Scientific Research Publishing

Intelligent Control and Automation, 2024, 15, 28-62
https://www.scirp.org/journal/ica
ISSN Online: 2153-0661
ISSN Print: 2153-0653

The Fundamental Theory of Artificial Intelligence—Logic Structure and Logic Engineering

Dong H. Liu

School of Computer Science, Guangdong Normal University of Technology, Guangzhou, China
Email: m13926032320@163.com

How to cite this paper: Liu, D.H. (2024) The Fundamental Theory of Artificial Intelligence—Logic Structure and Logic Engineering. *Intelligent Control and Automation*, **15**, 28-62.
https://doi.org/10.4236/ica.2024.151003

Received: January 27, 2024
Accepted: February 20, 2024
Published: February 23, 2024

Abstract

The research purpose of this dissertation is threefold: to innovate artificial intelligence methods, to create the intersection of artificial intelligence and biological research, and to innovate human methodology. The work I have done in my research includes: improving logical structure and logical engineering, using my theory to study the innovation of the development path of artificial intelligence, using my theory to create biomimetic logic, a new intersection of artificial intelligence and biological research, and exploring the innovation of human methodology through the previous two works. The results of the research are as follows: 1) Introduction to bionic logic, incorporating simulations of people, society, and life as core principles. 2) Definition of the logical structure as the primary focus of research, with logic mechanics serving as foundational research principles. 3) Examination of the logical structure's environment through logical fields and networks. 4) Study of logical structure communication via logical networks and main lines. 5) Proposal of data logic. 6) Investigation into the logic of logical structures, employing structural diagrams of logical equations. 7) Development of a theory of life activity within logical structures, encompassing information reasoning, its corresponding control structure, and structural reasoning. 8) Introduction of the lifecycle theory for logical structures and examination of the clock equation. 9) Exploration of logical structure intelligence. 10) Study of logical structures in mathematical forms. 11) Introduction of logic engineering. 12) Examination of artificial intelligence's significance. 13) Investigation into the significance of human methodology.

Keywords

Bionic Logic, Structural Diagram of Logical Equation, Data Logic, Intelligence

1. Logic Structure

1.1. Structure of Bionic Logic

1.1.1. Bionic Logic

1) Purpose of Bionic Logic

To propose novel approaches for developing artificial intelligence (AI) that meets the demands of the current era. These approaches aim to replace the algorithms and data science derived from the industrial society with innovative ones. They also address the colossal challenges of astronomical computing power demands and solve the problems associated with the huge volumes of data often needed to train larger models.

The algorithm created by bionic logic is a logical structure composed of equations. Machines can be constructed based on this structure. In the era of AI, the development of intelligent machines enables the creation of an algorithm. This algorithm can generate the directed graph of the machine logic equation, facilitating the manufacture of corresponding intelligent machines.

Data science, as redefined by bionic logic, replaces raw data with data classes and data analysis with object analysis. Data classes are placed within the variable set of logical equations, while object analysis is conducted through the analysis of logical equations rather than formula functions. Each data class corresponds to a set of related logical equations, which in turn correspond to a specific structure or life activity of an intelligent machine. This can include a clock equation and a specific lifecycle; thus, object analysis transitions to logical equation analysis, and logical equation analysis extends to life analysis.

2) Logical Equations

Logical equations are founded on physicochemical and biological principles, highlighting the critical impacts of certain variables on others. By assigning values to specific variables, it becomes possible to derive values for other variables. These derived values can be integrated into physicochemical and biological equations to detail the structure, activity, and lifecycle of both matter and life. When these equations are elevated to the level of logical equations, they shed light on the structure, activity, and lifecycle of logical structures. Furthermore, when applied to artificial intelligence, logical equations provide insights into the structure, activity, and lifecycle of intelligent machines. Consequently, logical equations form the foundational logic for both logical structures and intelligent machines.

It is important to note that logical equations include not only objective equations, like physicochemical and biological equations, but also subjective equations. Subjective equations, derived from personal initiative, include belief equations and emotion equations. These equations mirror the logic of the human brain and can serve as the basis for the logic of advanced logical structures and the consciousness of intelligent machines.

Logical equations represent a set of variables, storing possible values within these variables as data classes. These classes comprise a description set, an attribute set, and a functional set. The data class associated with the variable set evolves through the interactions facilitated by logical equations.

3) Structural Diagram of Logical Equations

This is a directed graph where each node represents a logical equation or a set of them. If the variables of one equation or set influence those of another, a directed path between the nodes is established. Incorporating path weights to signify the sequence and enumerating all logical equations while linking variable relationships through directed paths, finalizes the structural diagram.

4) Structural File of Logical Equations

This file is a directed graph, with each theme linked to a specific directed graph file. Here, the graph delineates the structural diagram of the logical equation. Various graphs can exhibit necessary relationships, while intersections between variables across different graphs are illustrated through weighted directed paths to denote sequence. This forms the structural file of logical equations.

5) Bionic Logic

Bionic logic, a study integrating logical structures and biology in artificial intelligence, involves several steps: ① Identifying biological equations, which encapsulate life's logical patterns evolved over millennia, considered more elaborate than human-devised logical rules. Designing artificial intelligence's logical frameworks begins with exploring life's biological equations; ② Beyond identifying biological equations, understanding the variable relationships within these equations is vital; ③ These biological equations and their variable relationships are then translated into a directed graph comprising logical equations and their connections, resulting in a structural diagram for the logical equation; ④ For example, studying the walking movements of humans doesn't require artificial design, but analyzing how human bodies walk and deriving logical equations and their interrelations from observed patterns leads to a directed graph. This represents the structural diagram for bionic logic associated with human locomotion.

6) Simulating Life

Simulating life underpins bionic logic, informing both basic and intermediate logical structures, thereby shaping artificial intelligence's primary and intermediate structures. The process entails: ① Identifying cellular biological equations and relationships, generating directed graph files for each theme. These graphs represent the structural diagram of cells, capturing their structure, functions, and life cycle; ② Using the cellular structural diagram to devise logical structures and the structural diagram of logical equations for artificial intelligence's foundational elements; ③ Examining cellular relationships, creating directed graphs to depict inter-cellular relationships, forming a primary life structure, and simulating this to develop primary artificial intelligence structures; ④ Identifying biological equations and interrelations of biological tissue, generating directed graphs for each. These graphs depict the structural diagram of biological tissues, covering structure, functions, and life cycle; ⑤ Additionally, identifying equations depicting tissue-cell relationships, incorporating them into biological tissue's structural diagrams, linking these with other diagrams, thus producing an extensive structural file for biological tissues; ⑥ Simulating the structural diagram for biological tissue to create the necessary logical structures and the structural diagram of logical equations for artificial intelligence's intermediate structure.

7) Simulating Humans

The construction of logical and advanced structures for artificial intelligence is necessary to simulate human beings. As an advanced form of bionic logic, simulating humans involves several steps: Firstly, employ the theory of simulating life to mimic the cells and tissues of humans, forming primary and intermediate structures. Secondly, identify the relational equations between different tissues to create a structural diagram that connects various tissue structure files, thereby generating an integrated intermediate structure. Thirdly, explore the biological equations and relationships of brain tissue to produce directed graph files, with each theme represented by one directed graph. These graphs illustrate the necessary relationships and compose the structural diagram of the brain tissue, detailing its structure, activities, and lifecycle. Fourthly, find biological equations that depict the relationships between brain tissue and cells, and between brain tissue and other tissues. This information is used to create a structural diagram for the equations; this diagram is then added to the structural file for brain tissue. Subsequently, establish connections with other structural diagrams to generate a comprehensive structural file for brain tissue. Finally, simulate the structural diagram for brain tissue to construct the logical structures and the structural diagram of the logical equation for the intermediate structure of artificial intelligence.

8) Principle of Bionic Logic

Bionic logic can be partially simulated as necessary. Simulation can progress iteratively from simple to complex stages. The extent of our understanding is directly proportional to the extent of our simulation. The components that cannot be simulated are temporarily handled through manual design and, as research progresses, can be replaced with simulations. This approach fosters a continuous developmental process.

1.1.2. Simulating Society

This theory posits that the environment of a logical structure mirrors that of human society. To simulate human society, we construct a logical structure that emulates the interactions among humans. This includes simulating interactions within the society, both among its logical structures and between these structures and humans. Simulation is an iterative, infinite, and continuously evolving process. By following this principle, a simulated society within an artificial intelligence framework can be developed.

1.1.3. Simulating Human Life

The lifecycle of advanced logical structures is modeled on human life, encompassing various stages. Similarly, the lifecycles of primary and intermediate structures within these advanced logical architectures emulate the different stages of human life. The lifespan simulation of the brain in advanced logical structures is based on the lifecycle of the human brain. To achieve this, the clock equation structural diagram file for humans is used as a model to construct the corresponding diagram for advanced logical structures. This approach can also be applied to the creation of the clock equation structural diagram file for artificial intelligence.

