

Non-authigenic Logic Comparison of Heav-en-Human Corresponding Analysis and Canonical Correlation Analysis- Mathematical Reasoning of Statistical Intervening Principle Based on Yin Yang Wu Xing Theory in Traditional Chinese Statistics (I)

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Abstract— Non-authigenic Logic is useful in understanding statistical disease. By using mathematical reasoning, this paper demonstrates the statistical intervening principle: “If some people want to logical reasoning or to check whether reasoning method is reasonable or not, in order to ensure reproducibility, so any assumptions and standard, can’t come from their own, and should, from a third party, have nothing to do with themselves and their observation” (第三方标准). This is a logic which is similar to a group and has nothing to do with the research object, namely non-authigenic logic (不自生逻辑), based on Yin Yang Wu Xing Theory in Traditional Chinese Statistics (TCS). The philosophy meanings of five aspects of Non-authigenic Logic are defined and the five basic principles and their rules of non-authigenic logic are discussed. The kernel of this paper is the existence and reasoning of the non-compatibility relations, and it accords with the oriental thinking model. Hilbert’s sixth mathematical conjecture of his 23 mathematical conjecture problems gets a negative answer. As an application, Heaven-human corresponding analysis in TCS is given, which is similar to Canonical cor-relation analysis proposed by Hotelling (1936), because they are all to study relations between two sets of variates. By simulation, compared with the Heaven-human corresponding analysis method in TCS and the traditional canonical correlation analysis method. Simulation analysis of examples: the problem is very serious, because western often use the canonical correlation analysis method, for the question of studying relations between two sets of variates is not applicable, without reproducibility.

Index Terms— Traditional Chinese Economics (TCE), Yin Yang Wu Xing Theory, steady multilateral systems, incompatibility relations, Heaven-human corresponding analysis, canonical correlation analysis, reproducibility

I. INTRODUCTION

Non-authigenic Logic is useful in understanding statistical disease. By using mathematical reasoning, this paper demonstrates the statistical intervening principle: “If some people want to logical reasoning or to check whether reasoning method is reasonable or not, in order to ensure reproducibility, so any assumptions and standard, can’t come from their own, and should, from a third party, have nothing to do with themselves” (第三方标准). This is a logic which is

similar to a group and has nothing to do with the research object, namely non-authigenic logic (不自生逻辑), based on Yin Yang Wu Xing Theory in Traditional Chinese Statistics (TCS).

People knowing the world is to understand the purpose of the scientific principles of the real world, the resulting real scientific theory. But different philosophy thoughts can produce different logic, different logic can produce different “scientific theories”. Therefore, the TCS’ meeting the first question is: what kind of logic is the reasonable logic?

The ancients speaking of “**statistics**” in Chinese is a word to intervene a statistical complex system through the comprehensive survey without Axiom hypothesis for own goal. This and what people now understand the statistic completely different things. In other words, in TCS, both intervening and controlling of an engineering are believed to as a statistical complex system. It is because to intervene an engineering is difficult and complex in which there are the loving relation, the killing relation and the equivalent relation among many Axiom systems. The loving and killing relations are non-compatibility relations, which can compose the whole energy of the system greater than or less than the sum of each part energy of the system, respectively, rarely equal conditions. Statistics means managing or controlling or intervening for the statistical complex system, and so on. Pursuing the goal is the harmonious sustainable or balance of the statistical complex system in order to compose the statistical complex system not outward expansion development. Used method is to look for its real image which is objective and repeating as reproducibility. In order to ensure reproducibility, inspection standard must come to as for a statistical complicated system itself, rather than a scholar. Generally speaking, all the logic inference was conducted on the premise of no assumptions. The assumption involved the behavior of people is not needed since the system is complex, only need to balance the statistical complex system and to ensure reproducibility. The logic reasoning of no assumptions is called **non-authigenic logic**. It is because if they want to logical reasoning or to check whether reasoning method is reasonable or not, in order to ensure reproducibility, so any assumptions and standard, can't come from their own, and should, from a third party, have nothing to do with themselves. Simple said, can't do the referee, and sportsman. This is the most basic logic of Chinese culture.

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But, in Western statistics, statistics means first obtaining statistical data, then performing statistical inference from the statistical data under one Axiom system assumption. Both obtaining and inference of data are believed to as a simple system, major statistical analysis method to analysis from simple assumptions or simple models. Data has everything. A lot of data can form a good statistical theory. It is because to obtain or analyze data is easy and simple in which there is only a compatibility relation or a generalized equivalent relation under One Axiom system assumption. The compatibility relation or generalized equivalent relation can compose the whole energy of the system equal to the sum of each part energy of the system, such as the recognition of adding Axiom system of probability theory. Thus to obtain or to analyze data under one Axiom system assumption can compose the simple system outward expansion development. Therefore, pursuing the goal is for obtaining or analyzing data in order to compose the simple system outward expansion development. Generally speaking, all the logic inference is carried out under the premise of certain assumptions. The various hypothetical models involve the behavior of people. The logic reasoning with hypothesis is called **authigenic logic**. It is because in their reasoning proof before, all standards from their own observational assumptions. This phenomenon in the TCS is not allowed since a statistical complex system cannot be supposed. Otherwise, can't guarantee the reproducibility.

There are a lot of examples to prove the above viewpoint. One of the most famous is Hilbert's sixth mathematical conjecture of his 23 mathematical conjecture problems. Hilbert's sixth mathematical conjecture problem said, "play an important role in mathematics the axiomatization of physics". In 1933, the Soviet union mathematician cole-monk-rove will probability axiomatic. Later, in quantum mechanics, quantum field theory of success. But the branches of physics can completely axiomatization, many people have suspected. Zhang [1] tried to adopt the traditional Chinese logic of Yin and Yang to prove the answer of Hilbert's sixth mathematical conjecture. Instead simplify the problem, but he has in the at the same time, to solve the problem of partial axiomatic 11 guess is introduced, the problem becomes more complicated. In this paper, the Hilbert's sixth mathematical conjecture will be answered from the negative. That is to say: could not establish an axiomatic system of all branches of physics. Not to mention the axiomatic system of the statistical complex system is established.

The western theory of axiomatic system has complicated trend recently. Guillaume [2] put forward to the concepts of both an Intricate Axioms and an Interaction Axioms. In epistemic logic, some axioms dealing with the notion of knowledge are rather convoluted and difficult to interpret intuitively, even though some of them, such as the axioms 2 and 3, are considered to be key axioms by some epistemic logicians. He shows that they can be characterized in terms of understandable interaction axioms relating knowledge and belief or knowledge and conditional belief. In order to show it, He first sketch a theory dealing with the characterization of axioms in terms of interaction axioms in modal logic. He then apply the main results and methods of this theory to obtain specific results related to epistemic and doxastic logics. In addition, many scholars tried to use the Chinese theory of Yin and Yang to establish axiomatic systems in the west. These

scholars are including Zhang etc [3], Zhang etc [4], Zhang [5], Zhang [6], Chen etc [7], Zhang etc [8], Fang [9], Kim etc [10], Fang etc [11], and so on. Also some scholars, for example, Zhang etc [12], tried to use the concept of Yin Yang Wu Xing in Chinese traditional philosophy to improve the axiomatic system in the west. However, in this paper to explain is: the mathematics of trying to cannot be completely successful, could only partial success.

In fact, at present a lot of many concepts in Chinese traditional culture, has been accepted by many scholars. In Chinese traditional culture, for example, there is a very important concept - **Heaven-human corresponding analysis** in TCS, is accepted by many scholars as Canonical correlation analysis, which was proposed by Hotelling [13]. The other scholars David etc [14] are the most prominent.

The philosophy meaning of five aspects of Non-authigenic Logic is an impotent concept of TCS. And discussed the five basic principles and their rules of non-authigenic logic is necessary. According to the Yin Yang Wu Xing philosophy meaning, known the world of logic, should have the meaning of the five aspects. That is to say: taking the research object is divided into five categories, i.e., **obtaining image from classification** or **classification taking image** (比类取象), to achieve real purpose of learning about the world.

As an application, **Heaven-human corresponding analysis** in TCS is given by using the Non-authigenic Logic, which is similar to **Canonical correlation analysis** proposed by Hotelling [13], because they are all to study relations between two sets of variates. By simulation, compared with the Heaven-human corresponding analysis method in TCS and the traditional canonical correlation analysis method. Simulation analysis of examples: the problem is very serious, because western often use the canonical correlation analysis method, for the question of studying relations between two sets of variates is not applicable, without reproducibility.

Zhang etc [15-49] have started a great interest and admired works for TCS, where, through mathematical reasoning, they demonstrate the presence of incompatibility relations, which are predominant in daily life, yet absent in traditional Aristotelian Western logic.

Many people as Western persons are beyond all doubt the Yin Yang Wu Xing theory is superior to the traditional true-false logic, which does not contemplate incompatibility relations, which Zhang [19] has expertly explained from a mathematical standpoint.

The work Zhang [15,16] has started, allows many people like Western person to think of a true re-foundation of mathematical language, to make it a better suited tool for the needs of a statistical complex system system and the environment. Although so doing, Zhang [18] also brings to light the difficulty of establishing the values of both the intervention reaction coefficients ρ_1, ρ_2 and the self-protection coefficient ρ_3 as parameters with due accuracy.

The article proceeds as follows. Section 2 contains the philosophy meaning of Five Aspects of Non-authigenic Logic and the negative answer of Hilbert's sixth mathematical conjecture, while Heaven-human corresponding analysis in TCS is demonstrated in Section 3. Simulation comparison of reproducibility between Heaven-human corresponding analysis in TCS and Canonical correlation analysis proposed

by Hotelling [13] is given in Section 4. And conclusions are drawn in Section 5.

II. PHILOSOPHY MEANING OF FIVE ASPECTS OF NON-AUTHIGENIC LOGIC

The principle for balance, reproducibility and that by doing nothing, everything is done (automation), is the pursuit of the overall goal of non-authigenic logic. For any a statistical complex system, the first question is to determine the philosophical meaning of the five subsets, determine the corresponding collection category. This is the key to the technology of classification taking images.

2.1 Five Aspects of Non-authigenic Logic

In order to apply the reasoning to other fields than a statistical complex system's health, Zhang etc [21] have started a steady multilateral system imitating a statistical complex system. A most basic steady multilateral system is as follows.

Theorem 2.1 [20] For each element x in a steady multilateral system V with two incompatibility relations, there exist five equivalence classes below:

$$X = \{y \in V \mid y \sim x\}, X_S = \{y \in V \mid x \rightarrow y\}, X_K = \{y \in V \mid x \Rightarrow y\},$$

$$K_X = \{y \in V \mid y \Rightarrow x\}, S_X = \{y \in V \mid y \rightarrow x\},$$

which the five equivalence classes have relations in Figure 1.#

It can be proved that the steady multilateral system in Theorem 2.1 is the reasoning model of Yin Yang Wu Xing in TCM if there is an energy function $\varphi(*)$ satisfying

$$\varphi(X_K) \geq \varphi(X_S) \geq \varphi(X) \geq \varphi(K_X) \geq \varphi(S_X)$$

which is called Yin Yang Wu Xing model, denoted by V^5 .

The Yin Yang Wu Xing model can be written as follows: Define $V_0 = X, V_1 = X_S, V_2 = X_K, V_3 = K_X, V_4 = S_X$, corresponding to wood, fire, earth, metal, water, respectively, and assume $V = V_0 + V_1 + V_2 + V_3 + V_4$ where

$$V_i \cap V_j = \emptyset, \forall i \neq j.$$

And take $\mathfrak{R} = \{R_0, R_1, \dots, R_4\}$ satisfying

$$R_r = \sum_{i=0}^4 V_i \times V_{\text{mod}(i+r,5)}, \forall r \in \{0,1,\dots,4\}, R_i * R_j \subseteq R_{\text{mod}(i+j,5)},$$

where $V_i \times V_j = \{(x, y) : x \in V_i, y \in V_j\}$ is the

Descartes product in set theory and $R_i * R_j = \{(x, y) : \exists u \in V \text{ such that } (x, u) \in R_i, (u, y) \in R_j\}$

is the **relation multiplication operation**. The relation multiplication of $*$ is isomorphic to the addition of module 5. Then V^5 is a steady multilateral system with one equivalent relation R_0 and two incompatibility relations $R_1 = R_4^{-1}$ and $R_2 = R_3^{-1}$ where

$R_i^{-1} = \{(x, y) : (y, x) \in R_i\}$ is the **relation inverse operation**. The Yin and Yang means the two incompatibility relations and the Wu Xing means the collection of five disjoint classification of $V = V_0 + V_1 + V_2 + V_3 + V_4$.

Figure 1 in Theorem 2.1 is the figure of Yin Yang Wu Xing theory in Ancient China. The steady multilateral system V with two incompatibility relations is equivalent to the logic architecture of reasoning model of Yin Yang Wu Xing theory in Ancient China. What describes the general method of a statistical complex system can be used in statistical complex systems.

By non-authigenic logic of TCS, i.e., a logic which is similar to a group has nothing to do with the research object

[20], in order to ensure the reproducibility such that the analysis conclusion can be applicable to any a statistical complex system, a logical analysis model which has nothing to do with the object of study should be chosen. The *Tao* model of Yin and Yang is a generalized one which means that two is basic. But the *Tao* model of Yin and Yang is simple in which there is not incompatibility relation. The analysis conclusion of *Tao* model of Yin and Yang cannot be applied to an incompatibility relation model. Thus the Yin Yang Wu Xing model with two incompatibility relations of Theorem 2.1 will be selected as the logic analysis model in this paper.

Western Statistics is different from TCS because the TCS has a concept of *Chi* or *Qi* (气) as a form of energy of steady multilateral systems. It is believed that this energy exists in all things of steady multilateral systems (living and non-living) including air, water, food and sunlight. *Chi* is said to be the unseen vital force that nourishes steady multilateral systems' body and sustains steady multilateral systems' life. It is also believed that an individual is born with an original amount of *Chi* at the beginning of steady multilateral systems' life and as a steady multilateral system grows and lives, the steady multilateral system acquires or attains *Chi* or energy from "eating" and "drinking", from "breathing" the surrounding "air" and also from living in its environment. The steady multilateral system having an energy is called **the anatomy system** or **the first physiological system**. And the first physiological system also affords *Chi* or energy for the steady multilateral system's meridian system (*Zang Xiang* (藏象) and *Jing-Luo* (经络)) which forms a parasitic system of the steady multilateral system, called **the second physiological system** of the steady multilateral system. The second physiological system of the steady multilateral system controls the first physiological system of the steady multilateral system. A steady multilateral system would become ill or dies if the *Chi* or energy in the steady multilateral system is imbalanced or exhausted, which means that $\rho_1 = \rho(x) \rightarrow 0, \rho_2 = \rho(x)^2 \rightarrow 0$ and $\rho_3 = c\rho(x) \rightarrow 0$.

For example, in TCS, a statistical complex system as the first physiological system of the steady multilateral system following the Yin Yang Wu Xing theory was classified into five equivalence classes as follows:

wood(x) = {industry, PPI (the Producer Price Index) or RPI (Retail Price Index), liver, bravery, soul, ribs, sour, east, spring, birth};

xiang-fire(x_S^x) = {agriculture, AAF (the total output value of Agriculture forestry Animal husbandry and Fishery), pericardium, the triple energizer, nerve, the blood, bitter taste, the south, summer, growth};

earth(x_K) = {commerce, CPI (the Consumer Price Index), spleen, stomach, willing, meat, sweetness, center, long summer, combined};

metal(x_X) = {science, education, public facilities, GBR (the General Budget Revenue), lung, large intestine, boldness, fur, spicy, west, autumn, accept};

water(s_X) = {army, economics, GDP (the Gross Domestic Product), kidney, bladder, ambition, bone, salty, the north, winter, hiding};

jun-fire(x_S^j) = {President or Governor, Finance (right of making money), heart, small intestine, bitter taste, whole

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statistical complex system, throughout the year, overall growth}.

$$\text{fire}(x_s) = \text{xiang-fire}(x_s^i) \cup \text{jun-fire}(x_s^j).$$

There is only one of both loving and killing relations between every two classes. General close is loving, alternate is killing.

In every category of internal, think that they are with an equivalent relationship, between each two of their elements there is a force of similar material accumulation of each other. It is because their pursuit of the goal is the same, i.e., follows the same "Axiom system". It can increase the energy of the class at low cost near to zero if they accumulate together. any a nature material activity follows the principle of maximizing so energy or minimizing so cost. In general, the size of the force of similar material accumulation of each other is smaller than the size of the loving force or the killing force in a stable complex system. The stability of any a statistical complex system first needs to maintain the equilibrium of the killing force and the loving force. The key is the killing force. For a stable statistical complex system, if the killing force is large, i.e., $\rho_3 = c\rho(x)$ becomes larger, which needs positive **exercise**, then the loving force is also large such that the force of similar material accumulation of each other is also large. They can make the statistical complex system more stable. If the killing force is small, i.e., $\rho_3 = c\rho(x)$ becomes smaller, which means little **exercise**, then the loving force is also small such that the force of similar material accumulation of each other is also small. They can make the statistical complex system becoming unstable.

People know the world's purpose is to find corresponding statistical complex systems in five categories:

wood(X), fire(X_s), earth(X_k), metal(K_x), water(S_x).

Five types of the statistical complex system how to find the corresponding research object? This becomes the crux of the problem. Also said: the philosophical meaning of the five classification is what? In other words, looking for every kind of problem, how should the idea? How to do? How to keep continuously to develop?

2.2 Philosophy Meaning of Each of Five Aspects of Non-authigenic Logic

The following cognitive logic of five aspects philosophy meaning is due to *Taoism*, called **cognitive logic of non-authigenic** or **cognitive logic of automation** or **cognitive logic of "Wu Xing"**, etc., it applies to any a statistical complex cognitive system. The basic idea is divided into five steps, called wood, fire, earth, metal, water. Every step has a principle and three rules. Principle provide basic idea. The rules provide specific practices. Specific practices, including how to thinking, how to do, how to keep continuously to develop.

(a) Wood(X): No assumptions principles (无假设原则)

"No suppose principle" has another name: Don't assume that teaching (不言施教). It means that without a priori axiom hypothesis conditions, only there are cognition, reasoning and analysis on the relationship of the statistical complex system. In the traditional Chinese saying is: not afraid not perceive afraid goods than goods (不怕不识货就怕货比货).

The ideology includes three aspects of content: one is how to thinking as non-authigenic thinking rule (不自生思维规则). All assumptions and inspection standard must come from

the actual problem itself, it is not relevant to the analysis methods or the analysis scholars (忘我能力) or the third party standard (第三方标准, 或者说, 双方比较的标准来自于第三方). Not according to the observed data and the hypothesized research object itself, is the core of non-authigenic thinking rules. Use put forward the assumption of non-authigenic thinking rules, can guarantee the processing method is a general problem. According to the rules of non-authigenic thinking, any a non-authigenic hypothesis, principle of no violation, no assumptions.

Even with the assumptions and inspection standards, so they are not able to be determined in the field of Statistics, both the western Statistics and the oriental Statistics cannot define these assumptions and inspection standards in the areas themselves, they must be determined by unrelated third parties to statistical fields.

Second is how to do as the resource limited rule (资源有限规则). It is recognized that resources are limited, not admit unlimited resources, all the way to solve the problem that must be solved within limited resources (有限能力). Within the scope of the limited resources to solve the problem, and guarantee that things will be successful. According to the rules of limited resources, any a resource hypothesis, principle of no violation, no assumptions.

Resources limited rules are due to that one doesn't have to look at the research object $V = \{x_1, \dots, x_n\}$, but to focus on how the cognition of the basic elements of a statistical complex system exist happen? First of all, don't think that the ability of researchers is infinite, infinite resources are not available. any a statistical complex system just can be understood only to rely on very small limited resources to solve the problem. This is the basic point of non-authigenic logic.

Third is how to keep continuously to develop as the fault-tolerant rule (容错规则). It is to allow the people to solve the problem within a certain range to make mistakes, including the assumption error (容错能力). Only permissible maximum human to make mistakes, what to do can continue. According to the rules of fault tolerance, any a fault tolerant hypothesis, principle of no violation, no assumptions.

The researchers themselves, to solve the problem of a statistical complex system, also have many insufficiency, cannot assume the ability of these people is very high, can make no mistake. It is understood only under the condition of assuming that these people often make mistakes, to try to solve the problem of a statistical complex system. The basic conclusion of non-authigenic logic, therefore, cannot has too strong dependence with resources and hypothesis.

No assumptions rule is the thinking way for the "wood" properties of a statistical complex system, and to consider the beginning problem of the statistical complex systems. It belongs to the Wood(X) subsystem of the statistical complex system since it cognizes the structure of the statistical complex system which is the beginning observation or birth stage of all things, just like in the Spring of a year. In the initial stages of a statistical complex system, and in the absence of birth assumptions, the purpose of both the greatest possible to restrict the behavior of the researchers and achieving the preliminary cognition of the statistical complex system is to make a statistical complex system can be able to generate. In order to explain the occurrence state of all things, must be in

the absence of cognitive assumptions, with the above ways of thinking, to cognize the structure of the statistical complex system first. The structure has nothing to do with the observer behavior, and only related to the birth state of the statistical complex system. Only in this way, can understand the birth cause of a statistical complex system, get real Wood(X) properties of a statistical complex system, and get the most cognitive goals.

