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The Assimilation Rule on the Parameters of Feedback System

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Abstract

In this paper, the reaction mechanism of system feedback on the changes of external environmental parameters has been discussed. And the conclusions have been attributed to the assimilation rule. According to the research results of the circuit system, assimilated factors should be defined at first--- the parts which have been isolated from the system equivalent parameters and the external parameters have been also contained. Afterwards, the analog inductive method has been adopted to conduct the overall feasibility study for the establishment of the rules. Then, several new ideas have been also provided in accordance with the applications of assimilation rules in the fields of biology, cognitive science and social organizations, etc. Finally, the block diagram has been provided so as to give a comprehensive overview for the thinking ideas of system.

Keywords: feedback; assimilation factor; supporting structure; assimilation of parameters; evolutionary mechanism

1. Introduction

The research on the relationship between the parameters of feedback system and the external parameters of system has made great progress in the field of negative feedback amplifier circuit[1] and it has also obtained the peer recognition[Zhuan Ping. Internal parameter "strain" analysis in negative feedback amplification circuit. Scientific Paper Online (http://www.paper.edu.cn), 2009, 8, 31]. The work has introduced the "strain" associated formula between the internal parameters of circuit (output resistance and input resistance) and the external parameters (load resistance and source resistance). At the same time, this association property has been also considered as the thing which is possessed by the general feedback system.

The assimilation factors as well as the concept of load-bearing structures have been produced in the following work. The exact meaning of assimilation refers to the assimilation changes of the internal parameters of feedback system on the changes of external parameters. For the system objects in the biological field, the cognitive field, the social organization field and some other fields, whether the assimilation of

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parameters will lead to the actual changes in the internal structure of system? A positive answer has been provided and some new ideas have been inspired. Then, the research results have been presented which have been expected to be corrected by the experts.

2. The assimilation factors

It has been confirmed that there are certain contacts between the internal parameters of negative feedback amplifier circuit (input resistance or output resistance) and the external parameters (source resistance or load resistance), which can be shown by formula (a) ~ (d).

(a) Output resistance of voltage negative feedback

$$R_{of} = \frac{R_o}{(1+AF)+AF\left(R_o/R_L\right)}$$

(b) Output resistance of current negative feedback

$$R_{of} = R_o\left[(1+AF)+AF\left(R_L/R_o\right)\right]$$

(c) Input resistance of negative feedback in series connection

$$R_{if} = R_i\left[(1+AF)+AF\left(R_S/R_i\right)\right]$$

(d) Input resistance of negative feedback in parallel connection

$$R_{if} = \frac{R_i}{(1+AF)+AF\left(R_i/R_S\right)}$$

In these formulas, A refers to the open-loop gain of amplifier circuit and F refers to the closed-loop feedback factor. They have different dimensions in each formula. R_o refers to the original open-loop output resistance and R_i refers to the original open-loop input resistance. R_L is the external load resistance of output and R_S refers to the external signal source resistance of input (shown in Figure 1).

The group of formula is established in condition that the external parameter R_L or R_S changes. For the classic formulas which people are familiar with, they can be deduced from this group of formula (R_L and R_S are 0 or∞)[1]. Compared with the new formulas and the old formulas, it is found that the changes of external parameters have caused the corresponding changes of internal parameters. And the changes have the nonlinear “mutation” features.

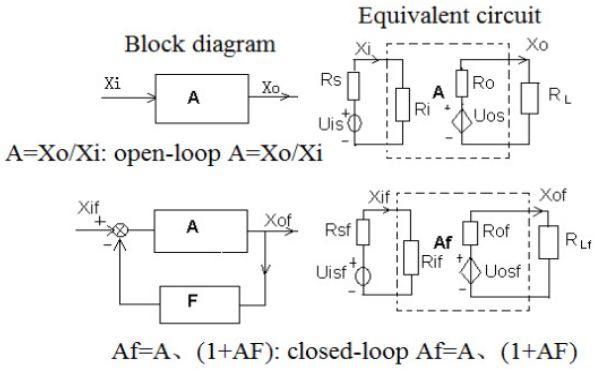

Fig.1. The feedback block diaF) model adopted by the derivation of new formula

The new formula has the extraordinary significance---from the perspective of professional "common sense", the parameters of the circuit system have depended on the features of internal components. Once the configuration of system is completed, the parameters of these components are unchanged and thus the equivalent parameters within the system will be not changed. However, the new formula contains an additional meaning--- the internal parameters will be adjusted with the changes of external parameters.