1.2. Logical Structures and Logical Mechanics

1.2.1. Macroscopic Form of Logical Structures

1) Ref. [1] [2] is the first to be proposed, and Ref. [3] is comprehensively proposed: Utilizing mathematical logic, logical structures are constructed with three hierarchical levels: advanced logical structures, intermediate logical structures, and primary logical structures.

Primary Logical Structure = Elements of Various Actual Structures + Inherent Logical Association (Formula 1);

Intermediate Logical Structure = Primary Logical Structure + Environmental Variables + Inherent Logical Association (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 Association (Subjective initiative variables are derived from the logical equation for brain tissue) (Formula 3);

① Lifeless Objective Structure

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

② Subjective Structure of Animals and Plants

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

③ Subjective Structure of Humans

An advanced logical structure comprises three hierarchical structures: primary, intermediate, and advanced.

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

2) Logical Structures in the Logical Field

Ref. [4] The first to propose a logic field. Logical structures are embedded within logical fields, reciprocally influencing each other. Logical fields exhibit the characteristics of a logical network, where structures interact by exchanging logic. This exchange involves the modification of the transmission mode between the network and other structures. The conveyance of logic is facilitated by various elements, including the structural file and diagram of logical equations, alongside the equations and their variable values themselves. These structures undertake activities and lifecycle processes within the logical fields and networks.

The logical field acts as an aggregator of filtering conditions for the primary structure, dictated by the environmental variable values produced by the logical equations. It encompasses all necessary operations as dictated by the environmental context. Initially, these filtering conditions identify the required attributes or functions. Subsequently, based on these criteria, they classify the logical classes of the primary structures, proceeding to filter these classes and generate intermediate structures. Through this process, logical structures are refined, enabling them to better adapt to the environment.

3) Primary Structure

Primary Logical Structure = Elements of Various Actual Structures + Inherent Logical Association;

The primary structure is tasked with establishing a set of basic elements based on the scientific theory of granularity. These elements are characterized within the framework of element logic classes. An element logic class is defined as follows:

Element logic class = Element Description Collection (Description Set) + Element Attribute Operation Collection (Attribute Set) + Element Functional Operation Collection (Functional Set) (Formula 7);

Hence, the basic element set is viewed as an aggregation of element logic classes.

Primary Structure = {All element logic classes + Integration of all element logic classes with other element logic classes + Integration of all element logic classes with Integrated Logical Classes + Integration of All Integrated Logical Classes with other Integrated Logical Classes} (Formula 8);

Elements from various actual structures denote the two objects engaged in all integrations. The method of integrated operation, termed as inherent logical association, may encompass function theory, algebraic structure theory (including algebraic systems, semigroups, groups and subgroups, Abelian groups and cyclic groups, homomorphisms and isomorphisms of algebraic systems, rings, and fields), lattices and Boolean algebra, and graph theory. Innovative methods can be introduced as well.

Primary structures are otherwise known as objective structures.

4) Intermediate Structure

Intermediate Logical Structure = Primary Logical Structure + Environmental Variables + Inherent Logical Associations. The structure of the primary logical structure is outlined as follows: Primary Structure = {All element logic classes + Integration of all element logic classes with other element logic classes + Integration of all element logic classes with Integrated Logical Classes + Integration of all Integrated Logical Classes with other Integrated Logical Classes}. Environmental variables generate logical fields, leading to a set of filtering conditions for the elements of the primary structure collection. This filtering process generates the filtered primary element classes, which serve as the foundational components, akin to tissues and organs, of the primary element classes, embodying a logical structure that evolves to survive in different environments. Filtering manifests through logical equations, refined by the values of variables.

Inherent logical association is defined as the process of the filtering operation. Intermediate Structure = Filtered Primary Structure Collection (Formula 9); these intermediate structures are also known as survival structures.

5) Advanced Structure

Advanced Logical Structure = Intermediate Logical Structure + Subjective Initiative Variables + Inherent Logical Association; The intermediate logical structure is defined as follows: Intermediate Structure = Filtered Primary Structure Collection. Subjective initiative variables, derived from logical equations for brain tissues, serve as a set of filtering conditions for elements within the intermediate structure collection. In practice, intermediate filtering precedes advanced filtering—a necessary process for the brain tissue to sift through intermediate tissue structures for both subjective and objective activities. The filtered intermediate tissues are then involved in current life activities. Subsequently, advanced structures select intermediate tissues for subjective initiatives, which are further filtered based on the variable values of the logical equations for brain tissue.

Inherent logical association is identified as the filtering operation: Advanced Structure = Filtered Intermediate Structure Collection (Formula 10). Advanced structures are alternatively known as subjective structures.

6) Subjective Initiative

Subjective initiative encompasses the filtering protocols for a collection of intermediate structures, generated by the values assigned to subjective initiative variables. These variable values are the result of logical equations rooted in brain tissue encompassing all functions essential for subjective initiative. The filtering process begins by pinpointing necessary attributes or functions, proceeding to classify logical groups based on these characteristics. This classification culminates in the filtration of logical classes, thereby assembling the intermediate structures requisite for complex structural activities. This filtration is executed through the logical equations of brain tissue, which are parsed by variable values.

1.2.2. Microscopic Form of Logical Structures

1) The Theory of Simulating Life and Simulating Humans

The Theory of Simulating Life and Simulating Humans posits that the microscopic construction of logical structures includes components analogous to biological cells. These components are designed with functionalities akin to learning, memory, signal transmission, and timekeeping. Analogously, in both animals and humans, nerve and brain cells exhibit capabilities such as learning and memory.

2) Microscopic Form of Primary Structures

Regarding the macroscopic form of primary structures, the logical classification of elements can be delineated as follows:

Element logic class = Element Description Collection + Element Attribute Operation Collection + Element Functional Operation Collection;

This equation encompasses element descriptions, attribute operations, and functional operations, providing a comprehensive framework for the logical classification of elements.

After introducing the theory of cell structures, the element logic class can be defined as follows:

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

In this framework, the description set, attribute set, and functional set are all depicted as structural diagrams of logical equations. Data is stored within the variables of these logic equations. Notably, each variable is part of a data logic class, allowing the description set, attribute set, and functional set to store data. The data itself is categorized within a data logic class.

The mailbox is designed to send and receive logical messages and other forms of logic, including substances. During the process of integration, the storage set, mailbox, and clock are all combined following specific rules.

Notes:

① The primary structure of logical structures comprises elements, which are governed by a scientific granularity theory. These elements form an element set, representing their collective assembly.

② The data logic class is defined as a Description Set + Attribute Set + Functional Set (Formula 12). The Description Set encompasses various descriptions of the element. The Attribute Set is generated from attribute operations, while the Functional Set arises from functional operations. For instance, the Description Set could symbolize a person, the Attribute Set exemplifies the life of this person, and the Functional Set reflects the person's work.

③ To conceptualize a theory that includes elements, element integration, and integrated element integration, the mathematical logic of Set Theory is employed. This forms the basis for constructing element sets. A rational theory built on Set Theory's foundations then integrates these elements and integrated elements, culminating in a unified whole. The exploration of various structural laws utilizes function theory, algebraic structure theory, group theories, homomorphism and isomorphism theories, as well as ring and field theories, lattice, and Boolean algebra theories and other algebraic system theories derived from rational theory. The culmination of this investigation is illustrated by a structural diagram of the logical equation.

④ Understanding the primary structure necessitates examining attribute sets and functional sets. The Attribute Set comprises attribute operations for elements, integrated elements, integrated element integration, and the entirety. Similarly, the Functional Set encompasses function operations for these components. Both sets are depicted by the structural diagram of the logical equation, providing the groundwork for developing intermediate structures.

⑤ The microscopic primary structure typically represents the objective composition of a logical structure. This structure undergoes filtration by the logical field to become a microscopic intermediate structure. The microscopic intermediate structure evolves into the microscopic advanced structure through the filtration of subjective initiative. This process of filtration is comparable to the self-structuring of plant tissues during photosynthesis or the coordination and utilization of various structures in the human body when dining at a restaurant.

3) Microscopic Form of the Intermediate Structure

The macroscopic form of the intermediate structure is defined as the Filtered Primary Structure Collection. On a microscopic level, an intermediate structure tissue is represented by the formula: Intermediate Tissue = {Tissue Description Set + Tissue Attribute Set + Tissue Functional Set} + {Memory + Mailbox + Logical Equation Structural Diagram of the Memory + Clock Equation Structural Diagram of Memory} (Formula 13).

In this context, the description set, attribute set, and functional set are all depicted through structural diagrams of logical equations. These equations store data within their variables, which are classified according to data logic. Consequently, the description, attribute, and functional sets are all capable of data storage.

The microscopic logical fields resemble a primary structure that has been filtered through the microscopic environment. This filtering process can be applied to various components including the description set, attribute set, functional set, storage set, mailbox, and clock, either individually or in any combination.