Under the principles of no assumption articles, see [15-21].

(b) Fire(X_S): Preconceptions Principle (先入为主原则)

The principle of that “first impressions are strongest” is also namely Preconceptions. Preconceptions, spelling for “Xian Ru Wei Zhu”(先入为主) in TCS, useful refers to listen or to get the first impression often dominant in your mind, later to meet different opinions, is not easy to accept.

This principle contains three aspects: one is how to thinking as the objective consistency rule (客观一致性规则). The objective consistency (客观一致性), i.e., what you observed the conclusions and the objective facts are consistent? Respect for the objective facts is the core of the human mind. Only to respect the objective facts as the idea, can assure to observe it is correct. According to the objective rules of consistency, any an objective method to deal with problems, do not violate the principle of “first impressions are most lasting”.

The preconceptions principle is also due to that one doesn't have to look at the research object $V = \{x_1, \dots, x_n\}$, but to focus on how to accelerate the development of a statistical complex system to eliminate interference? First of all, don't think that you observed the conclusions and the objective facts are consistent if you do not know the objective facts. But under the condition of objective conclusion assume that you know that, you can simulate test with your observation analysis method to the conclusions and the objective facts are consistent? In many simulation test under the condition of reasonable, can think of your observation analysis method is reasonable, with the objective consistency. Simulation is not proof, but at least it means that you used in the method has certain rationality. In TCS, the simulation method is considered to be the key method of a statistical analysis for determining the reproducibility. This is the basic point of non-authigenic logic.

Second is how to do as the repeatability rule (重复性规则). That is, what the relationship between the observed conclusions, which are obtained by different observers and different reasonable ways, are consistent? Observations of the fact that is objective, regardless of the observer, no matter what observation method, after fully observed, the conclusion there will be no big changes. This is because the objective conclusion is only one. Adhere to the repetitive rules, can guarantee that can do things correctly, because people's doing things is difficult to know the objective conclusion. According to the rules of repeatability, any a repeatability method to deal with problems, do not violate the principle of “first impressions are most lasting”.

The repeatability means under the condition of the same work, measured in the same input values in the same direction between the continuous measurement of the output value consistent with each other. Although you don't check that all observed conclusions, obtained by different observers, different reasonable ways and different the objective facts, are

consistent if you do not know the objective facts, you can at least check whether all observed conclusions obtained by both different observers and different ways are consistent or not. Some of them will be not the the objective facts if they are not consistent. In other words, the repeatability can be checked. In order to check the objective consistency, if you do not know the objective facts, you have to check whether the way you deal with data being objective consistency or not. The way is reasonable if you check a lot of times by simulation, according to the third party standard. Reproducibility also make the mean smaller between statistical measuring system and statistical measuring conditions if the reasonable ways include many environmental conditions.

The analysis conclusion of non-authigenic logic is not relevant to the statistical scholars. That is to say, no matter what statistical scholars, according to the similar statistical data, adopted with the reproducibility of statistical methods, analysis of the conclusion must be the similar to each other. This is because, the problem of a statistical study has nothing to do with statistical scholars, just is the only objective of law science.

Both the objective consistency and the repeatability are called reproducibility (再现性).

Third is how to keep continuously to develop as the default rules (默认规则). It means that the implied terms of the rules before there is not new information are legal and can ensure the normal operation of a statistical complex system. In other words, always respect the original hypothesis (尊重原假设). Everything is right in the world (存在的就是合理的)! The default rules is the fact that is one of the most reproducibility methods. Respect the default rules, can guarantee the things on the basis of the reproducibility is to keep continuously to develop. According to the rules of the default, any a default method to deal with problems, do not violate the principle of “first impressions are most lasting”.

The default rules should be as complete as possible. In no other intervention conditions, the default rules can make the statistical complex system running normally. For the complete default rules, you should strictly abide by as much as possible. If a researcher first has obtained the observations of some data of the object of study, non-authigenic logic will think that this data is a true reflection of the research object, the other data should be repeated observations of these data, so with the same type and form (reproducibility). The analysis conclusion of non-authigenic logic, in the data to the form of a limited number, will stabilize. At this time, must ensure no relationship between the analysis conclusion and the number of data of a small amount of increase and decrease.

What the first impressions are strongest is the thinking way for the “fire” properties of a statistical complex system, and to consider the controlling-development problems. It belongs to the Fire(X_S) subsystem of the statistical complex system since it controls the fluctuations of the statistical complex system under the condition of a lot of unknown disturbances, which is the development and growth stage of all things, just like in the Summer of a year. In the initial stage of development of a statistical complex system, under the condition of maintaining the status quo, the greatest possible to control interference, stable and free development, the purpose is to make a statistical complex system can quickly grow. In order to explain the growth state of all things, must be in the absence of disturbance assumptions, with the above

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ways of thinking, to control the fluctuations of the statistical complex system first. The fluctuations have nothing to do with the observer behavior, and only related to the growth state of the statistical complex system. Only in this way, can understand the growth cause of a statistical complex system, get real Fire(X_s) properties of a statistical complex system, and get the most development goals.

Under the principles of preconceptions articles, see [22-27].

(c)Earth(X_k): Integration coordination combining principle (整体协调化合原则)

The integration coordination combining principle is based on the overall nature of the problem, highlighting the overall structure of the analysis of a problem and transform, found that the problem of overall structural characteristics, is good at from the view of "integration", put some formula or graph as a whole, grasp the correlation between them, purposeful and conscious processing as a whole. For example, overall thought method in the algebraic expression of reduction and evaluated, equation (group), geometric solution certificate, etc, are widely used. Overall substitution, the superimposed fold by processing, the overall operation, assumes that the argument as a whole, fill in the whole processing, geometry shape, and so on, all is the whole idea concrete application of the method in solving statistical complex system problems.

The integration coordination combining principle contains three aspects: one is how to thinking as the searching-null-composition rule (零成分搜索规则). This is able to find the composition which has nothing to do with a statistical complex system as a whole, also called searching-null-composition capability(零成分搜索能力). In the affairs of human knowledge as a whole, it is difficult to realize the internal structure of things as a whole, can't distinguish who good who bad internal things. However, the human is able to distinguish between what has nothing to do with the whole thing? These things which have nothing to do with the things as a whole are called things zero composition as a whole. Adhere to the zero component search thinking, can ensure that the observation of the whole is correct and objective. Follow zero component search rules, the proposed any an observation of knowledge and the method of doing things, is not in violation of the principle of overall coordination compound.

Holistic thinking in TCS allows us to deal with a statistical complex system is not managed to seize the main factors of it, but tried to find itself has nothing to do with this statistical complex system of interference factors, and try to clear them out of the statistical complex system itself. This is because any internal factors of the statistical complex system, in some cases, is likely to be important factors. When statistical complex systems run by balance and stability, any a way of strengthening some factors or degradation of some factors by researchers may be harmful for statistical complex systems. For a social complex system, for example, if you eliminate all the criminals ("evil"), then the police system ("the vital chi") will not exist, because the police system ("the vital chi") is by eliminating the criminal system (the "evil") to survival. Again for a cancer patient, for example, if you eliminate all of the cancer cells (the "evil"), then all the white blood cells ("the vital chi") will not exist, because in TCM's concept, white

blood cells ("the vital chi") are by eating cancer cells (the "evil") to live. It can be done only to run the social complex system of various energy channels, makes the harmful energy ("evil") can't gather together and make good energy ("the vital chi") to eliminate harmful energy (the "evil") to survival. To increase the ability of the police system or to acupuncture a cancer patient, for example, is suitable method of integration, and is to get rid of the interference factors. People can bear a little significant factor as a significant factor to deal with, but can't bear a significant factor for processing as non-significant factors. This method is called "zero component search" in the TCS.

Second is how to do as the integration rule (整合规则). This is able to integrate many small problems into a handful of a big problem, also called integration capability (整合能力). Humans observe things as a whole, can do, is to put the small overall combination into a larger whole. Only adhere to the integration rule, can guarantee to have something done as a whole. Follow the integration rule, any an integration method of doing things, is not in violation of the principle of overall coordination compound.

The integration coordination combining principle is also due to that one doesn't have to look at the research object $V = \{x_1, \dots, x_n\}$, but to focus on how to promote the overall coordination of the scale rapid combined statistical complex system? First of all, the integration capability will guarantee that is able to integrate many small problems into a handful of a big problem. Integration job in the integration theory plays an extremely important role in the position. If there is no integration, so the global idea will not be able to be gotten, a statistical complex system capacity will not be able to realize overall understanding of, which will cause the integration work is not for a whole.

Third is how to keep continuously to develop as the decomposition rule (分解规则). This is able to have a big problem into several small problems, also called the decomposition capability (分解能力). Only one had the capacity to the overall decomposition of the things, he can continue in-depth development of the whole things gradually. Follow the rules of decomposition, the proposed any a decomposition method and the understanding of details are not in violation of the principle of overall coordination compound.

The decomposition capability will guarantee that is able to break down into several parts of a whole. The decomposition job in the integration theory plays an extremely important role in the position. If there is no decomposition, so the integration work will not be able to restore, a statistical complex system capacity will not be able to realize automation, which will cause the integration work is not for a long time.

The principle of overall coordination compound is the thinking way for the "earth" properties of a statistical complex system, and to consider the problems of combining to produce results. It belongs to the Earth(X_k) subsystem of the statistical complex system since it makes the coordination of the center and fluctuation in the statistical complex system which is the scale development continuously and combined stage of all things, just like in the Long-Summer of a year. In the long-term combined development stages of a statistical complex system, the purpose of both eliminating irrelevant factors interference and realizing the coordinated

development is to make a statistical complex system can realize the balanced development of the most stable and can combine to produce results. In order to explain the combined stage of all things, people must be in the absence of combined assumptions, with the above ways of thinking, to make the coordination of the center and fluctuation of all subsystems in the statistical complex system first. The coordination has nothing to do with the observer behavior, and only related to the combined state of the statistical complex system. Only in this way, can people understand the combining cause of a statistical complex system, get real Earth(X_K) properties of a statistical complex system, and get the most combined goals.

Under the principles of overall coordination compound, see [28-30].

(d) Metal(K_X):Logical layering principle(逻辑分层原则)

“Logical layering principle” has another name is: Heaven and People as a whole (天人合一). Heaven, is the nature; People, is human; Nature and humanity as a whole, is the mutual understanding, friendship, by using the same logic-analysis structure in a different level of.

This logical layering principle contains three aspects: one is how to thinking as the Global-Local thinking rule (从整体到局部思维). There are both the Global logic for a large statistical complex system and the Local logic for its subsystems. Their logic structures are the same. However the Local subjects and is restrained by the Global logic, and the Global logic contains and restrains the Local logic; the Global logic can solve the problems for the Local logic, not always the Local logic solves the problems for the Global logic. The idea is also called logic downward compatibility (逻辑向下兼容能力). Only keep from Global to Local thinking, can guarantee to the thing won't appear a large deviation of the understanding of the way, can logically guarantee to realize the objective laws of things. Follow from the Global to Local thinking, any one of the proposed knowledge of things as a whole and local, is not in violation of the principle of logical layering.

One of the basic requirements of logical reasoning must be compatible with down, it's like computer high version of the software must be able to handle it the low version of the software problems. That is the current level of logic of a statistical complex system must apply to the logic of its subsystems. Otherwise, the entire logical structure will be chaos. Low level logic, of course, can't deal with some high-level logic problems. The rules requiring people's mind should be from Global to Local, rather than the opposite. Because from the Global to Local thinking is unique, its uniqueness can guarantee the reproducibility of reasoning conclusion. But from the Local to Global thinking, the way may be varied. Because there is no uniqueness of thinking, the reproducibility can not be guaranteed. By the Global to Local thinking, the main problem of Statistics is not dimension reduction analysis, but improve dimensional analysis. Because only increase dimensional analysis, possible to master a Global logic, with the conclusion of Global reproducibility.

Second is how to do as the logical causal cycle rule (逻辑因果圈). It is also called the logical causal chain (逻辑因果链). That is, any a logic makes some logic, and is made by

some logic; any a logic restrains some logic, and is restrained by some logic: i.e., one logic overcomes another logic and one logic is overcome by another logic. In other words, any a logic is a certain logic analysis of cognitive level or watching layer by researchers. Only adhere to the rules of logic causal circle, can guarantee to any an understanding of things, people have done some things. Follow the rules of logic causal circle, any one of the proposed causal problems and the methods of dealing with the causal are not in violation of the principle of logical layering.

Logical layering principle is also due to that one doesn't have to look at the research object $V = \{x_1, \dots, x_n\}$, but to focus on how to get the biggest reward for statistical complex systems? First of all, anyone's ability is limited, he used a logic can only apply to his observes corresponding to a level of a statistical complex system. To believe in it the logical conclusion of also only applies to the corresponding level, in big ways, he always is conditioned by a large statistical complex system of logic, in small ways, it also can't take any a small statistical complex system logic completely clear. In general, a large statistical complex system logical subject is a logic coarsening of its some small statistical complex systems. Absolutely don't put any a logic as The king, and admits it is used in a certain level, it is the basic ways of dealing with problems of non-authigenic logic.

Third is how to keep continuously to develop as the seriousness of logical rules (逻辑的严肃性规则). It is that any a logic must at least satisfy the uniqueness, hereditary, reversibility, reasoning ability and associative law. In other words, any a logical system must be of a multilateral system (多边系统). Only adhere to the seriousness of logic rules, can trust to ensure that the correct logic reasoning conclusion, make the logic reasoning method and the conclusion, continue to exist for a long time. Follow the seriousness of logic rules, any a proposed by logical reasoning method and the conclusion, is not in violation of the principle of logical layering.

A logic is the law of thinking, a logic theory is the theory about law of thinking. Sometimes both logic and logic theory are same. As the law of thinking, the uniqueness, hereditary, reversibility, reasoning ability and associative law are the basic conditions of a reasoning logic. The reasoning ability can make the logic workable. The uniqueness and associative law of logic are to ensure that the inference conclusion by different logic reasoning has the reproducibility. The hereditary of logic is to ensure that the reasoning conclusion by different logic reasoning in the corresponding logical analysis level can be long-term survival and genetic. The reversibility of logic is to ensure that the reasoning conclusion by different logic reasoning conforms to the cultural characteristics of human beings. For example, the statements of both “A can launch B” and “B can be launched from A” are completely equivalent description in human culture. But from the point of relation theory, these are the two reversible relations to each other. The reversibility of logic is to ensure that the two relations reasoning are equivalent. From Appendix, it is found that any a logical system must be of a multilateral system.

The logical layering principle is the thinking way for the “metal” properties of a statistical complex system, and to consider the problems of getting-results as far as possible. It belongs to the Metal(K_X) subsystem of the statistical

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complex system since it makes the deviation between the real center of a statistical complex system and the expected goal of researchers smaller, which is the getting-results and accepted stage of all things, just like in the Autumn of a year. Receiving phase in a statistical complex system, namely, a preliminary systematic risk, the statistical complex system is to obtain the biggest harvest in order to make it can realize the biggest function ability. In order to explain the accepted stage of all things, people must be in the absence of accepted assumptions, with the above ways of thinking, to make the deviation between the real center of a statistical complex system and the expected goal of researchers smaller first. The deviation has nothing to do with the observer behavior, and only related to the accepted state of the statistical complex system. Only in this way, can people understand the accepted cause of a statistical complex system, get real Metal(K_x) properties of a statistical complex system, and get the most accepted goals.

Under the principles of logical layering articles, see [31-41].

(e) *Water*(S_x): *Automation principle*(自动化原则)

“Automation principle” has another name: by doing nothing, everything is done (无为而无不为). It means to believe that statistical complex systems have their own long-term survival genetic ability, as far as possible to protect and use this ability to achieve the purpose of people needs.

This principle contains three aspects: one is how to thinking as the intervention reaction rule (干预响应规则). This is to believe any a statistical complex system having intervention reaction ability(干预响应能力). with an automation ability, there must be a kind of force, this force for the intervention of the outside world, can produce an internal reaction. This internal reaction is: the statistical complex system, which has a loving relationship with the intervention statistical complex system, and intervention force same direction of change, the statistical complex system, which has a killing relationship with the intervention, and intervention of external force changes in the opposite direction. Only by insisting on intervention reaction of thought premise, to ensure the intervention has the possibility of an automatic operation. Following the intervention reaction rules, any one of the proposed method to deal with problems related to the intervention reaction and knowledge, is not in violation of the principle of automation.

The automation principle is also due to that one doesn't have to look at the research object $V = \{x_1, \dots, x_n\}$, but to focus on how to protect the long-term genetic survival of a statistical complex system's ability to fight the biggest risk? First of all, in order to allow us to get TCS' goal, only a statistical complex system must be able to response us intervention, so people can make the statistical complicated system to intervene. It is believed that a statistical complex system has the ability to response TCS' intervention, otherwise the system will be a simple system. The scope of simple system is not TCS' study. As a statistical complex system is intervened by an external force, the statistical complex system able to take advantage of the external force to change itself, this ability is called the intervention reaction ability. Generally speaking, the intervention reaction ability is more stronger if more use it. As far as possible the

intervention reaction ability of a statistical complex system is used to solve TCS' problems, it is one of the basic ideas of non-authigenic.

Second is how to do as the self-protection rule (自我保护规则). any a statistical complex system is believed having self-protection ability (自我保护能力). Self-protection ability is believed that by the intervention system has the ability to make the worst-hit subsystem restorable ability. Only insist on the self-protection rules, believe the intervention system can protect themselves, all things as far as possible let the intervention system on their own to do. In this way, to ensure that TCS has something done in the automatic operation. Follow the rules of self-protection, have put forward anything related to the self-protection and the method to deal with problems, is not in violation of the principle of automation.

A statistical complex system is able to exist because it already exists. A statistical complex system has been believed in it's ability to maintain its existence or to restore, this ability is called the self-protection ability. When a statistical complex system appears crisis or unstable, the statistical complex system can use its self-protection ability to maintain the balance of its existence or to make the statistical complex system restorable. If a statistical complex system can response the human statistical intervention, TCS should make full use of this intervention in the statistical complex system to increase its self-protection ability. Generally speaking, the self-protection ability is more stronger if more use it. As far as possible the self-protection ability of a statistical complex system is used to solve TCS' problems, it is one of the basic ideas of non-authigenic.

Third is how to keep continuously to develop as the second physiological system rule (第二生理系统规则). In order to ensure the operation of the whole can be automated, things must make it in the first physiological system, there is a physiological system in the second run. The second physiological systems control the first circadian system. In the first physiological system during a normal operation, it attains the energy from the first physiological systems. When the first physiological system is during an abnormal operation, the second physiological system is to afford the energy for the first physiological system, in order to ensure the normal operation of the first physiological systems. The second physiological system to effectively control the first physiological system, it must have a great strength. The macro in the first physiological systems is a generic and must be variable, called a macro variable. Any a statistical complex system has relatively constants or macro variables, it can carry out the macro substitution of macro variables. A statistical complex system can change the macro variable values, and achieve the purpose of the programming in order to maintain its system balance. The idea is called the macro substitution ability (宏替换能力) or the genetic ability (遗传能力). Only by insisting on the second physiological system rules, to ensure that system can run normally, and continue to genetic. Follow the rules of physiological system, any a proposed and the second physiological systems related knowledge and processing the second physiological system related method, are not in violation of the principle of automation.

An intervention response ability or a self-protection ability of a statistical complex system is how to implement? Within it must have a kind of parameters, these parameters are constants in a state, by changing the constants, statistical

complex systems will be arrived in another state. The parameters in the field of computer artificial intelligence logic are called macro variables. The statistical complex system can automatically change the macro variable values, making it automatically to the next state. The meaning of automation ability is to a statistical complex system can change by itself, it can increase its intervention response ability by itself, and it can realize its self-protection ability by itself. Macro variables are important factors of resistance biggest risk such that the statistical complex system can survive long genetic automatically. In order to control the statistical complex system service for human, the key is to find the corresponding macro variables.

Automation principle is the thinking way for the “water” properties of a statistical complex system, and to consider the problems of the biggest risk resistance making genetic survive for a long time. It belongs to the Water(S_x) subsystem of the statistical complex system since it makes the risk loss between each observed data of a statistical complex system and the expected goal of researchers smaller, which is the risk and hiding stage of all things, just like in the Winter of a year. The purpose of both against the biggest risk and achieving long-term hidden is to make a statistical complex system can genetic survive for a long time. In order to explain the hiding stage of all things, TCS must be in the absence of hiding assumptions, with the above ways of thinking, to make the risk loss between each observed data of a statistical complex system and the expected goal of researchers smaller first. The risk loss has nothing to do with the observer behavior first, and only related to the hiding state of the statistical complex system. Only in this way, can TCS understand the hiding cause of a statistical complex system, get real Water(S_x) properties of a statistical complex system, and get the most hiding goals.

Under the principles of automated articles, see [42-47].

All in all, the five subsets V_j 's of a Wu-Xing Model do not mean the five elements (metal, wood, water, fire and earth), but with the philosophy meaning of five aspects corresponding to the five subsets V_j 's. In above philosophy meaning of all five aspects (wood(X), fire(X_s), earth(X_K), metal(K_X), water(S_X)) of non-authigenic Logic, both wood(X) and earth(X_K) are the most basic aspects since they can at least ensure that the statistical complex system exist in and combine to produce results. All these conclusions can be summarized in Table 1.