More intriguing is that the new formula contains an independent item in which the external parameter has been directly involved. The changes of the internal parameters within the system which are brought by this independent item can be expressed in the aspects of function and structure--- at least in theory--- the output resistance parameter of (a) formula can be taken as the example and the specific discussion can be shown as follows.

R=1/G is substituted to (a) and (1) can be obtained:

$$G_{of} = G_o + AF\left(G_o + G_L\right) \tag{1}$$

It is required to make $g = \begin{cases} 0 & \Delta R_L = 0 \\ G_L & \Delta R_L \neq 0 \end{cases}$ in order to establish the contact with the classical formula. Then, (2) can be obtained.

$$g_{of} = G_o + AFG_o + AFg \tag{2}$$

Considering that the slight changes of R_L=1/G ($\triangle R_L \neq 0$) have affected A, it is required to make

$$k = A\left(G_L + \Delta G_L\right), g = G_L u\left(\Delta G_L\right), A\left(G_L\right) = A, \qquad u\left(\Delta G_L\right) = \begin{cases} 1 & |\Delta G_L| > 0 \\ 0 & \Delta G_L = 0 \end{cases}$$

Then, (3) can be obtained.

$$g_{of} = G_o + kFG_o + kFg \tag{3}$$

In this formula, kFg refers to the independent item which has strictly expressed the involvement of external parameters. According to the circuit theory, the structure of circuit model which is corresponding to the formula (3) can be shown by (c) of Fig 2. It should be noticed that kFg is considered as the independent bearing structural unit.

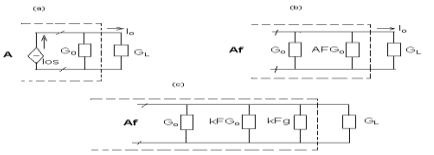

Fig.2. The analysis of the bearing structure of the resistance parameters in output of amplifier circuit: (a)open loop; (b) closed loop; (c) closed-loop variable external parameter. The introduction of prompt feedback has caused the structural differentiation of internal parameters. And the changes of external parameters have caused the re-differentiation of differentiation structures.

Assuming that the external parameters are unchanged in formula (3) and the corresponding classical formula (4) can be obtained. (R_L=1/G is the constant; k=A and g=0 when $\triangle g_L$=0).

$$G_{of} = G_o + AFG_o \Leftrightarrow R_{of} = \frac{R_o}{1+AF} \circ \tag{4}$$

The corresponding bearing structure can be shown in Figure 2(b).

In formula (4), $F \to 0$, G_{of}=G_o or R_{of}=R_o. The bearing structure can be shown in Figure 2(a), which is corresponding to the open-loop (no feedback) structure.

The analysis results of the structural changes can be shown in Figure (2).

In order to facilitate the general theory inquiry, this independent item *kFg* can be called the assimilation factor of parameters. It can be defined as the spontaneous added parts of the internal parameters in the feedback system in order to balance the changes of external parameters. What's more, the corresponding bearing structure can be called the assimilation structure.

