and astronomical computational power needed, and solve the problem that unthinkably large volumes of data are often needed to train larger intelligent models.

The algorithm created by bionic logic is a logical structure composed of logical equations. These logical structures are then used to construct actual machines. The first step to create an intelligent machine in the era of artificial intelligence is to develop an algorithm based on the machine logical equation directed graphs. Once this algorithm is established, it can be used to create the corresponding intelligent machine.

Data science created by bionic logic replaces raw data with classes, and data analysis with object analysis. Data classes exist within the variable set of logical equations, while object analysis analyzes logical equations rather than formula functions. Each data class corresponds to a set of related logical equations, which in turn correspond to specific structures or life activities of the intelligent machine, or even a clock equation and a specific lifecycle. Thus, object analysis becomes logical equation analysis, and logical equation analysis extends to life analysis.

5.1.2. Bionic Logic

This is an intersectional discipline between logical structure and biology, also known as biology in the context of artificial intelligence. The associated steps are as follows. ① Search for biological equations, representing the logical patterns of life that have evolved over hundreds of millions of years on Earth. These patterns are considered more sophisticated than the artificial logical rules studied by humans. To design the logical structures and logical equations of artificial intelligence, it is necessary to first search for the biological equations of life. ② In

addition to the biological equations themselves, it is also essential to search for the relationships between the variables of the biological equations. ③ The biological equations and their relationships are elevated to a directed graph composed of logical equations and their relationships; that is, a structure diagram of logical equations. ④ For instance, the movements of a walking human do not require artificial design, but the way the human body walks can be studied. The logical equations and equation sets, along with their mutual relationships, derived from observed regularities in the movements of various human bodies result in a directed graph, which serves as the structure diagram of the logical equation for the bionic logic associated with human walking.

5.2. Simulated Life

This is a fundamental part of bionic logic that shapes both the primary and intermediate logical structures, and also forms the primary and intermediate structures of artificial intelligence. The steps for simulating life are as follows. ① Search for the biological equations of cells and their relationships, which can generate the corresponding directed graph files, giving each subject one directed graph. Different graphs illustrate the required relationships. This file represents a structure diagram of the cell, encompassing its structure, activities, and lifecycle. ② Simulate the structure diagram of the cell to create the logical structure and structure diagram of the logical equation for the primary structural elements of artificial intelligence. ③ Study the relationships between cells, create a directed graph illustrating the relationship among files of structure diagrams of cells, form a primary structure for life, and simulate it to create the primary structure of the logical structure and artificial intelligence. ④ Search for the biological equations and relationships of biological tissue to generate corresponding directed graph files, giving each subject one directed graph. Different graphs illustrate the required relationships. This file represents the structure diagram of biological tissue, encompassing its structure, activities, and lifecycle. ⑤ Also search for biological equations representing the relationships between biological tissues and cells, form structure diagrams for the equations, add them to the structural files for biological tissue, and establish relationships with other structure diagrams to generate a comprehensive structural file for biological tissue. ⑥ Simulate the structure diagram for biological tissue to establish the required logical structures and structure diagrams of the logical equations for the intermediate structure of artificial intelligence.

5.3. Simulated Humans

Logical structures and advanced structures for artificial intelligence are required to simulate humans. As an advanced form of bionic logic, the steps for simulating humans are as follows. ① Utilize the theory of simulating life to simulate the cells and tissues of humans, forming both primary and intermediate structures. ② Search for the relationship equations between different tissues to form

structure diagrams which connect the various tissue structure files, thus creating an integrated intermediate structure. ③ Search for the biological equations and relationships of brain tissue, which can generate the directed graph files, giving each subject one directed graph. Different graphs illustrate the required relationships. This file represents the structure diagram of the brain tissue, encompassing its structure, activities, and lifecycle. ④ Also search for biological equations representing the relationships brain tissue has with and cells and other tissues, creating a structure diagram for the equations; add it to the structural file for brain tissue, and then establish relationships with other structure diagrams to generate a comprehensive structural file for brain tissue. ⑤ Simulate the structure diagram for brain tissue to establish the logical structures and structure diagrams of the logical equation for the intermediate structure of artificial intelligence.

5.4. Principles of Bionic Logic

① Bionic logic can be partially simulated as required. ② Simulation can be conducted in an iterative manner from simple to complex. ③ Simulation can understand as much as it simulates. The parts that cannot be simulated are temporarily designated by manual design. In the future, as relevant research advances, it can be replaced with simulations, creating a continuous process.

5.5. Simulated Society

This theory considers that the environment of the logical structure is similar to that of human society. Simulating human society involves establishing a logical structure within the simulated society, and interaction between humans is simulated to do so, including interactions between logical structures, and between them and humans. Simulation is an iterative, infinite and continuously evolving process. Following this principle, a simulated society can also be established within the artificial intelligence structure.

5.6. Simulated Life

The lifecycle of advanced logical structures is simulated as human life, including its various stages. The lifecycle of primary and intermediate structures within the advanced logical structures is also simulated in a manner which is similar to the different stages of human life. The lifecycle of the brain in advanced logical structures is modeled after the lifecycle of the human brain. The clock equation structure diagram file for humans is simulated to establish the clock equation structure diagram file for advanced logical structures. The clock equation structure diagram file for artificial intelligence can also be established similarly.

5.7. Case Studies

The most important function of the theory of bionic logic is to establish the structure diagram of life-giving logical equations. No step is arbitrary. The first choice is the real bionic logic of the life being studied, not artificial design. Every equation

in the structure diagram should preferably be based on the equations of life studied through bionic theory. If life equations are unavailable, then artificial designs can be used. Organizing equations – whether individual equations, sets of equations, structure diagrams, documents, works, collections of disciplinary works, or collections of disciplinary system works – should preferably follow the organizational form of real life. In the absence of realistic forms, artificial design can be used. Similarly, when establishing systems of clock equations, the preference is the bionic principles of real life; only in their absence should artificial designs be employed. The same applies to communication systems: the preference is for realistic life communication systems, and for communication systems of organs or tissues, using artificial designs only when realistic ones are unavailable. The equation unit generator should also use bionic research to simulate the thought processes of life, without artificial redesign.

This approach is justified because life represents the most correct and rational structure in the universe. It can be likened to the intelligence of higher-dimensional space, which creates the structure of life within three-dimensional space plus time. Human intelligence, a creation of the same dimensions, can be compared to the intelligence of chickens and ducks, which cannot reach the heights of human intellect. This is the fundamental principle behind the use of bionic logic to establish life-giving logical equation structure diagrams.

5.8. 5th Foundational Classical Theory

The fifth foundational classical theory is Bionic Logic. This theory shows the methods for developing artificial intelligence, robotics and intelligent society based on emulating life, and the relationships between different forms of life to advance these three main entities in the intelligent era.

The primary role of bionic logic is to establish logical equation structure diagrams.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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