2.3 The negative answer for Hilbert sixth mathematical conjecture

One of the most famous is Hilbert's sixth mathematical conjecture of his 23 mathematical conjecture problems. Hilbert's sixth mathematical conjecture problem said, “play an important role in mathematics the axiomatization of physics”.

Theorem 2.2 *There is no an axiomatic system which makes that all branches of physics can be axiomatic. #*

Remark 1. People build an Axiom system, first of all, to observe the research object, found some real objective facts. And put these a few real objective facts, summarizes become generally accepted an axiom system. Which violate the principle of no assumption is the non authigenic thinking

rules. This is because TCS' logic can not be related to the research object. Human beings are unable to determine the objective facts of true and false, only through a relationship is to identify the objective fact is good for human.

Remark 2. Humans build an Axiom system, first observed the objective facts of different due to different people, can put forward different axiom hypothesis. This violated the principle of preconceptions reproducibility rules. Rules of the reproducibility contains objective rules of consistency and repeatability. If you allow different people use different an Axiom system, there are the rules of repetitive problems. There is only one objective facts, two different processing methods of the axiom system of at least one is not reasonable. If you don't allow different people use different an Axiom system, so objective consistency checking can be a problem. Because the human is unable to determine the objective facts of true and false, whether can only judge for themselves.

Remark 3. Humans build an Axiom system, cannot be in fully understand the whole details of the research object, to establish a basic right of an Axiom system. This is because the human cannot understand the whole details of a statistical complex system, can only be observed whether things related to the research object, and only confirm the thing has nothing to do with the whole. For things related to the overall level, but it is difficult to identify. So that to establish a system of axioms, is in violation of the principle of overall coordination combining as the searching-null-composition rules of thinking.

Remark 4. To establish an axiomatic system is the logical foundation of western science. Had the axiomatic system, human have to distinguish the standard proposition and theorem of true and false. And an axiomatic system has compatibility relation proposition and the theorem is true proposition, do not have compatibility relation proposition is false propositions. Judge true and false proposition logic is the logical foundation of western science. This logic is called the formal logic.

In accordance with the logic seriousness rules of the principle of logical layering, any a logic must at least satisfy the uniqueness, hereditary, reversibility, reasoning ability and associative law. But, Zhang etc [21] show that true or false proposition logic is can not meet the needs of associative law. That is to say: three reasoning can not meet the needs of associative law between false propositions. In addition, it also can be proved that the formal logic does not meet the uniqueness of reasoning, reversibility, can push the rational, hereditary, and so on. This shows that: the logical basis of formal logic problems. Only in a formal logic Axiom system, carries on the compatibility between true proposition reasoning.

People build an Axiom system, to serve the formal logic reasoning. If the formal logic reasoning needs to change, people building the Axiom system itself is not necessary.

Remark 5. Once an Axiom system is established, then axiom system is not changed. That can't change things may be true, but statistical complex things are in change forever, in changing, the Axiom system is not the same. Human is the best way of doing things, is not set up any an Axiom system, should make a statistical complex system of the second physiological systems manage themselves. By itself, so say: building an Axiom system violators the automation principle

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of both the self-protection and the second physiological system rules.

III. HEAVEN-HUMAN CORRESPONDING ANALYSIS IN TCS

In image mathematics of TCS, **Heaven-human corresponding analysis** is to study relations between two set of variates, which is similar to Canonical correlation analysis proposed by Hotelling [13]. A set of variates (WITH variates) $Y = (Y_1, \dots, Y_q)^T$ is called **Heaven system**. And the other set of variates (VAR variates) $X = (X_1, \dots, X_p)^T$ is called **Human system**.

By non-authigenic logic, no matter how complicated the Heaven system and the Human system, they are following the same logic structure.

The logical structure of Heaven system for: Heaven system can be according to contribution rate, will be able to observe that the stems of the corresponding structure are divided into ten, called: the **Zangxiang system** or the **ten Heavenly Stems model for a statistical complex system**. The non-authigenic logic model is as follows:

Definition 3.1 (Zangxiang(藏象))[48] Assume the Yin Yang Wu Xing model V^5 is implemented by the Tao force of the Tao model V^2 . Then the steady multilateral system $V^2 \times V^5 = \{(i, j) | i \in V^2, j \in V^5\}$ is called the **Zangxiang** or the **Five Zang-organs model of the steady multilateral system**.

The Zangxiang model satisfies as follows:

$$R_{(r,r')}^{(2,5)} = \sum_{(i,i')=(0,0)}^{(1,4)} V_{(i,i')}^{(2,5)} \times V_{(mod(i+r,2),mod(i'+r',5))}^{(2,5)}, \forall (r, r') \in V^2 \times V^5,$$

$$R_{(i,i')}^{(2,5)} * R_{(j,j')}^{(2,5)} = R_{(mod(i+j,2),mod(i'+j',5))}^{(2,5)}.$$

Each of the elements,

(1, 0), (0, 0), (1, 1), (0, 1), (1, 2),
(0, 2), (1, 3), (0, 3), (1, 4), (0, 4),

is called respectively

Jia(1,0), Yi(0,0), Bing(1,1), Ding(0,1), Wu(1,2),
Ji(0,2), Geng(1,3), Xin(0,3), Ren(1,4), Gui(0,4),

corresponding to the Chinese words respectively:

甲(1,0), 乙(0,0), 丙(1,1), 丁(0,1), 戊(1,2),
己(0,2), 庚(1,3), 辛(0,3), 壬(1,4), 癸(0,4),

also corresponding to the notations in Theorem 3.1 respectively:

$X^+(1,0), X^-(0,0), X_S^+(1,1), X_S^-(0,1), X_K^+(1,2),$
 $X_K^-(0,2), X_X^+(1,3), X_X^-(0,3), S_X^+(1,4), S_X^-(0,4).$

Here, each of the elements: X, X_S, X_K, X_X, S_X is called wood, fire, earth, metal, water, respectively, and this is $*^+$ Yang, $*^-$ is Yin.

In TCS, an other name of the **Zangxiang system** is the **ten Heavenly Stems (天干)**. It means in the changes of energy transmission, plays a major role, is under the power of positive (Yang), although it is invisible, the reason of behind the sign.

In the ten heavenly stems, Yang is respectively:

Jia $X^+(1,0)$ liking Yang wood, Bing $X_S^+(1,1)$ liking Yang fire,

Wu $X_K^+(1,2)$ liking Yang earth, Geng $X_X^+(1,3)$ liking Yang metal,

Ren $S_X^+(1,4)$ liking Yang water;

Yin is respectively:

Yi $X^-(0,0)$ liking Yin wood, Ding $X_S^-(0,1)$ liking Yin fire,

Ji $X_K^-(0,2)$ liking Yin earth, Xin $X_X^-(0,3)$ liking Yin metal,

Gui $S_X^-(0,4)$ liking Yin water.

Yin is in the inside (里), Yang is in the outside (表). The relationship between the inside and the outside is the liking relationship.

The laws of the **Zangxiang system** or the **ten Heavenly Stems model** are summarized in Figure 2.#

The logical structure of Human system for: Human system can be according to contribution rate, will be able to observe that the meridians of the corresponding structure are divided into twelve, called: the **Jingluo system** or the **twelve Earthly Branches model for a statistical complex system**. The non-authigenic logic model is as follows:

Definition 3.2 (Jingluo) [48] Assume the **Telluric effluvium model** V^6 is implemented by the Tao force of the Tao model V^2 . Then the steady multilateral system $V^2 \times V^6 = \{(i, j) | i \in V^2, j \in V^6\}$ is called the **Jingluo** or the **Six Fu-organs model of the steady multilateral system**.

The Jingluo model satisfies as follows:

$$R_{(r,r')}^{(2,6)} = \sum_{(i,i')=(0,1)}^{(1,6)} V_{(i,i')}^{(2,6)} \times V_{(mod(i+r,2),i'*r')}^{(2,6)}, \forall (r, r') \in V^2 \times V^6,$$

$$R_{(i,i')}^{(2,6)} * R_{(j,j')}^{(2,6)} = R_{(mod(i+j,2),i'*j')}^{(2,6)}.$$

Each of the elements,

(0, e) (1, e) (0, (12)) (1, (12)) (0, (13)) (1, (13))
(0, (23)) (1, (23)) (0, (132)) (1, (132)) (0, (123)) (1, (123))

is called respectively

Zi(0,e) Hai(1,e) Chen(0,(12)) Mao(1,(12)) Shen(0,(13)) Wei(1,(13))

Chou(0,(23)) Xu(1,(23)) Si(0,(132)) Yin(1,(132)) You(0,(123)) Wu(1,(123));

Corresponding to the Chinese words respectively:

子(0,e) 亥(1,e) 辰(0,(12)) 卯(1,(12)) 申(0,(13)) 未(1,(13))

丑(0,(23)) 戌(1,(23)) 巳(0,(132)) 寅(1,(132)) 酉(0,(123)) 午(1,(123));

Also corresponding to the notations in Theorem 3.1 as the five viscera and six entrails respectively:

$X^+(0,e) X_S^{*+}(1,e) X_K^+(0,(12)) X_X^+(1,(12)) S_X^+(0,(13)) X_S^{*+}(1,(13))$

$X^-(0,(23)) X_S^{*-}(1,(23)) X_K^-(0,(132)) X_X^-(1,(132)) S_X^-(0,(123)) X_S^{*-}(1,(123)).$

Here, each of the elements: $X, X_S, X_K, X_X, S_X, X_S^j$ is called wood, xiang-fire (相火), earth, metal, water, jun-fire (君火) respectively, and this is $*^+$ Yang, $*^-$ is Yin.

In TCS, an other name of the **Jingluo system** is the **twelve Earthly Branches (地支)**. It means in the changes of energy transmission, plays a secondly role, is under the power of negative (Yin), although it is tangible, a sign of strength can be observed directly.

In the twelve earthly branches, Yang is respectively

Zi $X^+(0,e)$ liking Yang water, Hai $X_S^{*+}(1,e)$ liking Yin water,

Chen $X_K^+(0,(12))$ liking Yang earth, Mao $X_X^+(1,(12))$ liking Yin wood,

Shen $X_X^+(0,(13))$ liking Yang metal, Wei $X_S^{*+}(1,(13))$ liking Yin earth;

Yin is respectively

Chou $X^-(0,(23))$ liking Yin earth, Xu $X_S^{*-}(1,(23))$ liking Yang earth,

Si $X_K^-(0,(132))$ liking Yin fire, Yin $X_X^-(1,(132))$ liking Yang wood,

You $S_X^-(0,(123))$ liking Yin metal, Wu $X_S^{*-}(1,(123))$ liking Yang fire.

Yin is in the inside (里), Yang is in the outside (表). The relationship between the inside and the outside is the liking relationship.

In the twelve earthly branches, other names of them are corresponding to the human body organs respectively:

- Foot jueyin liver meridian (0,(23)),
- Foot shaoyang gallbladder meridian (0,e),
- Hand jueyin pericardium meridian (1,(23)),
- Hand shaoyang triple energizer meridian (1,e),
- Foot taiyin spleen meridian (0,(132)),
- Foot yangming stomach meridian (0,(12)),

- Hand taiyin lung meridian (1,(132)),
- Hand yangming large intestine meridian (1,(12)),
- Foot shaoyin kidney meridian (0,(123)),
- Foot taiyang bladder meridian (0,(13)),
- Hand shaoyin heart meridian (1,(123)),
- Hand taiyang small intestine meridian (1,(13)).

Or, respectively,

- 足厥阴肝经(0,(23)),足少阳胆经(0,e),
- 手厥阴心包经(1,(23)),手少阳三焦经(1,e),
- 足太阴脾经(0,(132)),足阳明胃经(0,(12)),
- 手太阴肺经(1,(132)),手阳明大肠经(1,(12)),
- 足少阴肾经(0,(123)),足太阳膀胱经(0,(13)),
- 手少阴心经(1,(123)),手太阳小肠经(1,(13)).

The laws of the **Jingluo** system or the **twelve Earthly Branches model** are summarized in **Figure 3.#**

In TCS, the Zangxiang and Jingluo models are not the anatomy systems as the first physiological system corresponding to their steady multilateral systems, are only them the mathematical logic models. If there are the **Yin Yang Wu Xing** model V^5 , the **Telluric effluvium** model V^6 and the **Tao** model V^2 , then the **Zangxiang** model $V^2 \times V^5$ and the **Jingluo** model $V^2 \times V^6$ must exist in logic. So they form a parasitic system of the Yin Yang Wu Xing system V^5 , namely the second physiological system of the steady multilateral systems $V^2 \times V^5$ and $V^2 \times V^6$.

In TCS, the Zangxiang model cannot be observed directly, so it is hidden behind the Jingluo system, namely the Zangxiang (藏象) model. Chinese word '藏' is the meaning of the hidden behind. Therefore, only the twelve meridians can be observed. Began to grow the 12 kinds of energies of each place, referred to as the basic **root-causes** (本). To generate the results of the 12 kinds of energies, referred to as the **symptoms** (标). Management of the 12 kinds of energies of each system, known as **meridians or the Jingluo systems**. Of course, for a healthy statistical complex system, the transfer law of each of the 12 kinds of energies is from its basic **root-causes** (本) to its **symptoms** (标).

Understanding a statistical complex system will meet its insides. And all satisfy with the same *Chi* attracting relationship. For any two of statistical complex systems, there is a correlation between the **wu-zang** and **six-fu** organs, and there is no correlation between the different **viscera**. The six factors are important. By simple consider Yin and Yang of six factors, the Eight Palace model can be gotten. The non-authigenic logic model of Eight Palaces is as follows:

Definition 3.3. (The Energy of Eight-Palaces or Eight Veins or Eight Extra Meridians) [49]

Suppose that the each Hexagram-image of **Eight-Palaces** is represented as six dimensional vector:

$$f = (f_1, f_2, f_3, f_4, f_5, f_6), f_i \in \{1, -1\}, i = 1, 2, 3, 4, 5, 6.$$

Then the following number is called the energy of the Hexagram-image.

$$e_f = ((|f_1| + f_1) / 2)^2 + ((|f_2| + f_2) / 2)^2 + ((|f_3| + f_3) / 2)^2 + ((|f_4| + f_4) / 2)^2 + ((|f_5| + f_5) / 2)^2 + ((|f_6| + f_6) / 2),$$

$$f_i \in \{1, -1\}, i = 1, 2, 3, 4, 5, 6.$$

Property 3.1. The energy of the each Hexagram-image of **Eight-Palaces** and their average value and the standard deviation is as follows respectively.

(1) Qian(乾)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
1	1	1	1	1	1	63	0	1
1	1	1	1	1	-1	62	1	1
1	1	1	1	-1	-1	60	2	1
1	1	1	-1	-1	-1	56	3	1
1	1	-1	-1	-1	-1	48	4	1
1	-1	-1	-1	-1	-1	32	5	1
1	-1	1	-1	-1	-1	40	6	1
1	-1	1	1	1	1	47	7	1

The average energy is equal to 51.0 and the standard deviation of energy is equal to 11.20.

(2) Dui(兑)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
-1	1	1	-1	1	1	27	0	2
-1	1	1	-1	1	-1	26	1	2
-1	1	1	-1	-1	-1	24	2	2
-1	1	1	1	-1	-1	28	3	2
-1	1	-1	1	-1	-1	20	4	2
-1	-1	-1	1	-1	-1	4	5	2
-1	-1	1	1	-1	-1	12	6	2
-1	-1	1	-1	1	1	11	7	2

The average energy is equal to 19.0 and the standard deviation of energy is equal to 8.93.

(3) Li(离)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
1	-1	1	1	-1	1	45	0	3
1	-1	1	1	-1	-1	44	1	3
1	-1	1	1	1	-1	46	2	3
1	-1	1	-1	1	-1	42	3	3
1	-1	-1	-1	1	-1	34	4	3
1	1	-1	-1	1	-1	50	5	3
1	1	1	-1	1	-1	58	6	3
1	1	1	1	-1	1	61	7	3

The average energy is equal to 47.5 and the standard deviation of energy is equal to 8.72.

(4) Zhen(震)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
-1	-1	1	-1	-1	1	9	0	4
-1	-1	1	-1	-1	-1	8	1	4
-1	-1	1	-1	1	-1	10	2	4
-1	-1	1	1	1	-1	14	3	4
-1	-1	-1	1	1	-1	6	4	4
-1	1	-1	1	1	-1	22	5	4
-1	1	1	1	1	-1	30	6	4
-1	1	1	-1	-1	1	25	7	4

The average energy is equal to 15.5 and the standard deviation of energy is equal to 8.98.

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(5)Xun(巽)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
1	1	-1	1	1	-1	54	0	5
1	1	-1	1	1	1	55	1	5
1	1	-1	1	-1	1	53	2	5
1	1	-1	-1	-1	1	49	3	5
1	1	1	-1	-1	1	57	4	5
1	-1	1	-1	-1	1	41	5	5
1	-1	-1	-1	-1	1	33	6	5
1	-1	-1	1	1	-1	38	7	5

The average energy is equal to 47.5 and the standard deviation of energy is equal to 8.98.

(6)Kan(坎)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
-1	1	-1	-1	1	-1	18	0	6
-1	1	-1	-1	1	1	19	1	6
-1	1	-1	-1	-1	1	17	2	6
-1	1	-1	1	-1	1	21	3	6
-1	1	1	1	-1	1	29	4	6
-1	-1	1	1	-1	1	13	5	6
-1	-1	-1	1	-1	1	5	6	6
-1	-1	-1	-1	1	-1	2	7	6

The average energy is equal to 15.5 and The standard deviation of energy is equal to 8.72.

(7)Gen(艮)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
1	-1	-1	1	-1	-1	36	0	7
1	-1	-1	1	-1	1	37	1	7
1	-1	-1	1	1	1	39	2	7
1	-1	-1	-1	1	1	35	3	7
1	-1	1	-1	1	1	43	4	7
1	1	1	-1	1	1	59	5	7
1	1	-1	-1	1	1	51	6	7
1	1	-1	1	-1	-1	52	7	7

The average energy is equal to 44.0 and the standard deviation of energy is equal to 8.93.

(8)Kun(坤)=

f_1	f_2	f_3	f_4	f_5	f_6	energy	image	palace
-1	-1	-1	-1	-1	-1	0	0	8
-1	-1	-1	-1	-1	1	1	1	8
-1	-1	-1	-1	1	1	3	2	8
-1	-1	-1	1	1	1	7	3	8
-1	-1	1	1	1	1	15	4	8
-1	1	1	1	1	1	31	5	8
-1	1	-1	1	1	1	23	6	8
-1	1	-1	-1	-1	-1	16	7	8

The average energy is equal to 12.0 and the standard deviation of energy is equal to 11.20.

(9)The energy of all eight palaces total average and total standard deviation is as follows respectively.

palace	average	deviation	palace	average	deviation
Qian	51.00	11.20	Kun	12.00	11.20
Kan	15.50	8.72	Li	47.50	8.72
Gen	44.00	8.93	Dui	19.00	8.93
Zhen	15.50	8.98	Xun	47.50	8.98

The energy balance
(11.20 = 11.20, 8.72 = 8.72, 8.93 = 8.93, 8.98 = 8.98)

between the standard deviation of all symmetrical palaces shows that the distribution of the energy is reasonable.

The energy difference
(11.2 = **max**(11.2, 8.72, 8.73, 8.93)

< 12.0 = **min**(51.00, 12.00, 15.50, 47.50, 44.00, 19.00))

between the standard deviation and the average of all palaces shows that the classification of the energy is reasonable.

(10)The energy of all Eight palaces total average is equal to 31.5 and the energy of all Eight palaces total standard deviation is equal to 18.62.

The energy of first four hexagrams of all palaces total average is equal to 31.5 and the energy of first four hexagrams of all palaces total standard deviation is equal to 17.93.

The energy of last four hexagrams of all palaces total average energy is equal to 31.5 and the energy of last four hexagrams of all palaces total standard deviation is equal to 19.58.

The energy balance (31.5 = 31.5 = 31.5) of total average between all palaces, the first four hexagrams of all palaces and the last four hexagrams energy of all palaces shows that the distribution of energy is reasonable.

The energy difference
(19.58 = **max**(18.62, 17.35, 19.58) < 31.5)

of total standard deviation and total average between all palaces, the first four hexagrams of all palaces and the last four hexagrams energy of all palaces shows that the classification of the energy is reasonable.

(11)The energy of all outsider and insider palaces total average and total standard deviation is in Table 2, respectively.

The energy balance
(7.41 = 7.41, 12.10 = 12.10, 6.55 = 6.55, 10.37 = 10.37;
3.10 = 3.10, 1.71 = 1.71, 1.71 = 1.71, 2.63 = 2.63)

between the standard deviation of all symmetrical outsider and insider palaces shows that the distribution of the energy is reasonable.

The energy difference
(10.37 = **max**(7.41, 12.10, 6.55, 10.37)

< 11.75 = **min**(41.75, 21.25, 12.25, 50.75, 36.75, 11.75, 20.75, 42.25);
2.63 = **max**(1.71, 2.63)

< 2.75 = **min**(60.25, 2.75, 18.75, 44.25, 51.25, 26.25, 10.25, 52.75))

between the standard deviation and the average of all symmetrical outsider or insider palaces shows that the classification of the energy is reasonable. #

Put these concepts with mathematical model of Heaven-human corresponding analysis can be described as follows.