For the resistance parameters in formula (d), they can be processed in the similar way. The assimilation factors of parameters in input can be determined by *kAg* in formula (5) (the slight changes of R_s=1/G_s has affected F). And the assimilation structure which is similar to Figure 2 can be also easily obtained.

$$G_{if} = G_i + kAG_i + kAg \tag{5}$$

$$k = F\left(G_S + \Delta G_S\right), g = G_S u\left(\Delta G_S\right),\ F\left(G_S\right) = F, \qquad u\left(\Delta G_S\right) = \begin{cases} 1 & \left|\Delta G_S\right| > 0 \\ 0 & \Delta G_S = 0 \end{cases}$$

For the parameter formulas of (b) and (c), the assimilation factors of the resistance dimensions as well as the duality assimilation structure in series connection can be directly obtained, which are not required to be repeated here.

It is further noted that the specific parameters involved in the assimilation factors are not limited to the resistance type. For example, the formula (6) can be got through conducting the equivalent processing for formula (a), which indicates that the changes of external parameter R_L can affect the *AF* parameter. According to formula (6) and assuming that R_{of} is unchanged, the assimilation factors of *AF* parameter as well as the assimilation structure can be performed the analytical similar description.

$$R_{of} = \frac{R_o}{\left(1+AF\right)+AF\left(R_o/R_L\right)} = \frac{R_o}{1+AF\left(1+R_o/R_L\right)} = \frac{R_o}{1+\left(AF\right)'} \tag{6}$$

Generally speaking, for the specific input and output target realization, if the correlation between the parameters in system is assumed to be ubiquitous and the parameters are assumed to determine the internal foreign equivalent parameters within the system, then it can be concluded that the concept of the assimilation factors of parameter are suited to the all parameters in system.

3. The assimilation rule

In view of the theoretical basis, the universality of derivation method and the influence of feedback polarity on the value symbols of *AF,* we have the sufficient reasons to propose a system rule with a wider application scope--- the assimilation rule. The content is:

When the external parameter factor (or the "environmental" constraint parameter) which has determined the input and output methods changes, the feedback system will change the internal function and the bearing structure parameters by the method of assimilation.

The word "input" has been set as the various non-destructive foreign effects which can change the internal state of system (material or information influence). "Output" has been set as the system state under the input conditions or the external display acts. Thus, once a system object is finalized and there is a feedback contact between "output-input", it will be considered as the suitable object of assimilation rule.

The fundamental basis of this rule is: the feedback controls the general system defined by the theoretical block diagram; if the feature of one object is found through the mathematical methods, this feature can be regarded as the common attributes of the general system objects in principle.

What are the application scope and the application extent of assimilation rule? It is required to respectively discuss the derivation premise, the arithmetical operation and the parameter natures of the source formulas (a) ~ (d).

The derivation premise of the formula refers to the diagram model of classical control theory. According to the ideas of Wiener[2], the application field can be defined as the generalized automata and biological organ at

least. For the application extent of this block diagram, it can cover almost all the objects of systematology which are related to the feedback from the "isomorphic" aspect of mathematical logic (model theory), which includes the social class (economy, politics and management, etc) and the cognitive class (psychology and education), etc. However, in the feature models[3] obtained by the study on the complex feedback system, all the features of the classical models (or having the "partial isomorphism"[8])are still contained (they should be corrected only when the output is defined as the next step of system status. The input and the environmental effects should be appropriately distinguished).

The mathematical operations involved in the formula derivation only include the algebra and the derivative (assuming that the external parameters have slightly changed). It should be noted that the concept of "derivative" is derived from "incremental ratio". And the latter is suited to the processing of the parameter changes of the general feedback system. Therefore, the qualitative expansion of the mathematical aspects can be undoubtedly determined. What is noticeable is that the independent variables of the derivation are the parameters rather than the time, which indicates that the assimilation process is not limited by the time. In other words, the objects of the specific feedback system can be expanded in any scale of time in the corresponding adjustment process of internal parameters when the external environment parameter changes.

The formula is the equation for the parameters of circuit system. Therefore, there exists the congruent relationship between the parameters of different systems, which is undoubtedly the key to determine the general applicability of the internalized rule. It is noted that the definition of the resistance (conductivity) parameters is determined by the ratio of the voltage and the current. Then, it is found that the key to the expansion of the system parameters lies in the corresponding expansion of its defined variables. Thus, the corresponding epitaxial relationship between the concepts of voltage and current can be analyzed as follows.