Ultimately, the microscopic form of the intermediate structure is influenced by the microscopic logical fields and primary structures. The environment's filtering effect on the microscopic primary structures leads to the transformation of these filtered primary structures into intermediate structures.

4) Advanced Logical Structure

Macroscopic Form:

Advanced Logical Structure = Intermediate Logical Structure + Subjective Initiative Variables + Inherent Logical Association;

Microscopic Form:

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

Brain Tissue = {Description Set + Attribute Set + Functional Set} + {Brain Memory + Nerves + Logical Equation Structural Diagram for Brain Memory + Clock Equation Structural Diagram for Brain Memory} (Formula 15);

In this context, the terms description set, attribute set, and functional set refer to structural diagrams of logical equations. Data is stored in the variables of these equations, which belong to data logic classes. These classes enable the storage of data within the description set, attribute set, and functional set.

Building on the theory of human simulation, an advanced logical structure incorporates the creation of subjective initiative variables to develop brain and memory structures. This process facilitates the editing of memory structures, enabling a learning function. Furthermore, the inherent logical association of advanced structures is instrumental in generating nerves and their associated functions.

The microscopic form of advanced structures primarily comprises subjective initiative structures, commonly described as brain tissue or intelligence.

1.2.3. Logical Mechanics

1) Logical Force

Natural logical fields involve the interaction of matter, conceptualized as a logical force. Social logical fields describe interactions between humans, also seen as logical forces. The interaction between natural and social logical fields generates a combination of forces, leading to the resultant force of logical forces. The impact of these forces on logical structures manifests in logical changes and the transmission of modifications within the structure itself. Logical changes are defined as transformations in logical equations associated with logical structures. Meanwhile, modification transmission illustrates the influence of logical forces on these equations.

2) Logical Mechanics

Logical mechanics emerges through the incorporation of logical truth values—1 (true) or 0 (false)—into a logic structure or logic engineering framework. If a structural diagram of a logical equation holds a truth value of 1, this signifies that the diagram is implementable. Conversely, a truth value of 0 indicates non-implementability, akin to the principles observed in construction engineering mechanics. Developing this theory necessitates the identification of subjective and objective laws that enable the successful construction of these structural diagrams. These principles, grounded in mathematical logic, form the objective basis for the existence, function, and evolution of logical equations' structural diagrams. Analogous to the way physical mechanics ensure building safety, mathematical logic underpinning logical equations is referred to as logical mechanics. Moreover, the process of generating these diagrams follows an optimal path, termed the logical process. The examination of this process falls within the scope of logic engineering.

1.2.4. Mathematical Form of the Logical Structure

Logical equation structural diagrams represent various logical equations in mathematical terms, serving two primary purposes. One is to align with the principles of von Neumann computing, which extends to the principles of future quantum and biological computers; the other is to meet the requirements of mathematical logical expression, thereby facilitating the computation and judgment of truth values.

1.2.5. Focusing on Logical Structure and Logical Mechanics

This approach views all objects as logical structures, ranging from objective objects with only a primary structure, through low-level subjective objects with intermediate structures, to advanced subject objects with complex structures. It examines the subjective and objective logical laws governing these structures, highlighting the importance of concentrating on logical structures.

There are two methods to develop a logical structure:

First, begin with the primary structure, followed by establishing a set of filtering conditions for the logical field. This leads to the formation of an intermediate structure through the filtering of the primary structure. Subsequently, establish another set of filtering conditions based on subjective initiative, which allows an advanced structure to emerge through further filtering of the intermediate structure. This method is referred to as growth logic.

Second, start by identifying the functional requirements of advanced structures, which create a set of filtering conditions for subjective initiative. Based on these conditions, establish the functional requirements for intermediate structures. These requirements then help define the primary structure through the logical field's filtering conditions. Establishing primary structures involves identifying logical classes using attributes or functions, which paves the way for creating intermediate and advanced structures following the first method. This approach is known as devolution logic.

Both methods are essential in the study of logical structure and engineering and serve as the foundational ideology for exploring logical structures.

Logical mechanics investigates the interaction between logical structures by examining the mutual influence of logical structures and fields. This includes validating all logical equation structural diagrams, assessing their existence or feasibility, and evaluating their truthfulness. This area of inquiry constitutes the field of logical mechanics.

1.3. Logical Fields and Logical Networks

1.3.1. Logical Fields

1) What Is the Logical Field

References [3] [4] and [5] all delve into the logic field from different perspectives. The logical field comprises an environment of interrelated logical structures. These structures interact within a field that integrates both natural and social elements, creating a unique combined field. This integration facilitates the development of a logical environment where the phenomena of mutual shaping occur between logical structures and the field itself. Interactions between logical structures and the field are mediated through logic transmissions. These transmissions occur externally via logical networks and internally through logical buses. The logic governing these interactions is data-centric, encompassing structures such as logical equation files, diagrams, equations, and variable values. Essentially, the logical field can be represented as a structured diagram, illustrating the intricate relationships and dynamics within.

2) Modification Transmission

After logic is transferred from one logical structure to another, the receiving structure modifies the logic emitted by the preceding structure. For example, the sun exerts a gravitational force on Earth, which, in turn, exerts a gravitational force on the moon. Changes in the sun's gravitational force on Earth may influence the force Earth exerts on the moon. In this context, gravity represents the data logic of the gravitational field, carrying the logic. When Earth receives and modifies the logic from the sun, it alters this logic before transmitting it to the moon. The interaction within physical fields often involves logic networks and the transmission of modified logic, a concept that also applies to social fields. For instance, assume the impact of Chinese laws on Country A is represented by the legal data logic; then, Country A's impact on Country B's legal system involves transmitting modified legal logic. In this scenario, legal logic transmitted from China to Country A can undergo modifications that subsequently affect the legal logic Country A transmits to Country B. Therefore, research into integrated fields can adopt a similar methodological approach. The logic or data logic transmitted through logical networks can include a logical equation structure file, diagram, a logical equation, and variable values of the equation.

3) Natural Logic Field

The natural logic field, a fundamental theory in physics, is composed of matter. Its primary action involves the interaction between matter.

4) Social Logic Field

Contrastingly, the social logic field focuses on the study of human society and is fundamentally composed of humans. The core of this field is the interaction among humans.

5) Logical Field Generated by Perception

For logical structures to shape the logical field, perception of the logical field must occur. This encompasses the perception of matter within the natural logical field and humans within social fields, as well as the integrated perception of logical structures across both fields. For example, feeling cold is tied to the natural logical field, whereas sensing mistreatment by a superior pertains to the social logical field. Experiencing both cold and mistreatment represents a combined perception stretching across both the natural and social logical fields.

Perception of the logical field by logical structures is facilitated through data logic, which may take the form of a logical equation structure file, diagram, equation, and variable values. Means of perception include both external logical networks and the internal main line of logical structures.

6) Environmental Effect of the Logical Field

The logical structure and logical field are interdependent, mutually shaping one another. The logical field influences the logical structure's existence by supporting or opposing its activities or lifecycle. For example, within the digestive system's logical structure, the disposal of waste simultaneously generates the necessary food, thus creating environmental impacts. Conversely, the logical structure impacts the logical field through its activities or lifecycle, contributing to environmental shaping. For instance, humans destroy forests for survival but are now also working to reduce greenhouse gas emissions.

7) Requirements and Control of Logical Fields

① Requirements of Logical Fields

The logical structure and logical field mutually shape each other. This interaction influences how requirements are formed, which are conveyed through data logic. For example, cold weather necessitates wearing more clothing, as indicated by data logic. Similarly, the pursuit of higher education requires diligence, also determined by data logic.

② How to Obtain the Requirements of Logical Fields

To define the requirements of logical fields, one should first gather the relevant data logic via logical network communication. Subsequent analysis of this data logic helps identify the requirements. These requirements can then be addressed by aligning them with life's natural laws.

③ Control of the Logical Field

The control exerted over the logical structure by the logical field is part of their mutual shaping. Examples include Earth's gravity and human laws, which are expressed and conveyed through data logic and logical networks. For instance, gravitational interactions can depict an individual's weight, and educational networks can propagate human laws.

④ How to Obtain Control over Logical Fields

A logical structure, situated within a logical field, is subject to the field's control, conveyed as data logic through a logical network. For example, the logic network of gravity communicates gravitational force, while government's logic network conveys legal regulations. Being within a logical field is essential for a logical structure to exert control, which is achieved through the interplay of laws governing the logical fields. Control over a logical structure is expressed through data logic, impacting the structure's activities and lifecycle. Once control is established, it is transmitted internally.

1.3.2. Logical Network

1) Logical Network

A logical network refers to a network that enables the transmission of interactions beyond conventional Internet or 5G technologies. It is specifically developed to facilitate the movement of data logic, encompassing logical equation structure files, structural diagrams, equations, and variable values associated with logical equations.