Definition 3.4 (Expectation, Variance and Covariance of the statistical complex systems)

Set $X = (x_1, \dots, x_p)^T$ is p -dim random vector, with F_X joint distribution function. $U = U(X)$ is a transformation of $X = (x_1, \dots, x_p)^T$.

Define the same $Y = (y_1, \dots, y_q)^T$ is q -dim random vector, with F_Y joint distribution function. $V = V(Y)$ is a transformation of $Y = (y_1, \dots, y_q)^T$.

And set (X, Y) is with $F_{X,Y}$ joint distribution function.

Under these assumptions, consider X and Y systems: expectation, variance and covariance of the statistical complex system.

Expectation:

$$E(X) = \int_{R^r} X dF_X, E(U(X)) = \int_{R^r} U(X) dF_X, E(Y) = \int_{R^r} Y dF_Y, E(V(Y)) = \int_{R^r} V(Y) dF_Y.$$

Variance:

$$\Sigma_{Y,Y} = \text{Var}(Y) = E(Y - EY)(Y - EY)^T, \text{Var}(V(Y)) = E(V(Y) - EV(Y))(V(X) - EV(X))^T. \mathbf{C}$$

covariance:

$$\Sigma_{X,Y} = \text{Cov}(X, Y) = E(X - EX)(Y - EY)^T = \int_{R^r} \int_{R^r} (X - EX)(Y - EY)^T dF_{X,Y},$$

$$\text{Cov}(U(X), V(Y)) = E(U(X) - EU(X))(V(Y) - EV(Y))^T.$$

Commonly used formula:

$$EYY^T = \text{Var}(Y) + (EY)(EY)^T.$$

$$\text{Var}(X + Y) = \text{Var}(X) + \text{Var}(Y) + \text{Cov}(Y, X) + \text{Cov}(X, Y).$$

$$\text{Cov}(Y, X)^T = \text{Cov}(X, Y). \#$$

Definition 3.5 (Heaven-human corresponding analysis)

When a given X , the conditional distribution function of Y is $F_{Y|X}$. Meet the conditions of distribution function: $F_{X,Y} = F_X F_{Y|X}$. If and only if $F_{Y|X} = F_Y$, X, Y independence.

Judge X, Y whether independent statistical analysis called **association analysis**, the statistical analysis does not involve in this paper.

When X, Y at independence, there must be $\text{Cov}(X, Y) = (E)(X - EX)E(Y - EY)^T = \mathbf{0}$.

When $|\text{Cov}(X, Y)| > 0$, research the relationship of statistical analysis systems X, Y called **related analysis**.

When X, Y related ($|\text{Cov}(X, Y)| > 0$), X, Y must be independent.

When X, Y unrelated ($|\text{Cov}(X, Y)| = 0$), X, Y are not necessarily independent. Irrelevant, also known as **orthogonal**.

In image mathematics of TCS, **Heaven-human corresponding analysis** is based on the following **dual-correlation matrices** to the analysis:

$$R_{X,Y}^2 = \text{Var}(X)^{-\frac{1}{2}} \text{Cov}(X, Y) \text{Var}(Y)^{-1} \text{Cov}(Y, X) \text{Var}(X)^{-\frac{1}{2}},$$

$$R_{Y,X}^2 = \text{Var}(Y)^{-\frac{1}{2}} \text{Cov}(Y, X) \text{Var}(X)^{-1} \text{Cov}(X, Y) \text{Var}(Y)^{-\frac{1}{2}}.$$

Here the **dual-correlation matrices** are called those of the human system X and the heaven system Y . #

Assuming δ_{ij} is the notation of Kronecker, i.e., $\delta_{ij} = 1$ if $i = j$; Otherwise, $\delta_{ij} = 0$.

Theorem 3.1. Suppose that

$$A_{p \times p} = \text{Var}(X) \geq 0, C_{q \times q} = \text{Var}(Y) \geq 0, B_{p \times q} = \text{Cov}(X, Y).$$

Set $D = A^{-\frac{1}{2}} B C^{-\frac{1}{2}}$, dual-correlation matrices for at this time are as follows:

$$R_1^2 = A^{-\frac{1}{2}} B C^{-1} B^T A^{-\frac{1}{2}} = D D^T, R_2^2 = C^{-\frac{1}{2}} B^T A^{-1} B C^{-\frac{1}{2}} = D^T D.$$

Then, the conclusion of the following statements is established.

$$(1). I_p \geq R_1^2 \geq 0, I_q \geq R_2^2 \geq 0.$$

(2). There are

$$\lambda_1^2 \geq \dots \geq \lambda_r^2 > 0, \alpha_j \neq 0, j = 1, \dots, r,$$

such that $R_1^2 \alpha_j = \lambda_j^2 \alpha_j, \alpha_i^T \alpha_j = \delta_{ij}$.

$$(3). \text{Take } \beta_j = \frac{1}{\lambda_j} D^T \alpha_j \neq 0, j = 1, \dots, r,$$

then $R_2^2 \beta_j = \lambda_j^2 \beta_j, \beta_i^T \beta_j = \delta_{ij}$.

(4). The dual-correlation matrices R_1^2, R_2^2 are with k the same nonzero eigenvalues.

(5). There are $a_j = A^{-\frac{1}{2}} \alpha_j, b_j = C^{-\frac{1}{2}} \beta_j$ such that

$$A^{\frac{1}{2}} a_j = \alpha_j, C^{\frac{1}{2}} b_j = \beta_j.$$

(6). In $5 a_j, b_j$, there are

$$\text{Cov}(a_i^T X, a_j^T X) = a_i^T \text{Var}(X) a_j = \delta_{ij},$$

$$\text{Cov}(b_i^T Y, b_j^T Y) = b_i^T \text{Var}(Y) b_j = \delta_{ij},$$

$$\text{Cov}(a_i^T X, b_j^T Y) = a_i^T \text{Cov}(X, Y) b_j = \lambda_j \delta_{ij} \leq \delta_{ij}. \#$$

Definition 3.6 (Canonical correlation degree of commonly used metrics) Assuming that when a given $\lambda_1^2(R^2) \geq \dots \geq \lambda_r^2(R^2) \geq 1/36, \lambda_j^2(R^2)$ is common nonzero eigenvalues of dual-correlation matrices $R_{X,Y}^2, R_{Y,X}^2$ as R^2 . Always consider the following five indicators:

$$(a). \lambda_1^2(R^2) = \max_U \left(\frac{U^T R^2 U}{U^T U} \right).$$

$$(b). \frac{1}{r} \text{tr}(R^2) = \frac{1}{r} (\lambda_1^2(R^2) + \dots + \lambda_r^2(R^2)).$$

$$(c). (\text{Det}^\#(R^2))^{\frac{1}{r}} = (\lambda_1^2(R^2) \dots \lambda_r^2(R^2))^{\frac{1}{r}}.$$

$$(d). \left(\frac{1}{r} \text{tr}(R^{-2}) \right)^{-1} = \left(\frac{1}{r} (\lambda_1^{-2}(R^2) + \dots + \lambda_r^{-2}(R^2)) \right)^{-1}.$$

$$(e). \lambda_r^2(R^2) = \min_V \left(\frac{V^T R^2 V}{V^T V} \geq 1/36 \right).$$

General equilibrium for steady state regulations: $\lambda_1^2(R^2) = \lambda_r^2(R^2)$.

For the **most balanced stable state** regulations: $\lambda_1^2(R^2) = \lambda_r^2(R^2) = 1$.

In the most balance stable state, dual correlation matrices $R_{X,Y}^2, R_{Y,X}^2$ are the projection matrices.

When the dual correlation matrices $R_{X,Y}^2, R_{Y,X}^2$ are the projection matrices, the statistical complex systems X, Y are for linear correlation systems. #

Property 3.2. Under the hypothesis of Definition 3.6, the following result is true.

$$\lambda_1^2(R^2) \geq \frac{1}{r} \text{tr}(R^2) \geq (\text{Det}^\#(R^2))^{\frac{1}{r}} \geq \left(\frac{1}{r} \text{tr}(R^{-2}) \right)^{-1} \geq \lambda_r^2(R^2) \geq 1/36.$$

According to the Theorem 3.1 can get general conclusion of canonical correlation analysis:

Definition 3.7 (The hexagram function and the energy coefficient) Assuming that α_j, β_j respectively is corresponding orthogonal eigenvectors of common nonzero eigenvalues $\lambda_j^2(R^2)$ of dual-correlation matrices $R_{X,Y}^2, R_{Y,X}^2$ as R^2 .

Take $a_j = \text{Var}(X)^{-\frac{1}{2}} \alpha_j, b_j = \text{Var}(Y)^{-\frac{1}{2}} \beta_j$, then there are

Regularization constraint:

$$\text{Var}(a_j^T X) = a_j^T \text{Var}(X) a_j = 1, \forall j, \text{Var}(b_j^T Y) = b_j^T \text{Var}(Y) b_j = 1, \forall j.$$

Orthogonalization constraints:

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$$\text{Cov}(a_i^T X, a_j^T X) = a_i^T \text{Vax}(X) a_j = 0, \forall i \neq j.$$

$$\text{Cov}(b_i^T Y, b_j^T Y) = b_i^T \text{Vax}(Y) b_j = 0, \forall i \neq j.$$

$$\text{Cov}(a_i^T X, b_j^T Y) = a_i^T \text{Cov}(X, Y) b_j = 0, \forall i \neq j.$$

$$\text{Cov}(b_i^T Y, a_j^T X) = b_i^T \text{Cov}(Y, X) a_j = 0, \forall i \neq j.$$

The set of variables $(a_j^T X, b_j^T Y)$ is called the **hexagram function** or the **canonical correlation variable** of the j^{th} group.

The value $\lambda_j(R^2) = \text{Cov}(a_j^T X, b_j^T Y)$ is called the **energy coefficient** or the **canonical correlation coefficient** of the j^{th} group. #

By non-authigenic logic in image mathematics in TCS point of view: any two statistical complex systems have heaven-human corresponding analytical relations, all have the insides of the structure. The canonical correlation coefficient is called the **energy coefficient of Chi**. The canonical correlation variable is called the **six hexagram function**. Any two statistical complex systems have the **same Chi attracting relationship** for each type of energy. The same **Chi** attracting relationship is a canonical correlation between the relevant variables.

According to this philosophy, image mathematics by non-authigenic logic thought that the number of non-zero energy coefficients of any a statistical complex system is 6. That is to say: whatever X or Y is a statistical complex system, dual correlation matrices $R_{X,Y}^2, R_{Y,X}^2$ together the number of nonzero eigenvalues are believed to be $r = 6$, and think that the property of the energy coefficients approximately equal is the stable state of balance for a statistical complex system. In image mathematics of TCS, Heaven-human corresponding analysis is to find out the six energy coefficients and 6 groups of hexagram functions. Coarsening 6 groups of hexagram functions is worth to the symmetrical design $S_{64}(2^6)$ row structure, according to the classification of the nature of eight palaces that being objective matching and forecast analysis.

In order to make about the calculation of non-zero energy coefficients having nothing to do with the data collected, image mathematics of TCS also stipulates: an energy coefficient greater than or equal to $1/6 \approx 0.167$ that non-zero (this ensures that when the energy coefficients are approximately equal, $\sum_{j=1}^6 \lambda_j(R^2) \geq 1$).

An energy coefficient less than or equal to $1/12 \approx 0.083$ is considered to be zero (this ensures that when the energy coefficients are approximately equal, $\sum_{j=1}^6 \lambda_j(R^2) \leq 1/2$).

An energy coefficient between $1/12 \approx 0.083$ and $1/6 \approx 0.167$ is not sure whether to zero.

Equivalent to the same provision: the square of an energy coefficient is greater than $1/36 \approx 0.028$ that non-zero. An energy coefficient square less than $1/144 \approx 0.007$ is considered to be zero. The square of an energy coefficient between $1/144 \approx 0.007$ and $1/36 \approx 0.028$ is not sure whether to zero.

IV. REPRODUCIBILITY SIMULATION COMPARISON OF HEAVEN-HUMAN CORRESPONDING ANALYSIS AND CANONICAL CORRELATION ANALYSIS

Because non-authigenic logic model is different from the western general authigenic logic model, so their statistical analysis conclusion is often not the same.

4.1 Canonical correlation analysis in the west

Western canonical correlation analysis is under the hypothesis of normal distribution of the statistical analysis. The statistical analysis in the SAS CANCERR process is used to express. The following explained by an example.

Example 4.1. Health club of 20 middle-aged measured three Physiological indexes (Physiological Measurements) : Weight (x_1), Waist (x_2), Pulse (x_3), and three training indexes (Exercises) :Chins (y_1), Situps (y_2), Jumps (y_3). The data in the following SAS programs. Try to analysis the correlation of training indexes and physiological indexes ?#

(A) Procedure of canonical correlation analysis in the west

Western canonical correlation analysis of reasoning logic is the authigenic logic. First asked to study fully observation, this paper puts forward assumptions. The number of non-zero canonical correlation coefficient needs to use hypothesis testing to determine. For example, in Example 4.1 there are only three variables of two groups of data. According to the authigenic logic of thinking, the variables and data are collected by the direct canonical correlation analysis. Written in CANCERR process western canonical correlation analysis of SAS program as follows:

```
%let k=3;%let m1=3;%let m2=3; %let name=1031;
data data&name; input x1-x&m1 y1-y&m2 @@; datalines;
191 36 50 5 162 60 189 37 52 2 110 60
193 38 58 12 101 101 162 35 62 12 105 37
189 35 46 13 155 58 182 36 56 4 101 42
211 38 56 8 101 38 167 34 60 6 125 40
176 31 74 15 200 40 154 33 56 17 251 250
169 34 50 17 120 38 166 33 52 13 210 115
154 34 64 14 215 105 247 46 50 1 50 50
193 36 46 6 70 31 202 37 62 12 210 120
176 37 54 4 60 25 157 32 52 11 230 80
156 33 54 15 225 73 138 33 68 2 110 43
;data a; set data&name;
num+1;call symput('nnn',num);
proc cancorr data=a out=bbb ncan=&k;
var x1-x&m1; with y1-y&m2;
proc print data=bbb;
proc reg data=bbb outest=www noprint;
model v1-v&k=x1-x&m1;
data www; set www; array name _RMSE_ Intercept
x1-x&m1; do over
name; name=round(name,0.01); end;
proc print data=www; run;
proc reg data=bbb outest=www noprint; model
w1-w&k=y1-y&m2;
data www; set www; array name _RMSE_ Intercept
y1-y&m2;
do over name; name=round(name,0.01); end; proc print
data=www; run;
```

(B)Conclusion of canonical correlation analysis in the west

Western canonical correlation analysis, test the number of non-zero canonical correlation coefficient with distribution assumption, but distribution assumption generally positive definite variance demands. Inspection conditions are too strong, its principle is: in the canonical correlation coefficient is not zero, the reason is quite good, but in the canonical correlation coefficient is zero, insufficient reason.

VAR and WITH canonical correlation coefficients are shown in Table 3, nonzero test conclusions of them are shown in Table 4. The nonzero other significance test conclusions of first canonical correlation coefficient are shown in Table 5. VAR and WITH variables with the corresponding variable regression relations are shown in Tables 6 and 7.

In order to verify whether western analysis of canonical correlation analysis is related to the number of data or not, in cases of Example 4.1, 20 data last removed, and the same data analysis, get similar three canonical correlation coefficients and three groups of canonical correlation variables.

VAR and WITH canonical correlation coefficients are shown in Table 3b, nonzero test conclusions of them are shown in Table 4b. The non zero other significance test conclusions of first canonical correlation coefficient are shown in Table 5b. VAR and WITH variables with the corresponding variable regression relations are shown in Tables 6b and 7b.

Table 3. Western canonical correlation coefficients

Canonical Correlation Analysis				
	Canonical Correlation	Adjusted Canonical Correlation	Approximate Standard Error	Squared Canonical Correlation
1	0.795608	0.754056	0.084197	0.632992
2	0.200556	-0.076399	0.220188	0.040223
3	0.07257	.	0.228208	0.005266

Table 3b. Western canonical correlation coefficients

The CANCERR Procedure				
Canonical Correlation Analysis				
	Canonical Correlation	Adjusted Canonical Correlation	Approximate Standard Error	Squared Canonical Correlation
1	0.820965	0.783154	0.076843	0.673984
2	0.299416	0.143557	0.214572	0.08965
3	0.041192	.	0.235302	0.001697

Table 4. Western canonical correlation coefficients of non zero significance test

Test of H0: The canonical correlations in the current row and all that follow are zero					
Likelihood	Approximate				
Ratio	F Value	Num DF	Den DF	Pr > F	
1	0.3503905	2.05	9	34.223	0.0635
2	0.9547227	0.18	4	30	0.9491
3	0.9947336	0.08	1	16	0.7748

Table 4b. Western canonical correlation coefficients of non zero significance test

Test of H0: The canonical correlations in the current row and all that follow are zero					
Likelihood	Approximate				
Ratio	F Value	Num DF	Den DF	Pr > F	
1	0.2962856	2.29	9	31.789	0.0412
2	0.9088055	0.34	4	28	0.8467
3	0.9983032	0.03	1	15	0.8753

Table 5. West the first canonical correlation coefficient of non zero other significance test

Multivariate Statistics and F Approximations					
S=3 M=-0.5 N=6					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.35	2.05	9	34.22	0.064
Pillai's Trace	0.68	1.56	9	48	0.155
Hottelling-Lawley Trace	1.77	2.64	9	19.05	0.036
Roy's Greatest Root	1.72	9.2	3	16	0.001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Table 5b. West the first canonical correlation coefficient of non zero other significance test

Multivariate Statistics and F Approximations					
S=3 M=-0.5 N=6					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.3	2.29	9	31.79	0.041
Pillai's Trace	0.77	1.71	9	45	0.114
Hottelling-Lawley Trace	2.17	2.99	9	17.5	0.024
Roy's Greatest Root	2.07	10.34	3	15	0.001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Table 6. Western VAR canonical correlation variables regression relationship with VAR variables

Obs	_D_	_R_	Int.	x1	x2	x3
1	V1	0	-11.39	-0.03	0.49	-0.01
2	V2	0	2.38	-0.08	0.37	-0.03
3	V3	0	-12.39	-0.01	0.16	0.15

etc. $V_i = -11.39 - 0.03x_1 + 0.49x_2 - 0.01x_3,$

Table 6b. Western VAR canonical correlation variables regression relationship with VAR variables

Obs	_D_	_R_	Int.	x1	x2	x3
1	V1	0	-9.65	-0.02	0.39	-0.02
2	V2	0	-3.58	-0.09	0.53	0.02
3	V3	0	-13.65	0	0.14	0.15

etc. $V_i = -9.65 - 0.02x_1 + 0.39x_2 - 0.02x_3,$

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**Table 7. Western WITH canonical correlation variables
regression relationship with WITH variables**

Obs	_D_	_R_	Int.	y1	y2	y3
1	W1	0	2.09	-0.07	-0.02	0.01
2	W2	0	-1.07	-0.07	0	0.02
3	W3	0	0.01	-0.25	0.02	-0.01

etc. $W_1 = 2.09 - 0.07y_1 - 0.02y_2 + 0.01y_3,$

**Table 7b. Western WITH canonical correlation variables
regression relationship with WITH variables**

Obs	_D_	_R_	Int.	y1	y2	y3
1	W1	0	2.17	-0.09	-0.01	0.01
2	W2	0	-0.76	0.09	-0.01	0.02
3	W3	0	0.57	0.24	-0.02	-0.01

etc $W_1 = 2.17 - 0.09y_1 - 0.01y_2 + 0.01y_3,$

In Table 3 and Table 3b, the three canonical correlation coefficients and three groups of canonical correlation variables are no big change, which seems to have the repeatability.

But in Table 4 and Table 4b, the calculation for the first canonical correlation coefficient of normal inspection, twice p values are $P_r > F = 0.0635, 0.0412$.

Explain first to calculate, under the error level of $\alpha_0 = 0.05$, the first canonical correlation coefficient is not significant, namely not denied the assumption of canonical correlation coefficient being zero.

The first calculation of other canonical correlation coefficient is not significant. Namely under the level of $\alpha_0 = 0.05$, the number of non-zero canonical correlation coefficients is 0.

But second to calculate, under the error level of $\alpha_0 = 0.05$, the first canonical correlation coefficient is significant, i.e., the negative hypothesis that the canonical correlation coefficient is zero.

The second calculation of other canonical correlation coefficient is also not significant. Namely under the level of $\alpha_0 = 0.05$, the number of non-zero canonical correlation coefficients is 1.

Non zero judgment about western canonical correlation coefficient would not be repeated.

Also in Table 5 and Table 5b, according to the distribution of different assumptions and different statistical methods, twice calculations to the first canonical correlation coefficient of the non-zero property are different Under the error level of $\alpha_0 = 0.05$, twice calculations of Roy and Hotelling - Lawley inspection are significant, twice calculations of Pillai's Inspection are not significant, but twice calculations of Wilks inspection, a striking and another is not significant.

This suggests that the western first canonical correlation coefficient of the nonzero test conclusion is relevant scholars using statistical method, the conclusion would not be repeated.

In Table 6 and Table 6b, twice calculations to three VAR canonical correlation variables change greatly. For example, to the twice calculation results for the second VAR canonical correlation variable are as follows:

$$V_2 = 2.38 - 0.08x_1 + 0.37x_2 - 0.03x_3, V_2 = -3.58 - 0.09x_1 + 0.53x_2 + 0.02x_3.$$

Each of the intercept and x_3 coefficient change is bigger, its symbol is the opposite. This shows that for three canonical correlation variables, twice VAR calculations are not repeated.