From the perspective of physical disciplines, the physical quantities which have the epitaxial relationship with the concept of voltage include the various radiation pressures, the water levels, the pressures and the temperature differences, etc (the concentration difference which determines the reactants is also included in chemistry). The physical quantities which are corresponding to the current include the various radiation flows, the water, the gas and the heat flows, etc (the chemical reaction product flow). Therefore, the definition of the resistance (conductivity) parameters can be directly expanded in the physical (chemical) system. At the same time, it can be also linked to the properties and the shape of the composite materials.

What's more, if the voltage and the epitaxial physical quantities are uniformly processed, the concepts of the most general variables such as "source" and "tendency" can be abstractly obtained which can be considered as the external conditions of the changes of generalized system. For the current, the most general variables such as "flow" or "flux" can be abstractly obtained.

After the abstract processing of the concept generalization, the general application significance of the parameters of circuit system can be extended to the biological system, the cognitive system and the social system, etc.

From the perspective of biological disciplines, there exists the various complex input and output relations or energy and information exchanges between the various kinds of systems with various levels and the environment.

Taking the species and the populations as the example, the exogenous pressures which are derived from the food, the security, the habitat and other natural conditions can be reduced to the input voltage from the concept. In order to balance the exogenous pressure, the system status and the behavioral responses should be presented in the forms of the input of certain things, energies or information. The concept can be reduced to the input current. Similarly, the endogenous pressures which are derived from the input effects or the environment can be reduced to the output pressures from the concept. In order to balance these pressures, the system status and the behavioral adjustment should be presented in the forms of the output of certain things, energies or information. The concept can be reduced to the output current.

Therefore, although the parameter types of the biological system are complicated, it will be not difficult to determine the application significance if the particular system objects, the input quantity and the output quantity are reasonably selected.

From the perspective of social disciplines, the existence and the development of a system undoubtedly depend on the demands of social members for its overall functions if the biological or the blood factors are neglected. No matter consciously or unconsciously, actively or passively, the generation and the satisfaction of this demand tend to balance its internal and external pressures. In other words, it is indicated that:

1. The social members will face the common external (internal) pressures which have limited their behavior demands as well as the internal (external) pressures which have consistently changed or used the environmental conditions in a certain period.

2. The overall functional advantage of the system is generated by a few members in a division complementary manner. The exchanges of advantages between different systems enable the members to easily or effectively balance the suffered internal and external pressures.

3. As the members of system, the special internal and external pressures suffered from the system objectives and the requirements can be considered as the conversion of the above internal and external pressures.

Once the system is established, it should accept the specific input so as to generate the specific output. If the input quantity, the output quantity and the feedback quantity are provided, the corresponding descriptive parameters will be defined and the significance which is corresponding to the model parameters of circuit system will be also established.

For example, when a production enterprise is considered as the object of the socio-economic subsystem, it is found that the flux of the required raw materials depends on the market supply and the consumption demands of enterprises. The supply capacity can be regarded as a generalized input voltage when the demand is stable. The ratio of the “voltage” and the “flux of raw materials” can determine the price parameters of the raw materials. Generally speaking, the output flux of the enterprise products naturally depends on the production of enterprises as well as the consumption demands of users. The consumption capacity can be considered as a generalized output voltage when the production is stable. The ratio of the “voltage” and the “flux of products” can undoubtedly determine the price parameters of the products. At the same time, the business profits (they are affected by the capital flow and the parameters of profits flow) depend on the difference between the output (the investment of the return funds) and the input (the production of the invested funds) in a certain period. Obviously, the changes of these parameters will directly affect the function and the structure of enterprises.