2) Natural Networks and Social Networks in the Universe

The universe hosts an array of natural networks, including Earth's water cycle, wind and ocean currents, crust dynamics, geocentric changes affecting Earth's surface, interactions and transmissions among microscopic particles, gravitational networks spanning macroscopic spaces, and the transmission of light and radio waves, as well as temporal and spatial networks.

On the other hand, human social networks are equally diverse, featuring the Internet and 5G networks, transportation systems (roads, railways, waterways, air routes), and urban and rural infrastructures, all classified as hardware networks. There are also software networks, political, legal, cultural, educational, and religious networks, among others.

In essence, any phenomenon that involves logical propagation is underpinned by a logical network.

3) What Is a Logical Network

A logical network is an attribute of a logical field, composed of interactions between logical structures. These interactions result in the formation of networks through the phenomena of logical propagation, referred to as logical networks.

Logical networks are responsible for propagating logic. There exists a multitude of logical networks, such as the propagation networks of radio waves, interactive networks of microscopic particles, the water network on Earth, the transmission network of forces within the Earth's crust, and human-made networks like the highway system and legal framework. Moreover, the propagation of radio waves, interactions among microscopic particles, the movement of water, the dynamics of the Earth's crust, the transportation of goods on highways, and the enforcement of legal constraints all embody logic; thus, logical networks facilitate the transmission of this logic.

The propagation of logic is carried by what is known as data logic, which includes structures and variables of logical equations, such as a logical equation structure file, a logic structure diagram, and the values of logical equation variables. Data logic can manifest in various forms, like a cargo truck, a courthouse, or even a parcel, showcasing its versatility in transmitting logic. It is essential to recognize that the core of propagation is logic itself, influencing both the transmitting and receiving logical structures, including their structures, diagrams, equations, and variable values.

Logical propagation involves the process of transmission modification. When a logical structure is subjected to logical propagation, the incoming logic alters the structure, and the modified structure then emits its own data logic to a new logical structure based on its inherent laws of activity.

4) Role of Logical Networks

Logical networks are fundamental aspects of logical fields. Establishing a logical field requires the creation of logical networks, and the quality of these networks mirrors the field's quality. Logical networks facilitate the transmission of logic through data logic forms, encompassing the logical equation structure file, structural diagram, equation itself, and variable values.

The advancement of artificial intelligence (AI) hinges not only on the Internet and 5G technologies but also on the study and construction of logical networks. Both natural and artificial networks that humans encounter and build are crucial for intelligent machines. For instance, these machines must navigate gravitational networks in the universe and comply with legal frameworks.

5) How to Construct and Use Logical Networks

The growth of human capabilities and artificial intelligence is intertwined with the development and application of logical networks. The essence of these networks in disseminating logic covers a broad spectrum of human network engineering and applications. This includes fields such as aerospace and deep-sea engineering, legal and educational systems, and market and legal frameworks essential for the evolution of artificial intelligence and its governance.

1.4. Communication of Logical Structures

1.4.1. Logical Structure Main Line for Internal Communication

1) Primary Structure Main Line

In life theory, cells are endowed with the capabilities of memory and communication. They utilize a designated element set for storing and transmitting information to a mailbox. Each element's storage set contains a specific number of logical equation structural diagrams. Additionally, the element's description set, attribute set, and functional set include the necessary structural diagrams for logical equations. Elements are capable of solving logical equations by receiving variable values from one element's mailbox and transferring them to another element's mailbox. These values are then applied to the logical equation corresponding to the storage set or to the corresponding logical equation of the element class. The variable values derived from solving these equations may be utilized by the element itself, contribute to solving other equations, or be shared with other elements. Such variable values influence the logical equation and its structural diagram, leading to alterations in logical structures—a process referred to as information reasoning. The outcomes of information reasoning have the potential to control the state of the structure. Consequently, changes or ongoing alterations in the structure's state induce structural reasoning.

2) Intermediate Structure Main Line

Tissues and organs not only constitute the physical structure of life but also possess capabilities for memory and communication. In the theoretical simulation of life, mailboxes serve as nodes for the intermediate logical structures of tissues and organs. Consequently, each element is associated with one or more of the following: a logical equation structural diagram and a memory specific to a tissue or organ. This intermediate structure adheres to the principles of equation solving and logic transmission, akin to the primary structure, as well as those specific to tissues or organs. Essentially, it functions as the post office for external tissues or organs, facilitating the transfer of information. This information is relayed from the tissue or organ's post office to the logical equation structure diagram within its memory. Tissues and organs are also capable of equation solving, and the resulting variable value is transmitted to the corresponding element or another tissue or organ's post office. This process enables the forwarding of information to individual element mailboxes within other tissues or organs, thus fostering both informational and structural reasoning.

3) Advanced Structure Main Line

In the theory of simulating life, the nervous system creates pathways, known as nerves, which serve as conduits for signal transmission. Nerves, constituted either as tissues or organs, operate under subjective initiative. This subjective initiative in the primary structure adheres to physical laws, whereas in the intermediate structure, it adheres to environmental laws. In the advanced structure, the brain directs subjective initiative. The advanced structure encompasses nerves; the intermediate structure comprises post offices; and the primary structure consists of mailboxes.

The advanced structure is characterized by three layers of structural diagrams in the logical equation: one for elements, another for tissues or organs, and a third for brain memory. The variable values, sourced from either the primary or intermediate inputs, are processed in the brain memory through the subjective initiative function. The resultant values are transmitted via nerves to the tissue or organ mailbox, which then relays them to the element mailbox. This process facilitates both information and structural reasoning. Additionally, the logical equation structural diagram from the brain memory can be communicated externally through the output organs of the advanced logical structure.

4) Logical Structure Main Line Used for Information Reasoning

Abiotic reasoning employs mailbox reasoning, which involves solving equations. Variable values sent or received by a mailbox induce logical and structural changes. This is evident in scientific equations. Similarly, plants utilize a method akin to post office reasoning, where tissues and organs solve equations. Intermediate tissue or organ post offices send or receive variable values, which are then relayed to the element mailboxes. This process triggers both logical and structural changes, as seen in changes to the plant equation. Conversely, animals and humans engage in reasoning through brain logic and neural transmission of variable values. Here, brain tissue acts to solve equations with variable values transmitted by nerves and processed by tissues or organ post offices, leading to changes in both logic and structure, *i.e.*, shifts in the equation of life.

5) Logical Structure Main Line Used for Information Reasoning Control Structure

Information reasoning initiates logical changes, which then alter the structural diagram of the logical equation and the values of other variables. Any alterations in new variable values or other variables can modify the data of the control structure, potentially leading to the creation of a new control structure. For instance, when a person walking becomes anxious, their step frequency variable value increases. This, in turn, modifies the logical equation's structural diagram related to the human body. Such modifications in the body's structural diagram subsequently result in bodily changes, which manifest as an increase in the person's walking pace.

6) Logical Structure Main Line Used for Structural Reasoning

According to the theory of life, the values of variables in a logical equation dictate the logic, which in turn controls the structure and generates structural reasoning. For instance, take the scenario where a person is thirsty: the variable representing a new demand for a drink in the logical equation for drinking water changes. This alteration causes the value of the variable associated with the drinking action in the same equation to increase. Consequently, individuals gain a new logic for the subjective initiative of the brain that desires to consume a significant amount of water. This logic is transmitted through neural processes, tissues, organs, and ultimately to the element mailbox. Finally, a set of variable commands prompts the human body to drink water, culminating in structural reasoning. While information reasoning is concerned with establishing a goal, structural reasoning focuses on devising the means and processes.

1.4.2. Logical Networks Used for Communication between Units

1) Logical Network Communication

The logical network is a characteristic of the logical field, emerging from extensive interactions and widespread modifications within the logical field's structure.

2) Logical Network Communication with Primary Structure Only

A logical structure that includes only a primary structure is an inanimate objective structure. In this structure's logical network, communication is the logic of interaction and modification transmission across element mailboxes. Once transmitted, it undergoes further internal transmission. This internal transmission logic precipitates structural changes, which are then followed by the external transmission of modifications. Here, information pertains to the logic of data, encompassing forces, light, languages, and more.

3) Logical Network Communication with Intermediate Structures

Logical network communication that involves intermediate structures is categorized into two levels. The first level pertains to communication with the primary structure, as previously described. The second level involves communication with tissue or organ "post offices". This communication consists of data logic sent through interactions and modifications. Upon receiving the logic signal, these "post offices" transfer it internally to the designated mailboxes, akin to the previously mentioned internal main line. Following the completion of communication at both levels, the logical structure, through the use of post offices and mailboxes, externally modifies the transmission logic.