Similarly, in Table 7 and Table 7b, the twice calculations of three WITH canonical correlation variables change greatly. For example, the twice calculation results of the third WITH canonical correlation variable are as follows:

$$W_3 = 0.01 - 0.25y_1 + 0.02y_2 - 0.01y_3, W_3 = 0.57 + 0.24y_1 - 0.02y_2 - 0.01y_3.$$

The intercept, y_1 and y_2 coefficients change greatly. Difference of intercept is greater than 0.5, the symbol of the y_1 and y_2 coefficients is the opposite. It also suggests that twice calculations of three WITH canonical correlation variables are not repeated.

The repeatability does not meet the statistical conclusion, makes little sense to research its objective consistency. This because no matter how is the result of objective consistency, the analysis conclusion is not reproducibility. This shows that the fixed number of non-zero canonical correlation coefficients and the canonical correlation variable calculation, in the reproducibility of canonical correlation analysis discussion, is the important philosophical views.

Due to western logic is based on the observed data and the assumption to judge the reasoning, mainly to according to the data has been observed to proposition of true and false, so its conclusions are relevant data obtained from the observer. Because its proposition is the observer, any analysis of knowledge about nature and statistical scholars, different scholars can draw different conclusions, so it is hard to believe that its conclusion has reproducibility.

4.2 Heaven-human corresponding analysis in TCS

Image mathematics of TCS, the logic of Heaven-human corresponding analysis is non-authigenic logic, not any hypothesis for research object and requirements, the analysis of the problem has nothing to do with statistical scholars, requirements analysis have reproducibility.

(A) Procedure of Heaven-human corresponding analysis in TCS

Due to meet the need of the logical structure of statistical complex systems, so that both sides of "Heaven" and "Human" statistical complex systems are with the same logic structure. The number of non-zero energy coefficients is to six, for statistical complex systems to know its insides. Otherwise cannot be made after the research of reasoning using the theory of insides, nor on the relationship between the internal structure in statistical complex systems. The same *Chi* attracting and the analysis of the loving and killing relations, based on analysis of the non compatible relationship also is impossible.

According to logic is non-authigenic, for Example 4.1 the same problem, in order to ensure to get 6 energy coefficients and 6 groups of hexagram functions, you first need to one set of observations in the form of input variables into more than six. Image mathematics of TCS generally identified data are

not negative, and there are all kinds of interaction between various variables. That is to say, in between variables x_1, \dots, x_p , adopt with the same-dimension of the transformation :

$$x_{i_1, i_2, \dots, i_s} = \sqrt[s]{x_{i_1} x_{i_2} \dots x_{i_s}}, s = 2, 3, \dots, p, 1 \leq i_1 < i_2 < \dots < i_s \leq p. \quad (1)$$

It does not change the internal structure of a statistical complex system.

The equation (1) of the same dimension transformation for Example 4.1 the raw data, will be able to get two groups have seven variable data. Based on these data, statistical analysis using SAS CANCECORR process, still could get 6 energy coefficients and six groups of hexagram functions. By non authentic logic thinking, according to a new variable transformation and new data, image mathematical Heaven-human corresponding analysis can be implemented. Written in CANCECORR process image mathematical Heaven-human corresponding analysis of SAS program is as follows:

```
%let k=3;%let m1=3;%let m2=3; %let name=1031;
data data&name; input x1-x&m1 y1-y&m2 @@; datalines;
191 36 50 5 162 60 189 37 52 2 110 60
193 38 58 12 101 101 162 35 62 12 105 37
189 35 46 13 155 58 182 36 56 4 101 42
211 38 56 8 101 38 167 34 60 6 125 40
176 31 74 15 200 40 154 33 56 17 251 250
169 34 50 17 120 38 166 33 52 13 210 115
154 34 64 14 215 105 247 46 50 1 50 50
193 36 46 6 70 31 202 37 62 12 210 120
176 37 54 4 60 25 157 32 52 11 230 80
156 33 54 15 225 73 138 33 68 2 110 43
;data a; set data&name;
num+1; call symput('nnn', num);
%macro funx; x1 x2 x3 x1x2 x1x3 x2x3 x1x2x3 %mend;
%macro funy; y1 y2 y3 y1y2 y1y3 y2y3 y1y2y3 %mend;
data a; set a;
x1x2=(x1*x2)**(1/2); x1x3=(x1*x3)**(1/2);
x2x3=(x2*x3)**(1/2);
x1x2x3=(x1*x2*x3)**(1/3);
y1y2=(y1*y2)**(1/2); y1y3=(y1*y3)**(1/2);
y2y3=(y2*y3)**(1/2);
y1y2y3=(y1*y2*y3)**(1/3);
proc cancel data=a out=bbb ncan=&k;
var %funx; with %funy;
proc print data=bbb;
proc reg data=bbb outest=www noprint;
model v1-v&k=%funx;
data www; set www; array name _RMSE_ Intercept %funx;
do over name; name=round(name,0.01); end;
proc print data=www; run;
proc reg data=bbb outest=www noprint;
model w1-w&k=%funy;
data www; set www; array name _RMSE_ Intercept %funy;
do over name; name=round(name,0.01); end;
proc print data=www; run;
```

(B)Conclusion of Heaven-human corresponding analysis in TCS

Image mathematical Heaven-human corresponding analysis, test the number of non-zero energy coefficients without distribution assumption, does not require the variance positive definite test condition. In order to identify whether an

energy coefficient is zero, general require that the energy coefficient $\leq 1/12 \approx 0.083$; About the identification of an energy coefficient of nonzero, general require that the energy coefficient $\geq 1/6 \approx 0.167$. Its principle is: in the energy coefficient is zero, reason is quite good, but in the energy coefficient is not zero, insufficient reason. That is to say, would rather make to identify zero energy coefficient to the non-zero error, but cannot commit to non-zero energy coefficient determined as zero error.

VAR and WITH energy coefficients are shown in Table 8, nonzero test conclusions of them are shown in Table 9. The nonzero other significance test conclusions of first energy coefficient are shown in Table 10. VAR and WITH variables with the corresponding variable regression relations are shown in Tables 11 and 12.

In order to verify whether the Heaven-human corresponding analysis is related to the number of data or not, in the case of Example 4.1, 20 data last removed, and the same data analysis, get similar six energy coefficients and 6 groups of the hexagram functions.

VAR and WITH energy coefficients are shown in Table 8b, nonzero test conclusions of them are shown in Table 9b. The nonzero other significance test conclusions of first energy coefficient are shown in table 10b. VAR and WITH variables with the corresponding variable regression relations are shown in Tables 11b and 12b.

Table 8. Image mathematics energy coefficients

The CANCECORR Procedure				
Canonical Correlation Analysis				
	Adjusted	Approximate	Squared	
	Canonical	Standard	Canonical	
	Correlation	Error	Correlation	
1	0.954007	0.921424	0.020618	0.910129
2	0.907713	0.865424	0.04039	0.823943
3	0.732667	0.610911	0.106265	0.536801
4	0.426102	0.045307	0.187762	0.181563
5	0.294699	-0.234408	0.209492	0.086848
6	0.246947	.	0.215425	0.060983
7	0.021525	.	0.229309	0.910129

Table 8b. Image mathematics energy coefficients

The CANCECORR Procedure				
Canonical Correlation Analysis				
	Adjusted	Approximate	Squared	
	Canonical	Standard	Canonical	
	Correlation	Error	Correlation	
1	0.980779	0.96822	0.008974	0.961927
2	0.910726	0.861209	0.040206	0.829422
3	0.735874	0.604599	0.108067	0.54151
4	0.456889	0.12905	0.1865	0.208748
5	0.27741	.	0.217563	0.076956
6	0.264237	.	0.219245	0.069821
7	0.04477	.	0.23523	0.002004

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**Table 9. Image mathematical energy coefficients
of non zero significance test of the west**

Test of H0: The canonical correlations in the current row and all that follow are zero					
Likelihood Ratio	Approximate F Value	Num DF	Den DF	Pr >F	
1	0.0051409	1.3	49	34.884	0.2107
2	0.0572033	0.85	36	33.5	0.6784
3	0.32491429	0.44	25	31.221	0.9805
4	0.7014569	0.22	16	28.133	0.9988
5	0.85706839	0.18	9	24.488	0.9947
6	0.93858202	0.18	4	22	0.9478
7	0.99953669	0.01	1	12	0.9418

**Table 9b. Image mathematical energy coefficients
of non zero significance test of the west**

Test of H0: The canonical correlations in the current row and all that follow are zero					
Likelihood Ratio	Approximate F Value	Num DF	Den DF	Pr >F	
1	0.00201884	1.46	49	29.807	0.1376
2	0.05302552	0.77	36	29.109	0.7739
3	0.31085793	0.41	25	27.506	0.9869
4	0.67800397	0.21	16	25.078	0.9989
5	0.85687473	0.16	9	22.054	0.9962
6	0.92831433	0.19	4	20	0.9411
7	0.99799563	0.02	1	11	0.8845

**Table 10. Image mathematical the first energy coefficient
of non zero other significance test of the west**

Multivariate Statistics and F Approximations S=7 M=-0.5 N=2					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.005	1.3	49	34.884	0.2107
Pillai's Trace	2.601	1.0149	49	84	0.4702
Hotelling-Lawley Trace	16.348	1.74	49	8.5946	0.1959
Roy's Greatest Root	10.127	17.36	7	12	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

**Table 10b. Image mathematical the first energy coefficient
of non zero other significance test of the west**

Multivariate Statistics and F Approximations S=7 M=-0.5 N=2					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.002	1.46	49	29.807	0.1376
Pillai's Trace	2.69	0.98	49	77	0.5218
Hotelling-Lawley Trace	31.733	2.88	49	6.125	0.0888
Roy's Greatest Root	25.265	39.7	7	11	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

**Table 11. Image mathematical VAR hexagram functions
regression relationship with VAR variables**

V.	_R_	Int.	x1	x2	x3	x1x2	x1x3	x2x3	x1x2x3
V1	0.66	-7.36	0.3	-1.36	-0.69	-0.48	-0.72	3.39	0
V2	0.51	5.33	-1.36	-13.59	-0.82	8.42	-1.74	6.06	0
V3	0.79	-4.05	0.77	7.16	0.17	-4.6	0.85	-2.55	0
V4	0.1	-12.12	0.07	1.08	-1.14	-1.43	1.03	0.84	0
V5	0.22	-1.95	-1.98	-22.34	0.33	14.4	-4.02	8.64	0
V6	0.22	-11.53	-2.09	-10.18	0.36	9.46	-0.25	-0.02	0

$$V_1 = -7.36 + 0.30x_1 - 1.36x_2 - 0.69x_3 - 0.48\sqrt{x_1x_2} - 0.72\sqrt{x_1x_3} + 3.39\sqrt{x_2x_3}$$

**Table 11b. Image mathematical VAR hexagram functions
regression relationship with VAR variables**

V.	_R_	Int.	x1	x2	x3	x1x2	x1x3	x2x3	x1x2x3	x1x2x3
V1	0.61	-9.07	-2.52	-13.16	-0.51	11.25	0.08	1.16	0	0
V2	0.35	4.53	-0.04	-7.68	-0.9	2.77	-2.01	6.85	0	0
V3	0.58	-2.96	3.68	20.35	0.13	-17.08	0.27	-1.16	0	0
V4	0.34	-7.67	4.85	22.17	-1.08	-21.52	-0.13	3.17	0	0
V5	0.57	-10.84	-5.84	-37.19	0.37	29.75	-2.57	5.45	0	0
V6	0.09	-9.05	1.2	15.47	-0.33	-9.67	3.02	-5.99	0	0

$$V_1 = -9.07 - 2.52x_1 - 13.16x_2 - 0.51x_3 + 11.25\sqrt{x_1x_2} + 0.08\sqrt{x_1x_3} + 1.16\sqrt{x_2x_3}$$

Table 12. Image mathematical WITH hexagram functions

regression relationship with WITH variables									
W.	_R_	Int.	y1	y2	y3	y1y2	y1y3	y2y3	y1y2y3
W1	0	1.2	0.3	0.01	-0.13	-0.31	0.57	0.14	-0.28
W2	0	-0.95	3.31	0.21	0.31	-3.51	-4.44	-1.09	5.93
W3	0	1.33	0.81	-0.08	0.22	-0.73	-3.01	-0.38	2.85
W4	0	0.74	-4.32	-0.32	-0.49	3.74	4.79	1.23	-5.77
W5	0	-0.59	-3	-0.26	-0.42	2.87	3.43	1.11	-4.6
W6	0	-0.92	-0.7	0.02	-0.05	0.76	1.73	0.24	-1.97

$W_i = 1.20 + 0.30y_1 + 0.01y_2 - 0.13y_3 - 0.31\sqrt{y_1y_2} + 0.57\sqrt{y_1y_3} + 0.14\sqrt{y_2y_3} - 0.28\sqrt{y_1y_2y_3}$.

Table 12b. Image mathematical WITH hexagram functions

regression relationship with WITH variables										
W.	_R_	Int.	y1	y2	y3	y1y2	y1y3	y2y3	y1y2y3	x1x2x3
W1	0	1.22	0.11	0.02	-0.15	-0.06	1.18	0.22	-1	0
W2	0	-0.7	3.13	0.19	0.28	-3.33	-4.17	-1	5.61	0
W3	0	1.34	0.41	-0.12	0.16	-0.34	-2.55	-0.24	2.25	0
W4	0	0.54	-4.77	-0.4	-0.6	4.31	5.3	1.49	-6.59	0
W5	0	-0.6	-2.39	-0.12	-0.25	2.14	3.1	0.74	-3.81	0
W6	0	-0.12	0.65	0.12	0.15	-0.62	-0.22	-0.32	0.61	0

$W_i = 1.22 + 0.11y_1 + 0.02y_2 - 0.15y_3 - 0.06\sqrt{y_1y_2} + 1.18\sqrt{y_1y_3} + 0.22\sqrt{y_2y_3} - 1.00\sqrt{y_1y_2y_3}$.

In Table 8 and Table 8b, twice calculations of the sixth energy coefficient at 0.246947, 0.264237 are greater than $1/6 \approx 0.167$, and the seventh energy coefficient of twice calculations at 0.021525, 0.044770 is smaller than $1/12 \approx 0.083$, from the 6th to the seventh energy coefficient have taken place in the size of the jump, so the results of twice calculations agree that non-zero coefficients of energy have six. That is to say: the image mathematical point of view, twice calculations by the number of non-zero coefficients of energy are the same, with repeated its conclusion. In addition, image mathematical objective that the number of non-zero coefficients of energy is 6, and the estimate is 6, this shows that the estimate also has objective consistency. As a result, the estimate of the number of non-zero coefficients of energy here is with reproducibility.

But in Tables 9 and 9b, twice calculations to the first energy coefficient of normal inspection p values are $Pr > F = 0.2107, 0.1376$. Under the error level of $\alpha_0 = 0.05$, the twice calculations of the first energy coefficient are not significant, namely not denied the assumption of the energy coefficient being zero. Twice calculations of other energy coefficients are not significant. It's quite different with image mathematical intuitive understanding. This is because the size of the energy coefficient between 0 and 1, according to the hypothesis testing of western, as the twice calculations of the energy coefficients $\lambda_1(R^2) = 0.954007, 0.980779$ are 0, really hard to accept. This suggests that the western hypothesis test is used to image mathematical the energy coefficient of nonzero test is not objective. So the hypothesis testing of western can not be used in the energy coefficient of non zero reproducibility test.

Also in Table 10 and Table 10b, according to the different distribution hypothesis and statistical method, twice computations to the first energy coefficient of nonzero are different. In the error level of $\alpha_0 = 0.05$, the twice calculations of Roy's maximum root test are significant, and two calculations of other inspections are not significant. This suggests that the western energy coefficients of nonzero test conclusion is relevant scholars using statistical methods, the conclusion would not be repeated. So the hypothesis testing of western can not be used in the energy coefficient of non zero reproducibility test.

Listed in Tables 11 and 11b, the calculation method of 6 Var hexagram functions can see their twice calculation conclusions of only small changes. Listed in Tables 12 and 12b, the calculation method of 6 WITH hexagram functions, you can see their twice calculation conclusions of only small changes. Image mathematics about six Var and WITH hexagram functions of two haven't changed much. This shows that: image mathematics about six Var and WITH hexagram functions, the calculation is repeated.

Can be seen from the above analysis: In image mathematics, the calculation of six energy coefficients and the six hexagram functions is with repeatability, therefore is also likely to have an objective consistency, thus has the reproducibility.

4.3 Use of Heaven-human corresponding analysis in TCS

In sections 4.1 and 4.2, according to the same data, calculate for canonical correlation analysis and heaven-human corresponding analysis between the west and the east, found that the data analysis conclusion is completely different. Canonical correlation analysis in the west has not repeated.

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Heaven-human corresponding analysis of TCS is repeated, in addition to the non zero energy coefficient estimates are objective consistency, but cannot judge the six hexagram functions objective consistency.

How should the objective consistency of 6 hexagram functions evaluation? Although the front made intuitive discussion, but its persuasive power is not strong, always has a chance for statistical analysis. To illustrate the necessity of reproducibility, below to reconsider the reproducibility problem from the perspective of application.

The application of western canonical correlation analysis is mainly use the canonical correlation variables, according to the observation data of one space computing function values of canonical correlation variables, to another space observation data are interpreted accordingly. Canonical correlation variables, the variable calculated function values are more complex, so make to the same data, the interpretation of the corresponding conclusions are also diverse. This diversity will cause its reproducibility data analysis conclusions do not have.

In image mathematics of TCS, the application of Heaven-human corresponding analysis is mainly use the six hexagram functions, calculated according to observation data of one space hexagram function value plus or minus, another space to the corresponding data that being predicted. Because the six hexagram functions are only relatively stable six, calculate the function values of the symbol and only 64 cases (64 hexagrams). The 64 cases can also be divided into 8 classes (8 palaces), designed according to the symmetrical array $S_{64}(2^6)$, so that for the same data, the interpretation of the corresponding conclusion is basically stable. This stability will cause that its data analysis conclusion is reproducibility.

The traditional Chinese book (周易) of changes to the 64 hexagrams 8 palaces has a fixed logic conclusion (see Property 3.1), has the quite rich relationship analysis. As a main application of Heaven-human corresponding analysis, mathematics is by symmetrical design $S_{64}(2^6)$ row structure calculation, makes the analysis conclusion and objective actual problem matching. If this match work finished, you can use Chinese traditional logic to the object of study on forecast analysis, so as to solve practical problems accordingly.

(A)Objective consistence analysis of six hexagram functions

In case of Example 4.1, rehabilitation club of 20 middle-aged measured three physiological indexes (Physiological Measurements) : Weight (x_1), Waist (x_2), Pulse (x_3), and three training index (Exercises) : Chins (y_1), Situps (y_2), Jumps (y_3). There are 20 known data. Image mathematics Heaven-human corresponding analysis using the method of same-dimensional data changes, the three physiological indexes and three training indicators into seven variables respectively, six energy coefficients have been obtained respectively, 6 groups formed the six hexagram functions .

Objective consistent concern is: Is the 6 groups of hexagram functions (6 hexagram functions) calculation about the known data analysis objective? Can the conclusion be used for prediction of unknown data analysis? Can use the known data for view point, use the unknown data for applications.

Match the validation of known data. Middle-aged tenth of the corresponding data are the three Physiological indexes of

the body (Physiological Measurements) :Weight ($x_1=154$), Waist ($x_2=33$), Pulse ($x_3=56$), and three training index (Exercises) : Chins ($y_1=17$), Situps ($y_2=251$), Jumps ($y_3=250$). The three training index was the best of 20 people. If we want to choose sports talents, then you can extract the hexagram functions of information, as the standard selection of sports talents.

According to the three physiological indexes of the individual 10, the calculation of 6 hexagram functions V_1, V_2, \dots, V_6 is as follows:

$(-0.98858, 1.11358, 0.73427, -0.40980, -0.51006, 0.62540)$.

Coarsening consider the symbol of the six function values as follows:

$(-1, 1, 1, -1, -1, 1)$.

The result is the Zhen palace to the return of the soul. The Zhen palace of Yin Yang Wu Xing of attributes is Yang wood. Disposition is prepared, solution, constant, rising, well, big, random. Press as the philosophy of mathematics, it is a physical feeling man of great ability.

According to the three personal training indicators of the individual 10, the calculation of 6 hexagram functions W_1, W_2, \dots, W_6 is as follows:

$(-1.13466, 1.00124, 1.67535, -0.23084, -0.91792, 3.22614)$

Coarsening consider the symbol of the six function values as follows:

$(-1, 1, 1, -1, -1, 1)$.

The result is the Zhen palace to the return of the soul. The Zhen palace of Yin Yang Wu Xing of attributes is Yang wood. Disposition is prepared, solution, constant, rising, well, big, random. Press as the philosophy of mathematics, it is a training ability and have big luck with the change.

Because of personal training in three indexes, the best 10 its three physiological indexes in the palace, so predictable: "a Zhen or shock palace three physiological indexes of middle-aged, also has a good three training target."