The cognitive and psychological system objects belong to the monitoring subsystem of human individual. The input information not only derives from the external (physical, biological and social) environments, but also originates from the adjustment of the internal state of the system caused by the environment. The output information (the partial information depends on the memory and the evaluation units) will constitute the feedback quantity which can directly act on the human decision-making subsystem and it can also control and affect the internal and external behavior status of the whole human system. Although the input and the output of this system have the multi-dimensional features as well as the staggered relationship between the internal levels, the application significance of the parameter expansion should also exist in different degrees from the perspectives of the use of external information, the adjustment of internal state and the information output generated by the main targets.

In short, although the proposition of the assimilation rule of parameters is derived from the analysis results of circuit system, the sufficient basis can be found and the applicability can be extended in the aspects of derivation premise, mathematical operation and parameter nature.

4. The assimilation structure (query reference)

Needless to say, the assimilation structure is just the theoretic description of the conclusion that the parameters of feedback system are changed by the assimilation factors of parameters. However, whether this structure corresponds to the true organizational forms is still required to be clearly defined. At the same time, the object scope of this correspondence also needs to be defined so as to avoid the false judgment. For example, the study is limited to the specific circuit or other object scope of man-made products, the judgment can be intuitively made that: the assimilation process just changes the system functions rather than the actual structural forms.

In order to avoid this false judgment, the actual object scope of assimilation structure can be limited to the self-organizing system. The organized man-made system objects can be considered as the subsidiary objects of social and economic self-organizing systems to develop the exploration of the historical evolution. At the same time, the micro-structural changes of the specific circuit or the man-made products within a certain range of experimental conditions can be regarded as the technical topics which should be separately verified and analyzed.

For the complex self-organizing system objects of biology, cognitive science and social organization, the general basis of assimilation structure are:

1. Even if there are no required external conditions for assimilation process, the object structures are still updated and reconstructed in the normal form. The update process is not only controlled by the genetic (history and culture) endogenous factors, but also affected by the characteristic factors of natural environment (external conditions). When the required external conditions are provided, there is a natural channel for the internal assimilation factors to be involved in the reconstruction process of system and play an important role in this process.

2. The influence of this intervention on the whole system may be limited in the functional parameters within a short period of time or within a small scope. Even so, the original relationship between the system structure (or the structural forms) and the function has been also changed to a certain extent. When the external condition changes for a long period of time or within a large scope, the changes of the essentiality of this relationship will become a real trend.

3. If the objects don't have the adaptive changes in the structure, it will be indicated that the living conditions have been relatively deteriorated. The adaptive changes in structure are bound to bring the sustainable competitive advantages to the system. The accumulation of advantages and the enlargement of adaptability are inevitably contributed to the generation of new structure. If the structure of system is not changed or adaptively changed, it is indicated that this structure will be eliminated or marginalized in the competition.

From the perspective of qualitative mathematical relationship, if S represents the function of the balance relationship between the system and the environment, there should be

$$S = F(u_i, u_o; \alpha_i, \alpha_o; \beta_i, \beta_o)$$

In this function, u_i and u_o are the generalized input quantity and output quantity; α_i and α_o refer to the (generalized) external environmental parameters of constraint input and output modes; $\beta_i$andβ_o are the internal generalized parameters, which include the functional aspect and the structural aspect.

If S=0 represents the original balance relationship, the changes of the above quantities or one of the parameters will indicate that the balance is broken. The reconstruction of the new balance relationship, i.e. S retakes zero value, has a variety of equivalent ways. In other words, the changes of one quantity or one parameter can be compensated by the equivalent changes of other quantities or parameters. The imbalance caused by one quantity or one parameter can be compensated by the equivalent changes of another party.

Combining with the previous analytical results of circuit structure, the actual situation should be--- when u_i and u_o change, the balance will depend on the changes of the functional parameters of $\beta_i$andβ_o. However, when α_i and α_o change, the balance will only depend on the changes of the structural parameters of β_i andβ_o. In other words, the regular changes of input quantity and output quantity can maintain the balance through adjusting the system functions. The unconventional changes of input quantity and output quantity can rebuild the balance relationship only through adjusting the system structures. When the adjustment range of the functional parameters is insufficient to maintain the necessary conditions of S balance, it will be required to integrate, update and reconstruct the original structure of the system with the assimilation mode so as to ensure the survival of system or avoid the stricken damage.