4) Logical Network Communication with Advanced Structures

Logical network communication involving advanced structures encompasses three levels. These include two levels within the intermediate structure and additional communication involving the brain, nerves, and sense organs. At the third level, the sense organs receive various forms of logic. This logic is then processed by the brain, with any modifications outputted through the nerves.

1.5. Data Logic

1.5.1. Data Logic

The theories of the logical field, logical network, and modification transmission are explored herein. Logical fields give rise to interacting data logic, logic networks facilitate the propagation of data logic, and modification transmissions depict the influence of data logic on logical structures. Data logic embodies all interactions within the logical framework. A unified form of data logic is presented as a process, consisting of the data logic class and other logic classes:

Data Logic Class = Description Set + Attribute Operation Set + Function Operation Set (Formula 17);

The description set entails the situational portrayal of data logic, encompassing data polymorphism and the logical significances of other logics. It adopts the form of logical equation structure files, logical equation structural diagrams, logical equations, and the variable values of logical equations. The attribute operation set encompasses logical equation structure files, logical equation structural diagrams, logical equations, and variables values that define attributes. Alterations in certain variables may influence attributes. The function operation set incorporates logical equation structure files, logical equation structural diagrams, logical equations, and the variable values of logical equations, where changes in some variables may impact function.

1.5.2. Data Logic Class

The Data Logic Class refers to a system of logic that signifies data through a structure encompassing a description set, an attribute operation set, and a functional operation set. Unlike traditional raw data, a Data Logic Class can be customized to facilitate records in the spheres of description, attribute, and function. It is possible for a Data Logic Class to adopt a simplified form, consisting solely of descriptions and excluding attributes and functions, thereby resembling raw data. Essentially, the Data Logic Class organizes data within a logical framework.

1.5.3. Data Logic Class Group

The Data Logic Class Group comprises a collection of related Data Logic Classes, abbreviated as "class group." An example would be the aggregation of student files within a class or the registration records of all motor vehicles in Guangzhou. This group encapsulates a novel database or data warehouse concept. The introduction of the Data Logic Class Group reflects a commitment to advancing data science by integrating logical structures and artificial intelligence, marking a significant shift away from conventional approaches to databases and data storage.

1.5.4. Mutual Interference of Data Logic Classes

Mutual interference, the interaction between data logic classes, signifies an advanced phase in logical analysis and data mining. It necessitates adopting specific research methodologies, requiring initially the amalgamation of the object sets from involved parties into a unified set. This process demands identifying an appropriate method that adheres to the governing laws of this unified set. For example, in studying the mutual interference of COVID-19 data from Hong Kong and Shenzhen, the datasets need merging to unveil common characteristics or variations in the epidemic's data. Similarly, the analysis of mutual interference between datasets on pond water quality and various aquatic species calls for the integration of these datasets. The combined set should highlight how water quality influences each aquatic species. This analysis leverages a variety of sophisticated technical and mathematical instruments.

Data logic classes, also known as data classes, require the amalgamation of two or more data class groups into a single entity for the study of mutual interference. This process may involve different types of integrations. For instance, the analysis of COVID-19 data from Hong Kong and Shenzhen benefits from a straightforward merging due to the data sets' similar natures. Conversely, studying the mutual interference between pond water quality and aquatic species datasets involves appending the water quality data to each aquatic species data point. Beyond these additions, other operations and their implications on data class groups merit exploration. Mutual interference underscores a sophisticated level in logical analysis and mining, demanding consideration of the applicable social or natural laws.

Research on data class connections and mutual interference among data class groups extensively employs theories from discrete mathematics, particularly group theory. For instance, consider the social law scenario involving various data class groups such as housing price, consumer basket, employment, income, stock price, and public satisfaction. By understanding the laws of mutual interference, a unified data class group can be established. This group leverages calculated indices from the aforementioned groups for data collection, monitors real-time changes and mutual interference, discerns the laws governing these interactions, and designs operations that unify the collected data class. This method facilitates the monitoring of societal, economic, and political developments, and it also provides insights into transforming core logical measures of public satisfaction.

The study of natural law provides another illustration. By establishing a data class that connects indices influencing atmospheric temperature, researchers can explore the mutual interference of these data class groups, design connecting operations, and create a new data class. This enables the observation of mutual interference and the investigation of methods to adjust the core logical measures of atmospheric temperature.

The research, modeling, and investigation of the mutual interference among data class groups hold significant implications for humanity. By incorporating advanced mathematical tools, these efforts can foster the creation of a highly intelligent production and living environment.

There are at least two scenarios for analyzing the mutual interference of data class groups. In the first scenario, an operation connects various data class groups into a single collection. This setup enables the observation of dynamic changes within the group, from which the laws of mutual interference can be identified. In the second scenario, understanding the laws of mutual interference precedes the operation. Once these laws are grasped, connections between operations are established. Subsequently, the data class groups are merged into a collection. This approach allows for the observation and monitoring of dynamic changes in key logical data, facilitating an understanding of relevant social and natural dynamic developments.

1.5.5. Original Ecology of Distributed Data

The core principle of this theory is inspired by bionic logic, aiming to emulate the logical systems observed in the life processes of animals, plants, and humans. By doing so, it pioneers a new branch of data science that is vibrant, self-regulating, interdependent, and dispersed. This paradigm shift evolves data analysis to focus on individual objects and groups, transitioning data regulation from supervising data stores to overseeing data associated with legal entities. Thus, it moves beyond the centralized databases characteristic of the industrial society and steps away from the machine data era, paving the way for life data in the age of artificial intelligence—a form of data science more aligned with human nature.

1.5.6. Object Analysis

Object analysis replaces traditional data analysis, grounding its methodology in corresponding logical equations. This approach is particularly useful in complex, large-scale analyses like census data processing, where individual data points are collected and analyzed collectively. Subsequent policies are tailored for each individual based on this analysis. The process encompasses objects and databases, with data logic converting databases into object groups. This transition from data to object analysis, coupled with ongoing research, may simplify the structure of object groups, making them more efficient than traditional databases. This simplification highlights the potential benefits of artificial intelligence in data processing.

1.5.7. Data Logic of Primary Structures

The data logic classes in primary structures are stored in the element storage set, forming groups that mutually interfere with each other. These classes are characterized by their dependability and distributed nature. Communication among data logic classes occurs via element mailboxes, whereas statistical computations, processing, and editing operations are managed through self-contained attribute operation sets and functional operation sets. By integrating attribute and function sets, data logic class groups can emulate a database replacement, altering the logical structure of elements by assigning values to variables in logical equations.

1.5.8. Data Logic of Intermediate Structures

The data logic of intermediate structures operates on two levels, encompassing the data logic of primary structures and introducing logic specific to intermediate structures. In these structures, data logic classes are stored within the memory of tissues and organs, where class groups exhibit mutual interference, dependency, and a distributed nature. The editing of data logic classes and their groups, along with the mutual interference between these groups, is facilitated through description sets, attribute sets, and functional sets, along with their integration. The primary function of tissues and organs within this logical framework is to assign values in various logical equations, leading to changes in variable values. This process not only affects tissues and organs but also allows the memory of these structures to communicate with the element storage set, thereby establishing distributed laws.

1.5.9. Data Logic of Advanced Structures

The data logic of advanced structures is categorized into three tiers. The first and second tiers encompass the data logic of primary and intermediate structures, respectively. Specific data logic classes for advanced structures are stored in brain memory, which exceeds the scale of memory found in tissues and organs. In turn, the memory capacity of tissues and organs surpasses that of element storage sets. Brain memory is capable of housing extensive data logic classes and managing the mutual interference among substantial class groups. The editing method employs a comprehensive integration of description sets, attribute sets, and functional sets. This process also involves assigning values to logical equations within the brain, facilitating large-scale cognitive processes. Brain memory can interface with the external world via nerves and senses, enabling learning. It also communicates with tissues, organs, and element storage sets through neural pathways, thereby establishing distributed laws.

Such advances may herald the onset of a new data era.

1.6. Logical Equations

1.6.1. Objective Equation of Matter

All lifeless matter is described by matter equations, distinguished by physical or chemical frameworks. These equations are underpinned by various mathematical theories. Objective matter is capable of retaining these equations, serving as the repository for universal laws. Through matter equations, the existence, motion, and temporal phases of objective matter are comprehensively characterized.

1.6.2. Biological Equation of Life

Biological equations encompass both plant and animal equations, with our focus here being on those applicable to humans. These are categorized into three levels. The foundational level comprises cellular biological equations, which entail those present in cellular memory. These equations facilitate all cellular life activities and cycles, encapsulating the properties and functions of DNA. At the intermediate level, we delve into the biological equations of tissues and organs. This includes equations at both the cellular base and the tissue or organ levels. An example of such equations is the representation of hunger and fullness in the stomach as two values of a single variable, determinable by specific biological equations. These equations at the tissue and organ level cover all life activities and cycles pertinent to these biological structures. The advanced level encompasses biological equations involving the cell base, tissue or organ, and brain layers. The first two layers align with those discussed previously. At this level, equations integrate the brain, nerves, and various tissues and organs to model the activities and life cycles of the human body comprehensively.