According to the above point of view to look at the known data, found that has a similar relationship is the 19th of middle-aged people. The corresponding data are the three Physiological indexes of the body (Physiological Measurements) :Weight ($x_1=156$), Waist ($x_2=33$), Pulse ($x_3=54$), and three training index (Exercises) : Chins ($y_1=15$), Situps ($y_2=225$), Jumps ($y_3=73$). The three physiological indexes like 10th middle-aged, its three training indexes of the first two are the better in the 20 people in addition to the 10th middle-aged .

According to the three physiological indexes of the individual 19, the calculation of 6 hexagram functions V_1, V_2, \dots, V_6 is as follows:

$(-0.97934, 1.03557, 0.72944, -0.41311, -0.83916, 0.33374)$.

Coarsening consider the symbol of the six function values as follows:

$(-1, 1, 1, -1, -1, 1)$.

The result is the Zhen palace to the return of the soul. The Zhen palace of Yin Yang Wu Xing of attributes is Yang wood. Disposition is prepared, solution, constant, rising, well, big, random. Press as the philosophy of mathematics, it is a physical feeling man of great ability.

According to the three personal training indicators of the individual 19, the calculation of 6 hexagram functions W_1, W_2, \dots, W_6 is as follows:

$(-1.39233, 0.38205, -0.75277, 0.23270, 0.31564, -0.47828)$.

Coarsening consider the symbol of the six function values as follows:

$(-1, 1, -1, 1, 1, -1)$.

The result is the Zhen palace to the Five generations. The Zhen palace of Yin Yang Wu Xing of attributes is Yang wood. Disposition is prepared, solution, constant, rising, well, big, random. Press as the philosophy of mathematics, it is a training ability and have big luck with the change.

Because for the 10th and 19th individuals, the personal three training indicators are better, and all three physiological indexes are in the Zhen or earthquake palace, so the analysis conclusion "with Zhen or shock palace three physiological indexes of the middle-aged, training also has a good three indicators." For other known data, the analysis is also reasonable. This shows that in image mathematics of TCS, Heaven-human corresponding analysis of the data analysis conclusion of six hexagram functions has certain objective consistency.

V. CONCLUSIONS

This work has introduced the basic concepts and Philosophy principles of non-authigenic logic. Hilbert's sixth mathematical conjecture of the 23 mathematical conjecture problems gets the negative answer.

The basic concepts consist of the generalized relations, generalized reasoning, the steady multilateral systems, Yin Yang Wu Xing model, and so on. Mainly to illustrate: in solving the problem of a statistical complex system, cannot arbitrary assumptions, and cannot develop optimal guidelines by ourself before proof of reasoning. And should be under the condition of no assumption for logical reasoning. This reasoning requires at least satisfying the uniqueness, hereditary, reversibility, reasoning ability and associative law of steady multilateral systems. In order to ensure the reproducibility, the basic principles of non-authigenic logic consist of the philosophy of five aspects: no assumption principle, preconceptions principle, integration coordination combining principle, logical layering principle and automation principle. Both no assumption principle and integration coordination combining principle are the most basic.

This paper studies the east and the west on the difference of Heaven-human corresponding analysis and canonical correlation analysis. According to statistical standards, although different assumptions, but two analysis methods, about the energy or canonical correlation coefficients and the calculation method of the hexagram functions or the canonical correlation variables, are basically the same, can be used to calculate CANCORR process.

But because the philosophy of eastern and western is different, the data preprocessing and the energy or canonical correlation coefficients of nonzero test methods have very big difference. As the pretreatment of the image mathematics of TCS, nonzero test method of energy coefficients is agreed in advance to all the data together, it is the product of non authigenic logic; While western canonical correlation analysis, generally for normal data distribution, and based on the data according to the talk, few to nonlinear transformation

of the original variable data, often in direct canonical correlation analysis, USES the hypothesis test to judge the energy or canonical correlation coefficients of non-zero, test methods, data and its distribution assumes that the relationship is very big, it is the product of authigenic logic.

Image mathematics of TCS, in order to verify the reproducibility of Heaven-human corresponding analysis, founded the symmetrical design of row-relationship logic analysis method. The Heaven-human corresponding analysis is verified by this method. The conclusion is objective consistency and repeated, with a reproducibility. But there is currently no western canonical correlation analysis reproducibility test concept. And the western canonical correlation analysis of hypothesis test method cannot be used for the energy coefficients of nonzero test in image mathematics of TCS.

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APPENDIX

Before to prove Theorem 2.2, it is needed to prove a few lemmas.

(A) Generalized Relations and Reasoning of Non-authigenic Logic

Suppose all of the research objects is a collection $V = \{x_1, \dots, x_n\}$. The **authigenic logic** is first to look at the collection $V = \{x_1, \dots, x_n\}$ by observation, and discovered some research objects which constitute of a sub-collection $V_0 = \{y_1, \dots, y_m\} \subset V$, then according to the nature of the sub-set V_0 of axioms and assumptions, and according to the assumption to judge a certain proposition true or false. If a logical reasoning is based on the observations where V_0 , then the corresponding logic are called **authigenic logic**.

But the **non-authigenic logic** is not to look at the collection $V = \{x_1, \dots, x_n\}$ of the research objects, just according to their own needs, put forward and want to know what are the relations between the research objects by themselves? If a logical reasoning has nothing to do with the collection $V = \{x_1, \dots, x_n\}$ of the research objects, then the corresponding logic is called **non-authigenic logic**. From Eastern Philosophy thought, if a person will go to solve an objective problem of a statistical complex system, and if this person can get some analysis conclusion only by using non-authigenic logical reasoning or analysis, then the analysis conclusion can ensure to conform to the objective facts and to be reproduced by all others because the logical reasoning has nothing to do with the collection $V = \{x_1, \dots, x_n\}$ of the research objects. This property is known as the **reproducibility** (see Section 2.2). Reproducibility is the fundamental meaning of balanced measurement if the real conclusion of objects cannot be known. In general, the reproducibility was defined in a stable environment, the same

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object is measured by a lot of operators and only by using the similar measuring instruments and methods, the measured values of average variation should be similar to each other, and should be similar to the objective facts. Reproducibility also refers to the average variation is smaller between measuring system and measuring conditions.

Reproducibility is the most basic requirements for statistical scholars. If there is no reproducibility, so there would be no Chinese classical traditional Statistics. Because statistical scholars is to use the data to study the science law behind the data, the law has nothing to do with statistical scholars, and has nothing to do with how much data observed by statistical scholars, and has nothing to do with how what reasonable methods used by statistical scholars. The statistical method is reasonable if the method can at least ensure the reproducibility of the statistical analysis conclusion. As long as scholars using statistical method has reproducibility, so the analysis of the conclusions should be unique based on similar data.

In mathematics, let $V = \{x_1, \dots, x_n\}$ be a non-empty set (the collection $V = \{x_1, \dots, x_n\}$ of the research objects). Then there is a non-empty Descartes set

$$V \times V = \{(x, y) : x \in V, y \in V\}.$$

The non-empty subset $R \subset V \times V$ is called a **relation** of $V = \{x_1, \dots, x_n\}$. TCS mainly researches general relation rules for a general $V = \{x_1, \dots, x_n\}$ rather than for a special $V = \{x_1, \dots, x_n\}$. So the general $V = \{x_1, \dots, x_n\}$ cannot be supposed. The thing can only be done to research the structure of the set of relations $\mathfrak{R} = \{R_0, \dots, R_{m-1}\}$ because the structure has nothing to do with the collection $V = \{x_1, \dots, x_n\}$ of the research objects and without considering the specific content of the research object.

For a relation set $\mathfrak{R} = \{R_0, \dots, R_{m-1}\}$, define both an **inverse relationship** $^{*-1}$ of $R_i \in \mathfrak{R}$ and a **relation multiplication** $*$ between $R_i \in \mathfrak{R}$ and $R_j \in \mathfrak{R}$ as follows:

$$R_i^{-1} = \{(x, y) : (y, x) \in R_i\} \text{ and } R_i * R_j = \{(x, y) : \text{There is a } u \in V \text{ such that } (x, u) \in R_i \text{ and } (u, y) \in R_j\}.$$

The relation R_i is called a **reasonable relation** if $R_i^{-1} \in \mathfrak{R}$.

A **generalized reasoning** of general $V = \{x_1, \dots, x_n\}$ is defined as for $R_i * R_j \neq \emptyset$ there is a relation $R_k \in \mathfrak{R}$ such that $R_i * R_j \subset R_k$.

Lemma 5.1 For any a set of relations $\mathfrak{R} = \{R_0, \dots, R_{m-1}\}$, there are

(1) The associative law is formed naturally, i.e., $(R_i * R_j) * R_l = R_i * (R_j * R_l)$, $\forall i, j, l \in \{0, 1, \dots, m-1\}$.

(2) Inverse operation is similar to matrix, i.e., $(R_i * R_j)^{-1} = R_j^{-1} * R_i^{-1}$, $\forall i, j \in \{0, 1, \dots, m-1\}$.

(3) Maintain collections subordinate relations, i.e., $R_j^{-1} * R_i^{-1} \subset R_k^{-1}$, $R_i * (R_j * R_k) \subset R_i * R_k$, $(R_i * R_j) * R_l \subset R_k * R_l$, $(R_i^{-1} * R_j^{-1}) * R_l^{-1} \subset R_k^{-1} * R_l^{-1}$, $R_i^{-1} * (R_j^{-1} * R_k^{-1}) \subset R_i^{-1} * R_k^{-1}$,

if $R_i * R_j \subset R_k$, $\forall i, j, k, l \in \{0, 1, \dots, m-1\}$. #

Proof. (1). For any one $(x, y) \in (R_i * R_j) * R_l \neq \emptyset$, by the definition of the relation multiplication $*$, there is a $u \in V$ such that $(x, u) \in R_i * R_j$, $(u, y) \in R_l$.

Thus, there is a $v \in V$ such that $(x, v) \in R_i$, $(v, u) \in R_j$, $(u, y) \in R_l$.

Hence, there is a $v \in V$ such that $(x, v) \in R_i$, $(v, y) \in R_j * R_l$.

Therefore, $(x, y) \in R_i * (R_j * R_l)$. This means that $\emptyset \neq (R_i * R_j) * R_l \subset R_i * (R_j * R_l) \neq \emptyset$.

Similarly to prove:

$$\emptyset \neq R_i * (R_j * R_l) \subset (R_i * R_j) * R_l \neq \emptyset.$$

If $(R_i * R_j) * R_l = \emptyset$, then must be $R_i * (R_j * R_l) = \emptyset$.

Otherwise, there is

$$\emptyset \neq R_i * (R_j * R_l) \subset (R_i * R_j) * R_l \neq \emptyset.$$

This is a contradiction. Thus, the following result can be obtained $R_i * (R_j * R_l) = (R_i * R_j) * R_l$.

(2) For any one $(x, y) \in (R_i * R_j)^{-1}$, by the definition of the inverse relationship $^{*-1}$, there is $(y, x) \in R_i * R_j$

By the definition of the **relation multiplication** $*$, there is a $u \in V$ such that $(y, u) \in R_i$, $(u, x) \in R_j$.

Thus, by the definition of the **inverse relationship** $^{*-1}$ again, there are

$$(u, y) \in R_i^{-1}, (x, u) \in R_j^{-1} \text{ or } (x, u) \in R_j^{-1}, (u, y) \in R_i^{-1},$$

Hence, by the definition of the **relation multiplication** $*$, the following result can be obtained

$$(x, y) \in R_j^{-1} * R_i^{-1}.$$

Therefore,

$$(R_i * R_j)^{-1} \subset R_j^{-1} * R_i^{-1}, \forall i, j \in \{0, 1, \dots, m-1\}.$$

Similarly, for any one $(x, y) \in R_j^{-1} * R_i^{-1}$, by the definition of the relation multiplication $*$, there is a $u \in V$ such that $(x, u) \in R_j^{-1}$, $(u, y) \in R_i^{-1}$.

Thus, by the definition of the inverse relationship $^{*-1}$ again, there are

$$(u, x) \in R_j, (y, u) \in R_i \text{ or } (y, u) \in R_i, (u, x) \in R_j,$$

Hence, by the definition of the relation multiplication $*$, the following result can be obtained $(y, x) \in R_i * R_j$.

Then, by the definition of the inverse relationship $^{*-1}$ again, the following result can be gotten $(x, y) \in (R_i * R_j)^{-1}$.

Therefore,

$$(R_i * R_j)^{-1} \supset R_j^{-1} * R_i^{-1}, \forall i, j \in \{0, 1, \dots, m-1\}.$$

Comprehensive above, the desired conclusion can be achieved:

$$(R_i * R_j)^{-1} = R_j^{-1} * R_i^{-1}, \forall i, j \in \{0, 1, \dots, m-1\}.$$

(3) Assume that

$$R_i * R_j \subset R_k, R_l, \forall i, j, k, l \in \{0, 1, \dots, m-1\}.$$

By the definition of the inverse relationship $^{*-1}$, there is $(R_i * R_j)^{-1} \subset R_k^{-1}$, $\forall i, j, k \in \{0, 1, \dots, m-1\}$.

By 2., the following result can be gotten

$$R_j^{-1} * R_i^{-1} = (R_i * R_j)^{-1} \subset R_k^{-1}, \forall i, j, k \in \{0, 1, \dots, m-1\}.$$

By the definition of the relation multiplication $*$, the following results can be gotten

$$R_i * (R_j * R_k) \subset R_i * R_k, (R_i * R_j) * R_l \subset R_k * R_l, \forall i, j, k, l \in \{0, 1, \dots, m-1\}.$$

With above conclusion:

$$(R_i^{-1} * R_j^{-1}) * R_i^{-1} = (R_i * R_j)^{-1} * R_i^{-1} = (R_i * (R_i * R_j))^{-1} \subset (R_i * R_j)^{-1} = R_i^{-1} * R_j^{-1},$$

$$R_i^{-1} * (R_j^{-1} * R_i^{-1}) = R_i^{-1} * (R_i * R_j)^{-1} = ((R_i * R_j) * R_i)^{-1} \subset (R_i * R_j)^{-1} = R_i^{-1} * R_j^{-1}, \quad \forall i, j, k, l \in \{0, 1, \dots, m-1\}.$$

completes the proof. #

By Lemma 5.1, the generalized reasoning satisfies the associative law of reasoning, i.e., $(R_i * R_j) * R_k = R_i * (R_j * R_k)$. This is the basic requirement of reasoning in TCS. But there are a lot of reasoning forms which do not satisfy the associative law of reasoning in Western Statistics.

For example, in the true and false binary of proposition logic, the associative law of reasoning does not hold since $(\text{false} * \text{false}) * \text{false} = \text{true} * \text{false} = \text{false} \neq \text{true} = \text{false} * \text{true} = \text{false} * (\text{false} * \text{false})$.

(B) Equivalence Relations of Non-authentic Logic

Let $V = \{x_1, \dots, x_n\}$ be a non empty set (the collection $V = \{x_1, \dots, x_n\}$ of the research objects) and R_0 be its a relation. It is called an **equivalence relation**, denoted by \sim , if the following 3 conditions are all true:

- (1) Reflexive: $(x, x) \in R_0$ for all $x \in V$; i.e., $x \sim x$;
- (2) Symmetric: if $(x, y) \in R_0$, then $(y, x) \in R_0$; i.e., if $x \sim y$, then $y \sim x$;
- (3) Conveyable(Transitivity): if $(x, y) \in R_0, (y, z) \in R_0$, then $(x, z) \in R_0$; i.e., if $x \sim y$ and $y \sim z$, then $x \sim z$.

A relation $R \subset V \times V$ is called a **compatibility relation** if there is a non empty subset $R_1 \subset R$ such that the non empty subset R_1 satisfies at least one of the conditions above.

A relation $R \subset V \times V$ is called a **non-compatibility relation** if there is not any a non empty subset $R_1 \subset R$ such that the non empty subset R_1 satisfies at least one of the conditions above.

Any one of compatibility relations can be expanded into an equivalence relation to some extent. That is to say, in a certain logic analysis macro or global level, any a compatible relation R can be handled as an equivalence relation R_0 .

Western Statistics only considers the reasoning under one Axiom system such that only compatibility relation reasoning is researched. However there are many Axiom systems in Nature. TCS mainly researches the relation reasoning among many Axiom systems in Nature. Of course, she also considers the relation reasoning under one Axiom system but she only expands the reasoning as the equivalence relation reasoning.

(B) Two kinds of opposite non-compatibility relations of Non-authentic Logic

Equivalence relations, even compatibility relations, can not portray the structure of the statistical complex systems clearly. In the following, two non-compatibility relations can be considered.

In TCS, the non-authentic logic having other name: image mathematics [20], any an Axiom system is not considered, but should first consider to use a logic system. Believe that the rules of Heaven and the behavior of Human can follow the same logic system (天人合一). This logic system is equivalent to a group of computation. The method is to abide by the selected logic system to the research object classification, without considering the specific content of the research object, namely, **classification taking images** (比类

取象). Analysis of the relationship between research object, make relationships with a computational reasoning comply with the selected logic system operation. And then in considering the research object of the specific content of the conditions, according to the logic of the selected system operation to solve specific problems. In mathematics, the method of classification taking images is explained in the following Definition 5.1.

Definition 5.1 Suppose that there exists a finite group $G^m = \{g_0, g_1, \dots, g_{m-1}\}$ of order m where g_0 is identity. Let $V = \{x_1, \dots, x_n\}$ be a none empty set satisfying that $V = V_{g_0} + \dots + V_{g_{m-1}}$ where the notation means that $V = V_{g_0} \cup \dots \cup V_{g_{m-1}}, V_{g_i} \cap V_{g_j} = \emptyset, \forall i \neq j$ (the following the same).

In image mathematics, the V_{g_j} is first called a **factor** of group element g_j for any j , and $V = V_{g_0} + \dots + V_{g_{m-1}}$ is called a **factor space** (all "Hexagram" (卦)). People do not consider the factor size (as class variables) and only consider it as mathematical symbols ("Hexagram" (卦)), such as, -1 or 1, because the size is defined by a human behavior for $V = \{x_1, \dots, x_n\}$, but people have no assumption of $V = \{x_1, \dots, x_n\}$.

A mathematical index of the unknown multivariate function $f(x_{g_0}, \dots, x_{g_{m-1}}), \forall x_{g_i} \in V_{g_i}, i = 0, \dots, m-1$, is called a **function image** of V . All mathematical indexes of the unknown multivariate function f compose of the formation of a new set, namely, **the image space** $F(V) = F_{\omega_0}(V) + \dots + F_{\omega_{q-1}}(V)$ where $G^q = \{\omega_0, \omega_1, \dots, \omega_{q-1}\}$ is also a finite group of order q where ω_0 is identity. The $F_{\omega_j}(V)$ is also called an **Axiom system** for any j if at least $F_{\omega_j}(V) \neq \emptyset$ because any an Axiom system is the assumption of $F(V)$ in which there is only the compatibility relations, i.e., pursuing the same mathematics index $h(F_{\omega_j}(V))$.

The special multivariate function f (i.e., special function image) is not considered and only the calculation way of the general mathematical indexes of f is considered from the factor space $V = V_{g_0} + \dots + V_{g_{m-1}}$ in order to know some causal relations, because of no assumption of f . But the size of the data image should be considered if specific issues are studied by the general rules of data images.

In other words, on one hand, a study of the hexagrams ("Hexagram" (卦)) in image mathematics is to learn the generalized properties of the inputs $x_{g_0}, \dots, x_{g_{m-1}}$ of any a multivariate function f for the given factor space $V = V_{g_0} + \dots + V_{g_{m-1}}$, such as all inputs $x_{g_0}, \dots, x_{g_{m-1}}$ are the non-size and non-order relations, but there are orthogonal relations among some inputs $x_{g_0}, \dots, x_{g_{m-1}}$, there are also symmetrical relations among some inputs $x_{g_0}, \dots, x_{g_{m-1}}$, and only there is an equivalence relation among all inputs $x_{g_j} \in V_{g_j}$ for any j , and so on.

On the other hand, a study of the image ("Xiang" (象)) in image mathematics is to learn the generalized properties of all outputs inputs $f_{\omega_0}, \dots, f_{\omega_{q-1}}$ for the image space

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$F(V) = F_{\omega_0}(V) + \dots + F_{\omega_{g-1}}(V)$, such as all outputs $f_{\omega_0}, \dots, f_{\omega_{g-1}}$ are size specific meaning and a sequence of relationship, but there are killing relations among some outputs $f_{\omega_0}, \dots, f_{\omega_{g-1}}$, and there are also loving relations among some outputs $f_{\omega_0}, \dots, f_{\omega_{g-1}}$, and only there is a liking relation among all outputs $f_{\omega_j} \in F_{\omega_j}(V)$ for any j , and so on.

Without loss of generality, the function image space $F(V)$ and the factor space V are putted, still keep for V because of no assumption of V . In order to study the generalized relations and generalized reasoning, image mathematics researches the following relations.