As the assimilation rule of parameters just explains the evolutionary mechanisms of system from a new perspective, the existing data of the various disciplines can be refreshed so that a lot of solid evidences about the assimilation structure can be provided. Therefore, the pursuit of new solid evidences also has a clear direction.

Generally speaking, when the object of study is determined, it is required to contrastively analyze the experimental observation data and the normal data under the abnormal environmental conditions so as to discuss whether the assimilation process can change the system structure and analyze the determination of specific change methods. Thus, the classical and scientific evidence can be obtained. However, the limitations of this approach are that: it only applies to a limited number of individual objects and the limited time range; the changes of environmental parameters are difficult to be controlled in natural ways.

Therefore, when the conclusions are related to the species evolution, the cognitive evolution and the social changes, the long-term statistical data in a wide range about the changes of external parameters are demanded. What's more, it should be also noted that (there are some tips in complex feedback system model[3]):

1. When an assimilation process is complete, the functions and the structures of system will be changed. The new ("execution- feedback) conditions within the system in next process will be naturally opened. These conditions not only bring (or inhibit, it is determined by the original environmental conditions) the new expansion trend to this system, but also provide the internalized process conditions for other systems under the same environment. The competition between the systems can not only change the high-level internal structure of system, but also restrict the environment of the low-level subsystem.

2. Generally speaking, the generation of the new system structure will be inevitably affected by various factors. Once the assimilation process of system interactively influences the assimilation process of subsystems, the whole "mutation" effect of system will be enhanced. Thus, the revolutionary (or destructive) structural changes will be appeared.

3. For the formation of the new system structure with the decisive significance, the cumulative superposition of various assimilation processes and the mutual cooperation between subsystem units and levels are required. At the same time, the long-term tendentious changes of environmental factors are also considered as the necessary conditions.

If these problems can be noticed in the process of re-examining the historical data and processing the new information, the available scientific evidences of assimilation structure can be obtained in the larger scope and in the stricter sense.

In any case, the determination of the general applicability of assimilation rule has the great theoretical significance. The assimilation structure also has the existence value from the perspective of theoretical economy. Then, the causes of the structural changes can be classified into three categories: regularity or stability, contingency and assimilation. In the process of examining the structural evolution of specific objects, if the first two factors are excluded, the assimilation can be attributed to.

For any organizational system unit with the ascertainable limit, assuming that the input is given in the form of energy function and the output is part of the input, it will be easy to prove that there exists the equivalent

unit negative feedback within the units[4] according to the equivalent transformation of transfer function. It not only helps to explain the formation and the early evolution of the original structure of system, but also indicates that the concept of assimilation applies to more self-organization systems.

5. The overview of significance

In view of the broad inclusiveness of system and feedback, it is difficult to give a comprehensive overview to the assimilation rule and the scientific significance of its ideology. Some suggestive ideas have been provided in the following several disciplines, which can stimulate the interest of professional researchers or improve the available scientific theories.

5.1. The extensive biology

As an abstract biological system, no matter the populations or the individuals, the tissues and organs or the cellular genes, the existence of feedback is considered as the common performance. The systematic internal functions in the process of adapting to the environmental changes, especially the changes of external structure and forms, have become the fact which has been widely recognized[5]. The proposition of assimilation rule is helpful to seek the more scientific explanations.

From the external features of living organisms, it can be directly deduced that once the external resistance factor of input or stimulus quantity as well as the external resistance factor of output or response quantity changes, the internal parameters of this organ will be strengthened and changed through the feedback. For the influence of this change on the external forms and the functional structures of various species and organs, there are two realization methods: the direct method and the indirect method. The direct realization method refers to the strengthening of the individual viability and the genetic advantages. The indirect realization method refers to the changes of the gene frequency of species.