1.6.3. Proposing the Logical Equation

Logical equations, derived from matter and biological equations, can be categorized into three levels. At the primary level, logical equations apply the principles of matter and cell equations. The intermediate level involves the use of biological equations related to tissues or organs. In contrast, the advanced level engages the principles of the brain's biological equations. The logical equation serves as a fundamental tool for object analysis, encompassing scientific, biological, and subjective equations, thereby integrating both objective and subjective dimensions. Research in bionic logic indicates that life activities are governed by ubiquitous equations that include both objective and subjective components. Hence, logical equations are integral to the logical structure, permeating description sets, attribute sets, and functional sets of element classes. These equations also play a crucial role in the three levels of storage: sets, memory, and brain, facilitated by transmission through mailboxes, post offices, and nerves. Furthermore, logical equations encompass clock equations with a structure composed of numerous logical equations. Human activities and lifecycles rely on logical equations for object analysis, enabling the invocation of relevant equations or sets of equations. This process allows for the calculation of certain variable values based on others, with large-scale object analysis involving extensive equation sets.

1.6.4. Logical Equations of Primary Structures

The logical equations of the primary structure are established using the laws of matter and cell equations. These equations describe all the activities and life cycles of primary structures.

1.6.5. Logical Equations of the Intermediate Structure

The intermediate structure emerges from the filtering of primary structures through environmental variable logical fields, leading to the formation of tissues or organs. Each tissue or organ adheres to laws governed by primary logical equations. The intermediate structure, therefore, develops its logical equations based on primary logical equations' foundations. These equations follow the same laws as tissues or organs and, in conjunction with primary logical equations, facilitate the activities and life cycles of the intermediate structures within the logical framework.

1.6.6. Logical Equations of Advanced Structures

Advanced structures incorporate primary and intermediate logical equations. Advanced logical equations are formulated based on the biological laws of human bodies. This comprehensive framework, consisting of primary, intermediate, and advanced logical equations, along with their various combinations, delineates the structure, activities, and life cycles of advanced logical structures.

1.6.7. Constructing Logical Equation

Constructing logical equations involves three components: the equal sign, the left side of the equation, and the right side of the equation. The creation of the equal sign symbolizes the establishment of equilibrium. The interaction between the equal sign and the two sides of the equation aims to solve variables, which is the core theory behind logical equations.

1.7. Life Activities in Logical Structures

1.7.1. Information Reasoning

Information reasoning encompasses three levels: Primary Reasoning, Intermediate Reasoning, and Advanced Reasoning.

1) Primary Reasoning

Primary reasoning entails the informational analysis of basic structural elements, including storage sets and mailboxes, along with their intrinsic structures. The storage set holds the logical equation structure diagram related to the element, encompassing both matter and biological equations, as well as pertinent data. The mailbox receives persistent data logic, comprising data logic classes and other logical classes. Based on the received data logic, the element's structure assigns values to specific variables, solves equations, and thereby finds solutions for certain variables. These solutions signify alterations in the element's logical structure. Transmitting these solutions through the mailbox facilitates a form of modification transmission. Each cycle of this transmission process exemplifies the primary information reasoning process.

2) Intermediate Reasoning

Intermediate reasoning encompasses two distinct levels: primary information reasoning and intermediate information reasoning. This reasoning process employs the structural diagram of a logic equation stored in the intermediate structure memory, which additionally houses data pertinent to data logic classes. The intermediate structure's post offices manage a variety of data logic, encompassing both data logical classes and other logical categories. This data logic is allocated to specific variables. Following the assignment of these variables, the intermediate structure resolves equations based on its inherent configuration. The solutions to these variables signify alterations in the logic structure and, once deduced, are conveyed through the post office as a form of modification transmission. Each of these transmissions exemplifies a case of intermediate information reasoning. Effective communication between the two reasoning levels in the intermediate structure is essential to facilitate interaction.

3) Advanced Reasoning

Advanced reasoning encompasses primary-level reasoning, intermediate-level reasoning, and notably, advanced-level reasoning. This highest level of reasoning involves comprehending structural diagrams of logical equations stored in brain memory, along with pertinent data, neural pathways, and the capability to solve equations involving complex logical structures, in addition to the functioning of sense organs. Initially, sense organs gather input data, which is then conveyed via neural pathways to the brain. Here, the brain assigns values to variables within the memory's logical equation. The advanced logical structure determines the value of certain variables using its intrinsic equation-solving capability, leading to a logical alteration within this structure. Consequently, it either outputs this logical information to an internal "post office" or "mailbox" through neural pathways, or it sends the information directly to the relevant organ for logical information dissemination. This mechanism facilitates modification transmission and sophisticated structural information reasoning, culminating in an episode of advanced structural information inference.

The interaction between the three levels of reasoning—primary, intermediate, and advanced—allows for complex communication and processing within the realm of advanced reasoning.

1.7.2. Control of Logical Structure through Information Reasoning

Primary-level information reasoning initiates changes in the structural elements, that is, alterations to the structural diagram of the logical equation. These modifications, brought about by primary-level reasoning, facilitate primary control.

Intermediate-level reasoning encompasses both primary and intermediate methods. It instigates changes to the tissues or organs within the intermediate structure, thereby altering the structural diagram of the logical equation. This demonstrates an impact of intermediate-level reasoning on the intermediate structure, leading to intermediate control. Such control transcends primary control and encompasses combined primary and intermediate control.

Advanced-level information reasoning integrates primary and intermediate reasoning techniques, alongside its distinct advanced-level reasoning. This advanced reasoning brings about modifications in the logic of advanced logical structures, evident through alterations in the logical equation's structural diagram. Consequently, this induces changes at the advanced level, leading to advanced control. This category of control encompasses a comprehensive range including primary, intermediate, combined primary and intermediate, advanced, combined advanced and primary, combined advanced and intermediate, as well as a tri-level cooperative control.

1.7.3. Structural Reasoning

Structural reasoning involves a transition from one state to another due to logical changes in the structure, akin to an individual standing in one place and then stepping forward after processing information. This metaphor illustrates the process of structural reasoning, where information analysis drives the progression by one step. This kind of reasoning is crucial for the advancement of intelligent machines and the enhancement of intelligent control systems.

1.7.4. Explanations of Logical Equations

The application of logical equations is not limited by type, encompassing a wide array of mathematical formulas. This inclusivity allows for the extensive use of mathematical tools and theories in exploring the logic structure and advancing logic engineering. Consequently, this openness has significantly facilitated the continuous growth of artificial intelligence.

1.7.5. Laws of Life Activities within Logical Structures

Exploring the laws of life activities in logical structures requires understanding that these laws encompass three processes. The first is the information reasoning process, which entails the perception and collection of information, such as that obtained by sensory organs like eyes and ears. Advanced structures, such as human and animal brains, engage in logical statistics, information processing, and object analysis, commonly referred to as thinking. Conversely, lower-level structures depend on biological and physical reactions instead of cognitive functions. Information reasoning culminates in the generation of the desired output or response information. The second process involves producing the necessary output information through movements orchestrated by the brain in advanced structures or by the logical control structures in lower-level entities. The third process, structural reasoning, operates under the directives of information reasoning and ultimately delivers the required information output.

Even low-level structures exhibit life activities. For example, a hillside, in the absence of a brain but possessing a physical structure, processes the information of soil and rock movements. Through object analysis based on the laws of physics, it predicts the outcome of a landslide. In this scenario, physical laws govern the information reasoning, directing the structural reasoning of the hillside, which leads to a landslide. This process culminates in obtaining the landslide's information output.

The study of life activities in logical structures is highly significant for the field of logic structures.

1.8. Lifecycle of Logical Structures

1.8.1. Clock of Logical Structures

Logical structures encompass three clock levels: the primary-level elements, the intermediate-level tissues or organs, and the advanced-level brains.

The clock within primary-level elements orchestrates the lifecycle of these elements. This clock operates as a logical equation structure diagram, formulating the lifecycle variable's value and facilitating information and structural reasoning.

Similarly, the clock residing in tissues or organs governs their lifecycle, maintaining its role as a logical equation structural diagram. This mechanism continues to generate the lifecycle variable's value for tissues or organs, enabling information and structural reasoning.

At the pinnacle, the clock embedded in the brain dictates the brain's lifecycle through a logical equation structure diagram. This system consistently generates the lifecycle variable's value for the brain, further supporting information and structural reasoning.

1.8.2. Lifecycle of Subjective Initiative

Taking humans as an example, intelligence persists as long as the brain is alive and ceases once the brain is no longer living. At the heart of advanced logical structures is subjective initiative, which constitutes the brain. This brain operates on a clock, with its lifecycle variable governed by a logical equation's structural diagram. It is the brain's structure that resolves this clock equation to derive the lifecycle variable. This variable not only determines the brain's survival but also impacts whether the advanced logical structure exhibits its own intelligence. The lifecycle variable of subjective initiative facilitates both information and structural reasoning.