Denoted $V_{g_i} \times V_{g_j} = \{(x, y) : x \in V_{g_i}, y \in V_{g_j}\}$, where the note \times is the usual Decartes product or cross join. Define relations

$$R_{g_r} = \sum_{g \in G} V_g \times V_{g_r}, r = \dots 0m-, \text{ where}$$

$R_{g_0} = R_{g_0}^{-1} = R_{g_0}$ is called an **equivalence relation** of V if g_0 is identity; denoted by \sim ;

$R_{g_s} = R_{g_s}^{-1} = R_{g_s}$ is called a **symmetrical relation**

of V if $g_s = g_s^{-1}, s \neq 0$; denoted by $\overset{R_{g_s}}{\leftrightarrow}$ or \leftrightarrow ;

$R_{g_1} = R_{g_1}^{-1} \neq R_{g_1}$ is called a **neighboring relation** of V

if $g_1 \neq g_1^{-1}$; denoted by $\overset{R_{g_1}}{\rightarrow}$ or \rightarrow ;

$R_{g_a} = R_{g_a}^{-1} \neq R_{g_a}, R_{g_1}, R_{g_1^{-1}}$ is called an **alternate (or atavism) relation** of V if $g_a \neq g_a^{-1}, g_1, g_1^{-1}, a > 1$; denoted by $\overset{R_{g_a}}{\Rightarrow}$ or \Rightarrow . #

In this case, the equivalence relations and symmetrical relations are compatibility relations but both neighboring relations and alternate relations are non-compatibility relations. These relations are all reasoning relations since the relation $R_{g_i}^{-1} = R_{g_i^{-1}} \in \mathfrak{R} = \{R_{g_0}, \dots, R_{g_{m-1}}\}$ if $R_{g_i} \in \mathfrak{R}$.

The equivalence relation R_{g_0} , symmetrical relations R_{g_s} 's, neighboring relation R_{g_1} and alternate relations R_{g_a} 's are all the possible relations for the method of classification taking images. In the following, the equivalence relation R_{g_0} , the neighboring relation R_{g_1} and the alternate relations R_{g_a} are mainly considered.

Assume there is an energy function on V (see [20]). In the future, the equivalence relation R_{g_0} will be the liking relation, the symmetrical relations R_{g_s} 's will be the reciprocal causation relations, the neighboring relation R_{g_1} will be the loving relation and the alternate relations R_{g_a} 's will be the killing relations. In the following, the liking relation R_{g_0} , the loving relation R_{g_1} and the killing relations R_{g_a} are mainly considered.

For example, there is a unique generalized logic reasoning model between the two kinds of opposite non-compatibility relations for case $m=5$. Let V be a none empty set, there are two kinds of opposite relations: the neighboring relation R_1 , denoted \rightarrow and the alternate (or atavism) relation R_2 , denoted \Rightarrow , having the property:

(1) If $x \rightarrow y, y \rightarrow z$, then $x \rightarrow z$, i.e., if $(x, y) \in R_1, (y, z) \in R_1$, then $(x, z) \in R_2$, or, $R_1 * R_1 \subset R_2$;

\Leftrightarrow If $x \rightarrow y, x \rightarrow z$, then $y \rightarrow z$, i.e., if $(x, y) \in R_1, (x, z) \in R_2$, then $(y, z) \in R_1$, or, $R_1^{-1} * R_2 \subset R_1$;

\Leftrightarrow If $x \rightarrow z, y \rightarrow z$, then $x \rightarrow y$, i.e., if $(x, z) \in R_2, (y, z) \in R_1$, then $(x, y) \in R_1$, or, $R_2 * R_1^{-1} \subset R_1$.

(2) If $x \Rightarrow y, y \Rightarrow z$, then $z \rightarrow x$, i.e., if $(x, y) \in R_2, (y, z) \in R_2$, then $(z, x) \in R_1$, or, $R_2 * R_2 \subset R_1^{-1}$;

\Leftrightarrow If $z \rightarrow x, y \Rightarrow z$, then $x \rightarrow y$, i.e., if $(z, x) \in R_1, (y, z) \in R_2$, then $(x, y) \in R_2$, or, $R_2 * R_1 \subset R_2^{-1}$;

\Leftrightarrow If $x \Rightarrow y, z \rightarrow x$, then $y \Rightarrow z$, i.e., if $(x, y) \in R_2, (z, x) \in R_1$, then $(y, z) \in R_2$, or, $R_1 * R_2 \subset R_2^{-1}$.

Let $R_3 = R_2^{-1}$ and $R_4 = R_1^{-1}$. Then above reasoning is equivalent to the calculating as follows:

$$R_i * R_j \subset R_{\text{mod}(i+j,5)}, \forall i, j \in \{1, 2, 3, 4\},$$

where the $\text{mod}(i+j,5)$ is the addition of module 5.

Two kinds of opposite relations can not exist separately. Such reasoning can be expressed in Figure 4. The first triangle reasoning is known as a **jumping-transition reasoning**, while the second triangle reasoning is known as an **atavism reasoning**.

Reasoning method is a triangle on both sides decided to any a third side. Both neighboring relations and alternate relations are not compatibility relations, of course, not equivalence relations, called **non-compatibility relations**.

(C)Genetic reasoning of Non-authigenic Logic

Let $V = \{x_1, \dots, x_n\}$ be a none empty set (the collection $V = \{x_1, \dots, x_n\}$ of the research objects) with the equivalent relation R_0 , the neighboring relation R_1 and the alternate relations $R_a \neq R_1^{-1}, a > 1$. Then a **genetic reasoning** is defined as follows:

(1) if $x \sim y, y \rightarrow z$, then $x \rightarrow z$, i.e., if $(x, y) \in R_0, (y, z) \in R_1$, then $(x, z) \in R_1$, or, $R_0 * R_1 = R_1$;

(2) if $x \sim y, y \Rightarrow z$, then $x \Rightarrow z$, i.e., if $(x, y) \in R_0, (y, z) \in R_a$, then $(x, z) \in R_a$, or, $R_0 * R_a = R_a$;

(3) if $x \rightarrow y, y \square z$, then $x \rightarrow z$, i.e., if $(x, y) \in R_1, (y, z) \in R_0$, then $(x, z) \in R_1$, or, $R_1 * R_0 = R_1$;

(4) if $x \Rightarrow y, y \sim z$, then $x \Rightarrow z$, i.e., if $(x, y) \in R_a, (y, z) \in R_0$, then $(x, z) \in R_a$, or, $R_a * R_0 = R_a$.

The genetic reasoning is equivalent to that there is a group $G_0^g = \{0, 1, \dots, g-1\}$ with the operation $*$ such that $V = \{x_1, \dots, x_n\}$ can be cut into $V_0 + \dots + V_{g-1}$ where V_i may be an empty set and

$$R_r = \sum_{i=0}^{g-1} V_i \times V_{i+r}, \forall r \in G_0^g = \{0, 1, \dots, g-1\},$$

satisfying $R_0 * R_j = R_j * R_0 = R_j, \forall j \in G_0^g$.

(D) Steady multilateral systems of Non-authigenic Logic

For a none empty set $V = \{x_1, \dots, x_n\}$ (the collection $V = \{x_1, \dots, x_n\}$ of the research objects) and its some relations

$R_0, \dots, R_{m-1} \subset V \times V = \{(x, y) : x \in V, y \in V\}$, $\mathfrak{R} = \{R_0, \dots, R_{m-1}\}$
 the form (V, \mathfrak{R}) (or simply, V) is called a multilateral system, if (V, \mathfrak{R}) satisfies the following properties:

- (a) (uniqueness) $R_0 + \dots + R_{m-1} = V \times V$.
- (b) (hereditary, or identity, or macro) $R_0 * R_j = R_j * R_0 = R_j, \forall j$.
- (c) (invertibility) For any $R_i \in \mathfrak{R} = \{R_0, \dots, R_{m-1}\}$, there is $R_i^{-1} \in \mathfrak{R}$.
- (d) (generalized reasoning) For any $R_i * R_j \neq \emptyset$, there exists $R_k \in \mathfrak{R}$ such that $R_i * R_j \subset R_k$.

The (d) is called **the generalized reasoning**, the (a) the **uniqueness** of the generalized reasoning, the (b) the **hereditary** (pass on from generation to generation) of the generalized reasoning (or **genetic reasoning**) and the (c) the **equivalent property** of the generalized reasoning of both relations R_i and R_i^{-1} , i.e., the reasoning of R_i is equivalent to the reasoning of R_i^{-1} . In this case, the two-relation set $\{R_i, R_i^{-1}\}$ is a lateral relation of V .

Furthermore, the V and \mathfrak{R} are called the state space and relationship set of (V, \mathfrak{R}) considered, respectively. the statistical complex system (V, \mathfrak{R}) can be written as $(V_0 + \dots + V_{n-1}, \{R_0, \dots, R_{m-1}\})$ where R_0 is called the **equivalent relation** or **identity** or **macro-variable** of (V, \mathfrak{R}) .

For a multilateral system (V, \mathfrak{R}) , it is called complete (or, perfect) if “ \subset ” changes into “ $=$ ”. And it is called complex if there exists at least a non-compatibility relation $R_i \in \mathfrak{R}$. In this case, the multilateral system is also called a logic analysis model of a statistical complex system [22].

Let R_1 be a non-compatibility relation. The multilateral system $(V, \mathfrak{R}) = (V_0 + \dots + V_{n-1}, \{R_0, \dots, R_{m-1}\})$ is said as a **steady multilateral system** (or, a **stable multilateral system**) if there exists a number n such that $R_1^{*n} = R_0 \neq \emptyset$ where $R_1^{*n} = R_1 * \dots * R_1$.

The condition is equivalent to there is a the chain $x_1, \dots, x_n \in V$ such that $(x_1, x_2), \dots, (x_n, x_1) \in R_1$, i.e., $x_1 \rightarrow x_2 \rightarrow \dots \rightarrow x_n \rightarrow x_1$.

The steady multilateral system is equivalent to the complete multilateral system. The stability definition given above, for a relatively stable system, is most essential. If there is not the chain or cycle, then there will be some elements without causes or some elements without results in a system. Thus, this system is to be in the persistent state of finding its results or causes, i.e., this system will fall into an unstable state, and there is not any stability to say.

Lemma 5.2 The statistical complex system (V, \mathfrak{R}) is a multilateral system if and only if there exists a group $G = \{g_0, \dots, g_{m-1}\}$ of order m where g_0 is identity such that $\mathfrak{R} = \{R_{g_0}, \dots, R_{g_{m-1}}\}$ satisfying

$$R_{g_i} * R_{g_j} \subset R_{g_i g_j}, \forall i, j \in \{0, \dots, m-1\}.$$

Proof. Let a multilateral system

$$(V, \mathfrak{R}) = (V_0 + \dots + V_{n-1}, \{R_0, \dots, R_{m-1}\}).$$

Because only the relations of the group of order m is considered, so can the serial number of the relationship with a group of Numbers to remember.

Let the group of order m is $G = \{g_0, \dots, g_{m-1}\}$ where g_0 is identity. Then the all relations $R_{g_i} = \sum_{g \in G} V_g \times V_{g g_i}, \forall i \in \{0, \dots, m-1\}$.

So, the classification of the space at least there should be a group of number. In other words, n is greater then or equal to m . In the following, it is proved that n is not greater then m . It is proved by using the reduction to absurdity.

If $n > m$, there is a space V_{m+1} such that

$$V = V_{g_0} + \dots + V_{g_{m-1}} + V_{m+1} + \dots$$

Thus $V \times V = (V_{g_0} + \dots + V_{g_{m-1}}) \times (V_{g_0} + \dots + V_{g_{m-1}}) + V_{m+1} \times V + \dots$.

Because by the definition of the relations, there is

$$R_{g_0} + \dots + R_{g_{m-1}} \subset (V_{g_0} + \dots + V_{g_{m-1}}) \times (V_{g_0} + \dots + V_{g_{m-1}}),$$

so the condition (a) of the multilateral system is not true, i.e., $R_{g_0} + \dots + R_{g_{m-1}} \neq V \times V$.

This is a contradiction. Thus $n \leq m$.

But there is also the case $n < m$.

For example, let

$$V = V_0 + V_1, V_2 = \emptyset.$$

Take

$$R_0 = V_0 \times V_0 + V_1 \times V_1 + V_2 \times V_2 = V_0 \times V_0 + V_1 \times V_1,$$

$$R_1 = V_0 \times V_1 + V_1 \times V_2 + V_2 \times V_0 = V_0 \times V_1,$$

$$R_2 = V_0 \times V_2 + V_1 \times V_0 + V_2 \times V_1 = V_1 \times V_0.$$

It satisfy the condition (a) of the multilateral system: $R_0 + R_1 + R_2 = (V_0 + V_1) \times (V_0 + V_1) = V \times V$.

Therefore, if $n < m$, people can add some empty set made the multilateral system for state space satisfying $V = V_{g_0} + \dots + V_{g_{m-1}}, R_{g_0} + \dots + R_{g_{m-1}} = V \times V$.

On the other hand, the definition of directly using the relationship between operation shows the following conclusions:

$$\begin{aligned} R_{g_i} * R_{g_j} &= \left(\sum_{g \in G} V_g \times V_{g g_i} \right) * \left(\sum_{g \in G} V_g \times V_{g g_j} \right) \\ &= \left(\sum_{g \in G} V_g \times V_{g g_i} \right) * \left(\sum_{g g_i \in G} V_{g g_i} \times V_{g g_i g_j} \right) \\ &\subset \left(\sum_{g \in G} V_g \times V_{g g_i g_j} \right) = R_{g_i g_j}. \end{aligned}$$

Therefore, the statistical complex system (V, \mathfrak{R}) is a multilateral system if and only if there exists a group $G = \{g_0, \dots, g_{m-1}\}$ of order m where g_0 is identity such that $\mathfrak{R} = \{R_{g_0}, \dots, R_{g_{m-1}}\}$ satisfying

$R_{g_i} * R_{g_j} \subset R_{g_i g_j}, \forall i, j \in \{0, \dots, m-1\}$. It completes the proof. #

In this case, the multilateral system (V, \mathfrak{R}) can be written as $(V_{g_0} + \dots + V_{g_{m-1}}, \{R_{g_0}, \dots, R_{g_{m-1}}\})$ satisfying

$$R_{g_i} = \sum_{g \in G} V_g \times V_{g g_i}, \forall g_i \in G = \{g_0, \dots, g_{m-1}\},$$

$$R_{g_i} * R_{g_j} \subset R_{g_i g_j}, \forall g_i, g_j \in G = \{g_0, \dots, g_{m-1}\}.$$

Here V_{g_i} may be an empty set. There is an Axiom system V_{g_i} if at least $V_{g_i} \neq \emptyset$. #

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Lemma 5.3 *If the following multilateral system is a steady multilateral system:*

$$(V, \mathfrak{R}) = (V_0 + \dots + V_{n-1}, \{R_0, \dots, R_{m-1}\}),$$

then $n=m$ and \mathfrak{R} is a group of order m about multiplication $R_k * R_l = R_i$ where V_i must be at least a non empty set for any i . #

Proof. By Lemma 5.2, there is

$$(V, \mathfrak{R}) = (V_{g_0} + \dots + V_{g_{m-1}}, \{R_{g_0}, \dots, R_{g_{m-1}}\}).$$

If the following multilateral system is a steady multilateral system:

$$(V, \mathfrak{R}) = (V_0 + \dots + V_{n-1}, \{R_0, \dots, R_{m-1}\}) = (V_{g_0} + \dots + V_{g_{m-1}}, \{R_{g_0}, \dots, R_{g_{m-1}}\})$$

then

(a) (uniqueness) $R_{g_0} + \dots + R_{g_{m-1}} = V \times V \cdot$

(b) (hereditary, or identity, or macro) $R_{g_0} * R_{g_j} = R_{g_j} * R_{g_0} = R_{g_j}, \forall j.$

(c) (invertibility) For any $R_{g_i} \in \mathfrak{R} = \{R_{g_0}, \dots, R_{g_{m-1}}\}$, there is $R_{g_i}^{-1} \in \mathfrak{R}$.

(d) (generalized reasoning) For any $R_{g_i} * R_{g_j}$, there exists $R_{g_i g_j} \in \mathfrak{R}$ such that $R_{g_i} * R_{g_j} = R_{g_i g_j}$.

By the definition of group, the \mathfrak{R} is a group of order m about multiplication $R_{g_i} * R_{g_j} = R_{g_i g_j}$.

Here, R_{g_0} is identity of the group \mathfrak{R} and $R_{g_i}^{-1}$ is the inverse of R_{g_i} of the group \mathfrak{R} for any i .

In the following, it just need to be proved that if the multilateral system

$$(V, \mathfrak{R}) = (V_0 + \dots + V_{n-1}, \{R_0, \dots, R_{m-1}\}) = (V_{g_0} + \dots + V_{g_{m-1}}, \{R_{g_0}, \dots, R_{g_{m-1}}\})$$

is a steady multilateral system, then $V_{g_i} \neq \emptyset$ must be at least a non empty set for any i . It is because, if $V_{g_i} \neq \emptyset$ is a non empty set for any i , then $n = m$. It is proved by using the reduction to absurdity.

In fact, if $V_{g_k} = \emptyset$, the definition of directly using the relationship between operation shows the following conclusions:

$$\begin{aligned} R_{g_i} * R_{g_j} &= \left(\sum_{g \in G} V_g \times V_{g g_i} \right) * \left(\sum_{g \in G} V_g \times V_{g g_j} \right) \\ &= \left(\sum_{g \in G} V_g \times V_{g g_i} \right) * \left(\sum_{g g_i \in G} V_{g g_i} \times V_{g g_i g_j} \right) \\ &\subset \sum_{g \neq g_k g_i^{-1}, g \in G} V_g \times V_{g g_i g_j} \\ &\neq \sum_{g \in G} V_g \times V_{g g_i g_j} = R_{g_i g_j}. \end{aligned}$$

This is a contradiction to the definition of the steady multilateral system. It is because the definition of the steady multilateral system should be $R_{g_i} * R_{g_j} = R_{g_i g_j}$. It completes the proof. #

Definition 5.2 *Let the multilateral system (V, \mathfrak{R}) can be written as*

$$(V, \mathfrak{R}) = (V_{g_0} + \dots + V_{g_{m-1}}, \{R_{g_0}, \dots, R_{g_{m-1}}\})$$

satisfying

$$R_{g_i} = \sum_{g \in G} V_g \times V_{g g_i}, \forall g_i \in G = \{g_0, \dots, g_{m-1}\},$$

$$R_{g_i} * R_{g_j} \subset R_{g_i g_j}, \forall g_i, g_j \in G = \{g_0, \dots, g_{m-1}\}.$$

The group $G^m = \{g_0, \dots, g_{m-1}\}$ of order m where g_0 is identity is called the **representation group** of the multilateral system (V, \mathfrak{R}) .

Denoted the generalized difference [41], set $I(R_{g_i}) = \{(x, y) : x^{-1}y = g_i, x, y \in G\}$ based on the group G , called the **representing function** of relation R_{g_i} . The representing function has nothing to do with the collection $V = \{x_1, \dots, x_n\}$ of the research objects.

Let multilateral systems $(V^i, \mathfrak{R}^i), i=1, 2$ be with two representation groups $G^i, i=1, 2$, respectively. Both multilateral systems $(V^i, \mathfrak{R}^i), i=1, 2$ are called **isomorphic** if the two representation groups $G^i, i=1, 2$ are isomorphic. #

Lemmas 5.2 and 5.3 and Definitions 5.1 and 5.2 are key concepts in multilateral system theory because they show the classification taking images as the basic method. In the following, introduce two basic models to illustrate the method.

Lemma 5.4 *Suppose that $G_0^2 = \{0, 1\}$ with multiplication table*

V^2	0	1
0	0	1
1	1	0

*i.e., the multiplication of G_0^2 is the addition of module 2. In other words, $i * r = \text{mod}(i + r, 2)$.*

And assume that $V = V_0 + V_1, \mathfrak{R} = \{R_0, R_1\}$, where

$$R_r = \sum_{i=0}^1 V_i \times V_{\text{mod}(i+r, 2)}, r = 0, 1,$$

$$R_i * R_j = R_{\text{mod}(i+j, 2)}, \forall i, j \in G_0^2.$$

Then $(V, \mathfrak{R}) = (V_0 + V_1, \{R_0, R_1\})$ is a steady multilateral system with one equivalent relation R_0 and one symmetrical relation R_1 . The system is simple since there is not any a non-compatibility relation. In other words, the relations R_i 's are the simple forms as follows:

$$I(R_0) = \{(0, 0), (1, 1)\}, I(R_1) = \{(0, 1), (1, 0)\},$$

where (i, j) is corresponding to $V_i \times V_j$. #

Proof. Because in the sense of isomorphism, dual group only Lemma 5.4 defined in a structure, so Definition 5.2, up to isomorphism only Lemma 5.4 defined in this a multilateral system.

In fact, the steady multilateral system in Lemma 5.4 is the reasoning model of "Tao" (道) or "Yin-Yang" (阴阳) in TCS if there are two energy functions $\varphi(V_0)$ and $\varphi(V_1)$ satisfying

$$\varphi(V_0) < \varphi(V_1), \text{ called Tao model, denoted by}$$

$$V^2 = V_0 + V_1, R_0 = V_0 \times V_0 + V_1 \times V_1, R_1 = V_0 \times V_1 + V_1 \times V_0,$$

where V_0 is called Yin(阴) state of V^2 and V_1 is called Yang(阳) state of V^2 . It completes the proof. #

Lemma 5.5 *For each element x in a steady multilateral system V with two non-compatibility relations, there exist five equivalence classes below:*

$$X = \{y \in V \mid y \sim x\}, X_s = \{y \in V \mid x \rightarrow y\}, X_k = \{y \in V \mid x \Rightarrow y\},$$

$$K_x = \{y \in V \mid y \Rightarrow x\}, S_x = \{y \in V \mid y \rightarrow x\},$$

which the five equivalence classes have relations in Figure 1. #

Proof. Because in the sense of isomorphism, dual group only Lemma 5.5 defined in a structure, so Definition 5.2, up to isomorphism only Lemma 5.5 defined in this a multilateral system.