1.9. Intelligence of Logical Structures

1.9.1. Subjective Initiative of Logical Structures

The subjective initiative of logical structures characterizes the brain's tissue or organs, enabling the brain to generate intelligence. The primary objective of intelligence is to solve variables in logical equation structural diagrams. These values are utilized for information reasoning and structural reasoning, ultimately assisting life activities.

We propose a theory that the brain's memory holds objective logical equations, encompassing both matter and biological equations. Additionally, subjective logical equations in the brain can produce subjective variable values, such as those representing happiness and unhappiness. Both types of variables are subject to information reasoning and structural reasoning.

Furthermore, we introduce a theory suggesting that learning involves constructing and solving logical equation structural diagrams in the brain's memory. Logical equations are categorized into objective and subjective equations, leading to two types of learning: objective and subjective. For instance, learning to operate a lathe constitutes objective learning, while reading a novel represents subjective learning. The emergence of new logical equations introduces new variables, paving the way for novel information reasoning and structural reasoning. This process generates new life activities and life cycles.

1.9.2. The Process of Intelligence

Intelligence encompasses two fundamental processes: solving equations and communication. The process begins with the individual receiving communication, employing sense organs to gather sensory data. This data is then transmitted to the brain via nerves. Subsequently, the brain processes this sensory data to assign values to variables stored in memory. Using these values, the brain solves equations to determine the outcomes, leading to potential logical adjustments within its structure. Following this, the application of new values facilitates the generation of informational reasoning and structural insights, prompting activities or life cycles. Ultimately, these altered logical structures send out modification signals.

1.9.3. Research on the Complexity of Intelligence Technology

The complexity of intelligence is directly proportional to its level: the more complex the intelligence, the higher it tends to be. This correlation underscores the importance of researching complexity within intelligent technology, which may involve multiple methodologies for its advancement.

For instance, a student engaged in education for the sole purpose of enhancing intellect represents a form of simple intelligence with a direct process. However, when a student's objectives expand to include moral, intellectual, and physical development, the process becomes considerably more complex. This complexity arises from the comprehensive nature of the goals and the integration of simple processes to achieve them.

Hence, the development of complexity in intelligent technology requires the training of intelligent machines using methods and capabilities that aim for comprehensive objectives. This involves combining various simple methods and processes to create an amalgam of integrated approaches. Such a strategy can then be scaled up by incorporating an extensive array of methods and processes. The formulation of a theory to integrate these methods and processes marks a significant step towards enhancing the complexity of intelligent technology.

1.9.4. A Tool for the Study of Mixed Integrated Intelligence Technology—Directed Graphs in Graph Theory

Developing complex intelligent technology necessitates the use of tools. Here, we propose the Directed Graph in Graph Theory as such a tool. Initially, a logical equation structural diagram is established for the functional nodes of intelligent machines, akin to marking cities on a map while determining the starting and ending points. In instances where certain nodes are missing, they can be generated based on logical structure theory. Subsequently, the optimal path from the starting point to the ending point is determined. Missing nodes or paths in the optimal path can also be generated based on logical structure theory, allowing the optimal path to represent the logical structure of the mixed integrated method. This tool, employing directed graphs in graph theory, facilitates both structural and informational reasoning.

2. Logic Engineering

2.1. Engineering of Bionic Logic

2.1.1. Bionic Logic

Bionic logic constructs a logical framework using the principles of bionics. It involves the creation of logical engineering structures through the same principles. Bionics can be categorized into two types: developmental logic bionics and transformative logic bionics. In developmental logic bionics, the process begins with the formation of the primary structure's logical equation structure diagram or structure file. This leads to the creation of intermediate and then advanced structure diagrams or structure files, sequentially. Conversely, transformative logic bionics, exemplified in the growth patterns of trees and most animals, starts with the advanced structure diagram or structure files. Only then are the intermediate and primary structure diagrams developed, based on the requirements of the advanced structures. The metamorphosis of a frog from a tadpole into an adult is a case in point. This theory focuses predominantly on the logic of growth.

2.1.2. Simulating Life

Logic engineering in this context seeks to emulate the life's growth logic. It concentrates on mimicking the process through which life develops its primary and intermediate structures.

2.1.3. Simulating Humans

Logic engineering simulates the advanced structure of humans, focusing on the formation and growth of brain tissue and nerves. The primary emphasis is on replicating the development of human intelligence. This includes the evolution of learning capabilities and the simulation of the activities and lifecycle processes of brain tissue and nerves.

2.1.4. Simulating Society

Ref. [5] The idea of a simulated society and a simulated life was proposed for the first time. Logic engineering also simulates the emergence and development of society. It establishes the developmental process of logical fields for logical structures, concentrating on the creation and growth of these fields for intelligent machines. The research examines the environment for intelligent machines, particularly the emergence and development of a society where humans and intelligent machines coexist. It explores the methods required to fulfill needs and exert control within such a society.

2.1.5. Simulating Human Life

The simulation of human life is a process that underpins the engineering of intelligent machines. This process emulates human experiences, wherein intelligent machines, analogous to humans, come into existence through the union of "parents." They undergo learning, engage in work, seek further education, enter retirement, and navigate their later years, mirroring human life stages.

2.2. Engineering Focusing on Logical Structures and Logical Mechanics

2.2.1. Focusing on Logical Structures

This methodology posits that the focal points of logical engineering are logical structures, adopting two primary research directions. The first, growth logic, begins with primary structures, progresses to intermediate structures, and culminates in advanced structures. The second, metamorphic logic, initiates with the development of an advanced structural diagram or structure file. Subsequent to this, the intermediate and primary structural diagrams or structure files are constructed, catering to the requisites of the advanced structure.

2.2.2. Focusing on Logical Mechanics

This methodology suggests that by evaluating the truth of mathematical logic and incorporating binary values of 1 and 0 into the logical framework and engineering, we can draw parallels to safety assessments in construction. A truth value judgment is applied, enabling the implementation of logical laws that are true, while those proven false are disregarded. This process sets a standard for feasibility.

2.3. Logical Fields of Engineering

In logical engineering, logical fields act similarly to the environment in traditional engineering. The concepts of feasibility, control, and demands within engineering stem from the logical field. They are governed by the interaction between logical structures and the logical field.

2.4. Engineering Process

2.4.1. Process of Establishing the Structural Diagram of the Logical Equation

1) Growth Logic

Initially, structural diagrams for the logical and clock equations are established for the primary structure, adhering to the sequence of elements before their integration. Subsequently, similar diagrams are prepared for the intermediate structure. The filtering equation's structural diagram is utilized to sift through the primary structure, thereby forming intermediate tissues. This is followed by the establishment of the structural diagram for the logical equation pertaining to the intermediate structure. An advanced structure is then developed, accompanied by the structural diagrams of the logical and clock equations for brain tissues.

2) Metamorphic Logic

The process begins with the creation of structural diagrams for the logical and clock equations for the advanced structure. Following this, analogous diagrams for the intermediate structure are formulated, based on the specifications of the advanced structure. Finally, the structural diagrams for these logical equations are prepared for the primary structure.

2.4.2. Process for Establishing Data Structures

1) Growth Logic

A data structure is developed following the sequence of primary, intermediate, and advanced structures. Data is integrated into logical and clock equations and distributed among variable sets that include description sets and attribute sets. This distribution also spans various levels of mailboxes, post offices, memory communications, and dynamic data.

2) Metamorphic Logic

A data structure unfolds in the reverse sequence starting from the advanced structure to the intermediate and then the primary structure. Data is allocated to logical and clock equations, organized in relevant variable sets encompassing description sets and attribute sets. This organization extends to various levels of mailboxes, post offices, memory communications, and evolving data.

2.4.3. Process for Establishing Communication Structures

1) Growth Logic

Initially, the primary structure is set up following the sequence of elements before integration, with mailboxes assigned to each element. Subsequently, the intermediate structure is developed using the filtering equation structure diagram to sieve through the primary structure and craft the intermediate tissues. Once this is accomplished and the intermediate structure takes form, a post office is created for each tissue to facilitate communication between the intermediate and primary structures. The advanced structure is then established, with nerves and sensory organs managed by brain tissue being set up to enable communication across the advanced, intermediate, and primary structures.

2) Metamorphic Logic

Initially, the advanced structure's subjective initiative is developed, followed by the establishment of nerves and sense organs based on this initiative. Subsequently, tissues and their corresponding control centers are formed in alignment with the subjective initiative, nerves, and sense organs. Communication between tissues and the brain is then established. Lastly, communication networks for the primary structure and its components are developed, facilitating communication between the components and tissues, as well as between the components and the brain, according to the needs of the tissues.

2.4.4. Process of Life Activities

1) Process of a Life Activity

Life activities are typically governed by the structural diagrams of logical equations. A change in the variable data within these equations can precipitate changes in other variable data, leading to logical reasoning. Such alterations in variable data can modify logical equations, thereby adjusting the structure's logic and exerting control over information. This transition in the structure's logic signifies a shift from one state to another, underpinning the essence of a life activity.

2) Life Activity of Tissue

The life activity of a tissue begins with a change in specific variable data. This change might stem from modifications in the brain tissue's logical equation structural diagram—essentially, thought processes—or from updated data acquired through communication. The alteration in variable data instigates changes in related data within the equation, culminating in logical reasoning, information control, and structural reasoning.

2.4.5. Process of the Life Cycle

The clock equation's structural diagram governs the lifecycle of logical structures. By establishing this life cycle, it is possible to generate clock equation structure diagrams at various levels. These diagrams can then be applied to different elements, including body and brain tissues. Moreover, changes in the variable data within the clock equation's structural diagram initiate information reasoning, control, and structural reasoning. This progression leads to effective management of the life cycle.

2.4.6. Mathematical Form of the Process

The representation of logical structures takes the form of mathematical logic. Consequently, the outcomes of different stages in the process that focus on logical structures are also expressed through mathematical logic. This approach facilitates evaluation and judgment using the principles of logical mechanics.

2.5. Intelligence Engineering

2.5.1. Applying Bionic Logic to Research Intelligence Engineering

Bionic logic theory offers a framework for simulating intelligent machines that mimic human behaviors. It establishes a logical social field that promotes the coexistence of humans and intelligent machines. This theory also enables the simulation of intelligent engineering processes akin to human life.

2.5.2. Simulating the Logic Field of Society

A social logic field facilitating the coexistence of humans and intelligent machines can be established. Society functions as the environment for intelligent engineering, which in turn derives its feasibility, control, and demands from society, thereby leading to a mutual shaping process between intelligent engineering and societal structures.

2.5.3. Simulating Intelligent Engineering for Human Life

1) Obtaining Parents and Family

In simulating human life, the establishment of parents and a family is a precursor to the birth of intelligent machines. The father symbolizes the demand side, while the mother represents the supply side. Guided by the control mechanisms of the social logic field, parents come together to form a family. Similar to human families, machine families are also required to obtain a marriage certificate for the purposes of supervision and monitoring.

2) Attaining Legal Status upon Birth

Following the principles of simulating human life, the initial stage for intelligent machines is represented by the machine fetus, characterized by a basic structure, immature intermediate structures, and the capacity for developing sophisticated structures. As they grow, adhering to a predetermined growth logic, machine fetuses must be registered to ensure their supervision and monitoring.

3) Growth

The growth stage of machine fetuses primarily focuses on enriching and perfecting their intermediate structures. Constructing the necessary logic equation diagrams for both primary and intermediate structures represents a developmental logic law.

4) Learning

Upon entering the learning stage, machine fetuses further develop and perfect advanced structures, transforming into machine students. They exhibit ability for metamorphic logic, crafting logic equation diagrams for life activities, and enhancing the variable dataset of their logic equations.

5) Working

After completing the learning process, intelligent machines have perfected primary, intermediate, and advanced structures. Completing the initial growth logic, they commence applying metamorphic logic in their work, thereby becoming machine workers.

6) Enhancement

Machine workers continue to engage with growth logic; like humans, they require ongoing education to improve logic equation diagrams across various structural levels and update the variable data for their equations.

7) Retirement

Similarly to humans, machine workers go through a retirement phase and can lead a life akin to human retirement. They also have the option to revert to traditional engineering methods.

8) Old Age

Intelligent machines, similar to humans, enter a final stage of old age. The field of social logic can oversee elderly machines in ways akin to the management of older human individuals.

3. Significance of This Theory to Artificial Intelligence and Human Methodology

3.1. Significance of This Theory to Artificial Intelligence

1) Introducing a foundational theory of artificial intelligence for the first time.

2) Opening a new avenue for the advancement of artificial intelligence through bionic logic theory and addressing challenges posed by traditional industrial society methodologies.

3) Enhancing the technological framework and engineering processes of artificial intelligence with the crucial use of logic equation diagrams.

4) This approach involves utilizing logic structures for research and development in artificial intelligence (AI) technology. It employs logical mechanics to assess the truth, validity, and feasibility of AI technology processes. Furthermore, it introduces logical mechanics to create software mechanics, focusing on logic structures as the research object and logic mechanics as the governing laws.

5) The application of the theory of the logic field enables the study of the environment of AI technology. Simultaneously, the theory of logic networks facili-

tates research into the novel networks required by AI technology.

6) The communication theory of logical structures is utilized to construct communication frameworks for AI technology.

7) This involves replacing the data science of industrial societies with data logic, thereby fostering the development of new data science essential for AI.

8) The logic structure theory of life activities is used to examine the operation of AI machines. This examination begins with the structural diagram of the logical equation and concludes with its analysis. The process is detailed through multiple logic equation diagrams and explored using three theories: information reasoning, information reasoning control structure, and structural reasoning. Additionally, the machine's lifecycle is analyzed using the life cycle theory, while the concept of time is studied through clock equation diagrams.

9) The development of intelligence theory is based on logic structuralism. This theory is applied to AI technology, laying the foundational theory for researching AI machines.

10) Software engineering for AI technology is developed based on logic engineering, generating a fundamental theory for the development of AI engineering.

3.2. Significance of This Theory to Human Methodology

1) Creating a New World View

This theory posits that the universe is neither subjective nor objective but is inherently logical. The foundational principle that logical laws not only determine truth but can also create new truths helps resolve the longstanding debate among scientists regarding the universe's inherent subjectivity or objectivity.

2) Establishing a New View of Life

Life adheres to logical laws that integrate aspects of both materialism and idealism. This perspective asserts that human existence is a manifestation of these laws, bridging objective and subjective realms.

3) Employing Bionic Logic in Problem Solving

This approach encourages imbuing issues with life-like qualities, thus facilitating the examination of problems at various levels, including cellular, human, societal, and those simulating human existence.

4) Utilizing Logical Equation Structural Diagrams

These structural diagrams serve as a crucial tool for examining the complexities of human issues. They help in investigating solutions and acting as a descriptive aid in the problem-solving process.

5) Adopting a Logic-Oriented Structure for Viewing Issues

By perceiving everything through logical frameworks, we leverage logical laws to fulfill needs, guide behavioral processes, and apply logical mechanics to assess truthfulness and feasibility.

6) Recognizing Research Subjects as Logical Entities

The approach classifies research objects as logical in nature and structure, focusing on the identification of logical laws. These laws span various professional and interdisciplinary domains, underscoring the quests for truth. Through understanding logical structures and discovering logical laws, this methodology paves the way for the advancement of logic engineering. It aims to satisfy the demands of interdisciplinary research, foster innovation, ensure the accuracy of logical laws, and introduce novel research methods. By redefining academic fields and categories, it offers fresh perspectives for scholarly inquiry.

7) Viewing the environment of all issues as logical fields and networks, and studying the mutual shaping of issues and logical fields.

8) Utilizing the communication theory of logical structure to study communication within various practical problems.

9) Innovating human perspectives on data processing through data logic, and replacing data analysis and formula analysis with object analysis and logic equation diagram analysis.

10) Applying the theory of life activities to study the generation, development, consequences, and solutions of issues, and using the lifecycle theory to examine various work processes.

11) Growing and developing human wisdom through the intelligence theory of logical structuralism.

12) Studying all process-related and engineering issues using the theory of logic engineering.

13) System structures, designed with the machine-oriented thinking of the industrial age, fail to meet the demands for subjective initiative or intelligence. Unlike system laws, which are not universal and fail to capture the truth of subjective and objective laws, logical laws possess unique truth values that can cover both subjective and objective truths, making them suitable for truth pursuit. Logic engineering, designed for logical structures, offers a complete set of independent processes with notable effectiveness. In contrast, system engineering, rooted in the traditional industrial age, lacks efficiency and fails to meet the demands of the artificial intelligence age. Logic Structure and Logic Engineering, by replacing System Structure and System Engineering, align with the requirements of the artificial intelligence age and represent the most effective method for pursuing truths in this era.

Conflicts of Interest

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

References

[1] Liu, D.H. (2012) 3D Social Engineering. Jinan University Press Edition, Guangzhou.

[2] Liu, D.H. (2013) Soft Structure of Social Science. Jinan University Press Edition, Guangzhou.

[3] Liu, D.H. (2015) Logic Structure and Logic Engineering. Sun Yat-sen University Press Edition, Guangzhou.

[4] Liu, D.H. (2014) Logical Field Economics. Jinan University Press Edition, Guangzhou.

[5] Liu, D.H. (2015) Logical Field Software Engineering. Jinan University Press Edition, Guangzhou.