In fact, the steady multilateral system in Lemma 5.5 is the reasoning model of Yin Yang Wu Xing in TCM if there is an energy function $\varphi(*)$ satisfying

$$\varphi(X_K) \geq \varphi(X_S) \geq \varphi(X) \geq \varphi(K_X) \geq \varphi(S_X)$$

which is called Yin Yang Wu Xing model, denoted by V^5 .

The Yin Yang Wu Xing model can be written as follows: Define $V_0 = X, V_1 = X_S, V_2 = X_K, V_3 = K_X, V_4 = S_X$, corresponding to wood, fire, earth, metal, water, respectively, and assume $V = V_0 + V_1 + V_2 + V_3 + V_4$ where $V_i \cap V_j = \emptyset, \forall i \neq j$.

And take $\mathfrak{R} = \{R_0, R_1, \dots, R_4\}$ satisfying

$$R_r = \sum_{i=0}^4 V_i \times V_{\text{mod}(i+r,5)}, \forall r \in \{0,1,\dots,4\}, R_i * R_j \subseteq R_{\text{mod}(i+j,5)},$$

where $V_i \times V_j = \{(x, y) : x \in V_i, y \in V_j\}$ is the Descartes product in set theory and $R_i * R_j = \{(x, y) : \exists u \in V \text{ such that } (x, u) \in R_i, (u, y) \in R_j\}$

is the **relation multiplication operation**. The relation multiplication of $*$ is isomorphic to the addition of module 5. Then V^5 is a steady multilateral system with one equivalent relation R_0 and two incompatibility relations $R_1 = R_4^{-1}$ and $R_2 = R_3^{-1}$ where the **relation inverse operation** $R_i^{-1} = \{(x, y) : (y, x) \in R_i\}$.

The Yin and Yang means the two incompatibility relations and the Wu Xing means the collection of five disjoint classification of $V = V_0 + V_1 + V_2 + V_3 + V_4$. It completes the proof. #

For the reasoning model of Yin Yang Wu Xing in TCS the words "Yin Yang" means there are two non-compatibility relations $R_1 = R_4^{-1}$ and $R_2 = R_3^{-1}$, where the neighboring relation $R_1 = R_4^{-1}$ is the loving relation, also called **Yang relation** or **interpromoting relation** (相生) among five subsets V_j 's, and the alternate relation $R_2 = R_3^{-1}$ is the killing relation, also called **Yin relation** or **restriction relation** (相克) among five subsets V_j 's; the words "Wu Xing" means there are five subsets V_j 's such that $V = V_0 + V_1 + V_2 + V_3 + V_4$, where there is only the equivalence relation R_0 among interior for each of five subsets V_j 's, and there are Yin or Yang relations among exterior for all five subsets V_j 's. The five subsets V_j 's do not means the five elements (metal, wood, water, fire and earth), but with philosophy meaning of five aspects corresponding to the five subsets V_j 's.

Study of a statistical complex system is the key to pathological diagnosis and treatment of a statistical complex system, also known as interference. any a steady multilateral system with an energy function, an intervention response capacity and self-protection capacity, is a logic to study the specific object of non-authigenic logic. According to non-authigenic logic thought, the stand or fall of intervention method for statistical complex systems depends on a statistical complex system's both side effects issue and medical and drug resistance problem from the intervention. Whether it can promote the health of the statistical complex

system without side effects issue? Whether it can promote the response ability to the intervention of the statistical complex systems and self-protection ability without medical and drug resistance problem? These standards have nothing to do with interveners. The **intervention methods** of this statistical complex system are in [17]- [21][48] [49], in general, as follows:

(1)"Virtual disease with a healthy statistical complex system is to fill its mother but real disease with a healthy statistical complex system rushes down its son" (虚则补其母, 实则泻其子) if only one subsystem of the statistical complex system fall ill or if only two subsystems with the loving relation of a statistical complex system encounter usual sick for a healthy statistical complex system.

(2)"Virtual disease with an unhealthy statistical complex system is to fill itself but real disease with an unhealthy statistical complex system rushes down itself" (虚则补之, 实则泻之) if only one subsystem of the statistical complex system fall ill or if only two subsystems with the killing relation of a statistical complex system encounter usual sick for an unhealthy statistical complex system.

(3)"Strong inhibition of the same time, support the weak" (抑强补弱, 或者, 泻南补北) if only two subsystems with a killing relation of a statistical complex system encounter usual sick, which destroyed the killing relation of the statistical complex system.

(4)"Do not treat a disease after it has occurred. But treat the disease before it will occur" (不治已病治未病) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

(5)"Searching for the primary cause of disease in treatment, cure both symptoms and root-cause at the same time" (治病求本, 标本兼治) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

(6)"Even if all changed, it is hard to change one's nature" (江山易改, 本性难移) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

(7)"seize the momentum of development, hasten lucky avoids disaster" (顺势而为, 趋吉避凶) if there are a lot of subsystems of a statistical complex system encounter sick for a long time.

Proof of Theorem 2.2. It is proved by using the reduction to absurdity.

If there is an axiom system which allows for all branches of the physical system being established, so, for the justice system, the relationship between the proposition and justice can only be compatible and incompatible relations. Write the compatible proposition is 0, write the incompatible proposition 1. The axiom system of all research propositions space can be written for

$$V = V_0 + V_1,$$

where V_0 is all compatible proposition space and V_1 is all incompatible proposition space.

According to the relationship between the true and false logic, the reasoning model can only be the evolution of the *Tao* model. For the *Tao* model in lemma 5.4, the relationships between all propositions should be:

$$R_0 = V_0 \times V_0 + V_1 \times V_1, R_1 = V_0 \times V_1 + V_1 \times V_0,$$

where R_0 is the relation between all compatible proposition space or between all incompatible proposition space as the

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true proposition of space 0, R_1 is the relation between all compatible proposition space and all incompatible proposition space or between all incompatible proposition space and all compatible proposition space as the false proposition space 1. Not consistent with the formal logic reasoning model.

Formal logic reasoning model is:

$$R_0 = V_0 \times V_0 + V_1 \times V_1, R_1 = V_0 \times V_1, R_2 = V_1 \times V_0,$$

where R_0 is the relation between all compatible proposition space or between all incompatible proposition space as a true proposition of space 0, R_1 the relation between all compatible proposition space and all incompatible proposition space as a false proposition of space 1. But R_2 is the relation between all incompatible proposition space and all compatible proposition space as a true proposition of space 0.

Formal logic reasoning in violation of the multilateral system reasoning mode. This is because according to lemma 5.1, the following results can be gotten

$$R_1 * R_2 = V_0 \times V_0 \subseteq R_0, R_2 * R_1 = V_1 \times V_1 \subseteq R_0.$$

That is to say: the combination of a true proposition and a false proposition reasoning should be a true proposition, or the combination of a false proposition and a true proposition is a true proposition. In other words, there are

$$false * true = true, true * false = true.$$

This, of course, does not conform to the reason of the fact.

Considering the converse proposition of the formal logic reasoning. Because

$$R_1 = R_2^{-1}, R_2 = R_1^{-1},$$

That is to say: a true proposition's converse proposition is a false proposition, a false proposition's converse proposition is a true proposition. In other words, there are

$$false = true^{-1}, true = false^{-1}.$$

This, of course, does not conform and reason of the fact.

Considering the converse proposition of the formal logic reasoning. Follow the same lemma 5.1, the following results can be gotten

$$R_1^{-1} * R_2^{-1} = V_1 \times V_1 \subseteq R_0, R_2^{-1} * R_1^{-1} = V_0 \times V_0 \subseteq R_0.$$

That is to say: the combination of a true inverse proposition and a false inverse proposition reasoning should be a true proposition, or the combination of a false inverse proposition and a true inverse proposition is a true proposition. In other words, there are

$$true * false = true, false * true = true.$$

This, of course, does not conform and reason of the fact.

Considering the proposition and its converse proposition of formal logic reasoning. Follow the same lemma 5.1, the following results can be gotten

$$R_1 * R_1^{-1} = V_0 \times V_0 \subseteq R_0, R_2 * R_2^{-1} = V_1 \times V_1 \subseteq R_0.$$

That is to say: the combination of a true proposition and its inverse proposition reasoning should be a true proposition, or the combination of a false proposition and its inverse propositions is a true proposition.

In other words, there are

$$false * true = true, true * false = true.$$

This, of course, does not conform and reason of the fact.

Consider three elements inference problem. Direct calculation, can get

$$R_1 * R_2 * R_1 = R_1, R_2 * R_1 * R_2 = R_2.$$

In other words, there are

$false * true * false = false, true * false * true = true.$ According to the definition of the formal logic, there are $true * false = false, false * true = true.$

Thus

$$false = false * true * false = false * (true * false) = false * false.$$

This is a contradiction with the definition of formal logic. Because, according to the definition of formal logic, there should be

$$true = false * false.$$

This contradictory results show that: the proposition of true and false of the formal logic reasoning model exist serious problems. Must to change its reasoning model.

For only two kinds of space elements of reasoning, there is only one model of reasoning mode, ability won't produce a reasoning contradictory. This reasoning model is the *Tao* model in lemma 5.4. This is because the isomorphism of binary group there is a only. By Lemmas 5.2 and 5.3 and Definition 5.2, in the sense of isomorphism, only the reasoning of the *Tao* model is correct.

Therefore, only according to the *Tao* model of reasoning model, the formal logic reasoning model is not a contradictory reasoning model. That is to say: a true proposition should launch a true proposition, a false proposition should launch a false proposition; While a true proposition cannot launch a false proposition, a false propositions also cannot launch a true proposition.

Even if the formal logic reasoning model is changed into a *Tao* model of reasoning model, can improve the Axiomatic system, but also can't solve the problem of the Axiomatic system. This is because the *Tao* model of reasoning mode, only used the equivalence relation and the symmetric relation. Symmetric relation reasoning, the reasoning is compatibility relation, can be used in an Axiomatic system. But, by Definition 5.1, of (among) all the reasoning relationship, in addition to the equivalence relation reasoning and symmetric relation reasoning, also has two kinds of non compatibility relation reasoning. Loving is a kind of incompatibility relation reasoning, one is the killing relation reasoning of incompatibility. And with two incompatible relation model is the Yin Yang Wu Xing of reasoning model in Lemma 5.5 by Zhang etc [21].

Even if the Yin Yang Wu Xing model in Lemma 5.5 by Zhang etc [21] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the Yin Yang Wu Xing model, only equivalence relation and the relations between the two kinds of non compatible, the lack of a symmetric relation reasoning. In order to exert symmetrical composition, model under the action of the *Tao*, can produce the Zangxing or ten heavenly stems model in Zhang [48].

Even if the Zangxiang or ten heavenly stems model in Zhang [48] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the Zangxiang or ten heavenly stems model, only the equivalence or liking relation and the relations between the two kinds of non compatible, the still lack of a symmetric relation reasoning. And, the elements of model is very difficult to actually observed. In order to increase the observation components, using three to generate models, the model under the action of the *Tao*, the meridian or Jingluo or twelve earthly branches model in Zhang [48] was introduced.

Even if the meridian or Jingluo or twelve earthly branches model in Zhang [48] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the meridian or Jingluo or twelve earthly branches model, only the equivalence or liking relation, the symmetric relation reasoning, and the relation between one kinds of non compatible as the loving relation, the lack of the killing relation. Due to the meridian or Jingluo or twelve earthly branches model can be divided into six classes with similar equivalent, the equivalence class of the bipolar poles as observation, Eight palace or Eight veins or Eight extra meridians model in Zhang [49] form.

Even if the Eight palace or Eight veins or Eight extra meridians model in Zhang [49] is introduced in the form of logical reasoning, can improve the Axiomatic system, but also is unable to complete the Axiomatic system. This is because in the Eight palace or Eight veins or Eight extra meridians model, only equivalence or liking relation and symmetric relation reasoning, the lack of both the loving relation and the killing relation. And so on.

By Lemmas 5.2 and 5.3 and Definition 5.2, there are an infinite number of reasoning model can be introduced into the pattern of formal logic reasoning, to further improve the Axiomatic system, but also is unable to complete the Axiomatic system. So, the Axiomatic system of the road is blocked. People don't need to the Axiomatic system, using the logic of the multilateral system is non authentic, can achieve the goal that to know the world.#

The Proof of Theorem 3.1. (1). About 1 part before. Because $R_1^2 = DD^T, R_2^2 = D^T D$, so they are not negative definite, namely $R_1^2 \geq 0, R_2^2 \geq 0$. Behind prove the $R_1^2 \leq I_p, R_2^2 \leq I_q$.

(2). Conclusion by the linear algebra, for the nonnegative definite matrix R_1^2 , there are $\lambda_1^2 \geq \dots \geq \lambda_r^2 > 0, \alpha_j \neq 0, j = 1, \dots, r$, such that $R_1^2 \alpha_j = \lambda_j^2 \alpha_j, \alpha_j^T \alpha_j = \delta_{ij}$.

(3). Take $\beta_j = \frac{1}{\lambda_j} D^T \alpha_j \neq 0, j = 1, \dots, r$, then

$$R_2^2 \beta_j = \frac{1}{\lambda_j} D^T D D^T \alpha_j = \frac{1}{\lambda_j} D^T R_1^2 \alpha_j = \lambda_j^2 \frac{1}{\lambda_j} D^T \alpha_j = \lambda_j^2 \beta_j, \beta_j^T \beta_j = \frac{1}{\lambda_j \lambda_j} \alpha_j^T D D^T \alpha_j = \frac{1}{\lambda_j \lambda_j} \alpha_j^T R_1^2 \alpha_j = \frac{\lambda_j^2}{\lambda_j \lambda_j} \alpha_j^T \alpha_j = \delta_{ij}.$$

(4). According to the conclusion of step 2, 3: nonnegative definite matrix R_1^2 by the number of nonzero eigenvalues is not greater than nonnegative definite matrix R_2^2 by the number of nonzero eigenvalues.

Because R_1^2 and R_2^2 position is symmetrical, swap R_1^2 and R_2^2 in steps 2, 3 known:

Nonnegative definite matrix R_2^2 by the number of nonzero eigenvalues is not greater than nonnegative definite matrix R_1^2 by the number of nonzero eigenvalues.

Conclusion comprehensive the above two points: R_1^2 and R_2^2 are with the same nonzero eigenvalues.

(5). Because

$$\alpha_j = \frac{1}{\lambda_j^2} R_1^2 \alpha_j = A^{\frac{1}{2}} \left(\frac{1}{\lambda_j^2} A^{-1} B C^{-1} B^T A^{-\frac{1}{2}} \alpha_j \right) \in R(A^{\frac{1}{2}}) = \{A^{\frac{1}{2}} t; t \in R^p\},$$

therefore there is an u_j such that

$$\alpha_j = A^{\frac{1}{2}} u_j = A^{\frac{1}{2}} A^{-\frac{1}{2}} A^{\frac{1}{2}} u_j.$$

Take $a_j = A^{-\frac{1}{2}} A^{\frac{1}{2}} u_j$, then $\alpha_j = A^{\frac{1}{2}} a_j$. And meet

$$A^{-\frac{1}{2}} \alpha_j = A^{-\frac{1}{2}} A^{\frac{1}{2}} a_j = A^{-\frac{1}{2}} A^{\frac{1}{2}} A^{-\frac{1}{2}} A^{\frac{1}{2}} u_j = A^{-\frac{1}{2}} A^{\frac{1}{2}} u_j = a_j.$$

Similarly, there is b_j , then $\beta_j = A^{\frac{1}{2}} b_j$. And meet $A^{-\frac{1}{2}} \beta_j = b_j$.

(6). With the use of 5 a_j, b_j , take

$$A = \text{Var}(X), C = \text{Var}(Y), B = \text{Cov}(X, Y).$$

Can get to know

$$\text{Cov}(a_i^T X, a_j^T X) = a_i^T A a_j = (A^{\frac{1}{2}} a_i)^T (A^{\frac{1}{2}} a_j) = \alpha_i^T \alpha_j = \delta_{ij},$$

$$\text{Cov}(b_i^T Y, b_j^T Y) = b_i^T C b_j = (C^{\frac{1}{2}} b_i)^T (C^{\frac{1}{2}} b_j) = \beta_i^T \beta_j = \delta_{ij},$$

$$\text{Cov}(a_i^T X, b_j^T Y) = a_i^T B b_j = (A^{-\frac{1}{2}} \alpha_i)^T B (C^{-\frac{1}{2}} \beta_j) = \alpha_i^T D \beta_j,$$

$$= \frac{1}{\lambda_j} \alpha_i^T D D^T \alpha_j = \frac{1}{\lambda_j} \alpha_i^T R_1^2 \alpha_j = \lambda_j \alpha_i^T \alpha_j = \lambda_j \delta_{ij}.$$

In addition, because

$$\text{Var}(a_j^T X) = \text{Cov}(a_j^T X, a_j^T X) = 1, \text{Var}(b_j^T Y) = \text{Cov}(b_j^T Y, b_j^T Y) = 1,$$

so

$$0 < \lambda_j = \text{Cov}(a_j^T X, b_j^T Y) = \frac{\text{Cov}(a_j^T X, b_j^T Y)}{\sqrt{\text{Var}(a_j^T X) \text{Var}(b_j^T Y)}} \leq 1, j = 1, \dots, r.$$

(1). The other part of the proof about 1. By a 6 the $\lambda_j^2 \leq 1$.

So by 2 is

$$R_1^2 = \sum_{j=1}^r \lambda_j^2 \alpha_j \alpha_j^T \leq \sum_{j=1}^r \alpha_j \alpha_j^T \leq I_p.$$

$$\text{Also, } R_2^2 = \sum_{j=1}^r \lambda_j^2 \beta_j \beta_j^T \leq \sum_{j=1}^r \beta_j \beta_j^T \leq I_q.$$

This completes the proof. #

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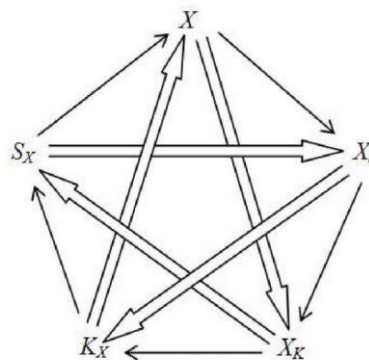


Figure 1. Finding Yin Yang Wu Xing Model

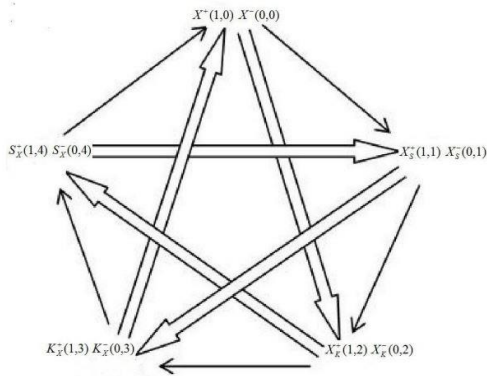


Figure 2. Relations of ten Heavenly Stems

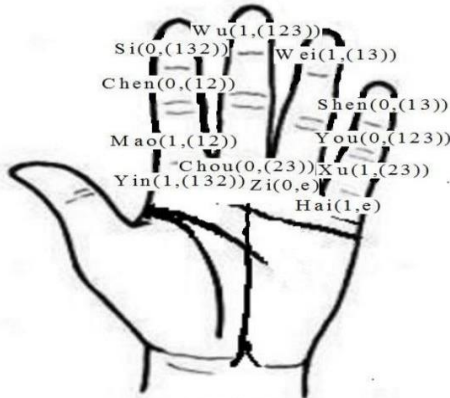


Figure 3. Relations of twelve Earthly Branches



Figure 4. Triangle Reasoning

Table 2. Eight Palace Model Energy Distribution

Palace sequence	Yang palace	Ten Stems	Twelve Branches	Yin Palace	Ten Stems	Twelve Branches
Outside	Qian	Ren 41.75	Wu 7.41	Kun	Gui 21.25	Chou 7.41
Inside	Qian	Jia 60.25	Zi 3.10	Kun	Yi 2.75	Wei 3.10
Outside	Kan	Wu 2.25	Xu 12.10	Li	Ji 50.75	Hai 12.10
Inside	Kan	Wu 18.75	Chen 1.71	Li	Ji 44.25	Si 1.71
Outside	Gen	Bing 36.75	Shen 6.55	Dui	Ding 11.75	You 6.55
Inside	Gen	Bing 51.25	Yin 1.71	Dui	Ding 26.25	Mao 1.71
Outside	Zhen	Geng 20.75	Wu 10.37	Xun	Xin 42.25	Wei 10.37
Inside	Zhen	Geng 10.25	Zi 2.63	Xun	Xin 52.75	Chou 2.63

Table 1. Non-authigenic Logic

No assumption principle	Non-authigenic thinking rule	Resources limited rule	Fault tolerant rule
Preconceptions principle	Objective consistency rule	Repeatability rule	Default rule
Integration coordination combining principle	Searching-null composition rule	Integration rule	Decomposition rule
Logical layering principle	Global-Local thinking rule	Logical causal cycle rule	Seriousness of logical rule
Automation principle	Intervention reaction rule	Self-protection rule	Second physiological system rule