In other words, under the pressures of environmental changes and survival competitions, the original forms and the structural parameters of biological organs will be inevitably changed due to the constraints of its function. At the same time, part of this change can be preserved in the form of natural (artificial) choice which will be continuously strengthened and expanded.

When the examination is conducted in a single cell and the genetic level, it should be noticed that the conditions which constitute the specific environment of input and output not only include the internal conditions of biological systems, but also contain the external natural (physical or chemical) conditions. Therefore, assuming that the changes of these conditions can affect the gene expression and the regulation process through the certain path, the application of assimilation rule will be meaningful in this level. If the survival adaption of different individuals is considered as the self-regulating performance of population gene pool system under the different environment, the controversy between the Darwinism which emphasizes the selection of environment for the natural mutation of species and the Lamarckian which stresses the selection of the adaptive mutation of species for the environment will obtain a common development and mutual promotion research platform due to the proposition of assimilation rule.

Assuming that the assimilation process of the whole life system can occur with the multi-level and accelerated form under the disaster environment (the special and changing environment will provide the diverse and rapid internalized methods to promote the generation of new species; the extinction of original species will reserve the space for the expansion of new species). At the same time, the influence of “catastrophe” on the appearance of new species can be reasonably explained according to the internalization rule.

In short, the various theoretical basis of the formation and the development of species[6][7] will obtain the new scientific orientation due to the proposition of assimilation rule. The whole biological basis can also penetrate into the evolutionary process of life with various assimilation methods through identifying the changes of external environmental factors. Then it will be more mature and complete.

5.2. The genetic epistemology

Obviously, the systematic structures of brain and nervous organs have determined the biological basis of cognitive function. The occurrence of understanding can be attributed to the results of the phenomenon that this system changes the information with the external physical world so as to serve the activity targets of subjects. The information in physical world constitutes the input of cognitive system, and the brain will produce some decision-making information which can affect the behaviors of subjects in order to constitute the output of cognitive system. The interaction results between the behaviors of subjects and the certain environment can also constitute the feedback of physical world on the cognitive system. The proposition of assimilation rule has further supported the views of "genetic epistemology" proposed by Piaget[6].

If it is confirmed that there exists the feedback contact of nerve organs between the input of receiving organs and the output of implementation organs which are uniformly controlled by the brain, according to the assimilation rule it will be easy to infer that---

The brain and the parameters which dominate the nerve organs and tissues will inevitably have the corresponding internal assimilation changes with the changes of the external (environmental conditions) parameters of input and output. Such changes can not only obtain the adaptive advantages, but also indirectly affect the environment. This indirect influence has provided the external conditions for the re-occurrence of internalization process. Therefore, the organizational structure of cognitive organs will have the tendentious changes with the deepening of specific cognitive processes, which can support the enhancement of specific functions.

Further more, the question that how the "mathematics- logic" cognitive ability occurs will explain the views of Piaget: The results of "reflexive abstraction" activities when the brain assists and coordinates the main system to complete the various target behaviors.

The "reflexive abstraction" is originated from the original self-awareness activities of brain. Then, the brain can look at the contact between its subject and the environment from the perspective of a third party. Through observing the behavior processes of different subjects and trying to improve their own behaviors, the information scope accepted and stored by brain has been continuously expanded. The successful employment of subject activities for these information as well as the increase of information from the environmental feedback can inevitably promote the original "execution- feedback" function of brain and the bearing structure to become much stronger and more complex according to the assimilation rule.

Through the expansion and the re-usage of new assimilation functions, the "schema" relation characteristic information which involves with the consistency of the different behavior processes and the difference of the same behavior processes will naturally have a greater probability to stay at the memory structures of brain. Then, it will be discovered by the self-awareness. As the inherent linkages and the conversion mode of these characteristic information are of great significance for the social and material communication demands between the subjects and the environmental changes of subject behaviors, so they can be noticed by the self-reinforcement which will become the new aids of subject activities. The unceasing use of this new tool as well as the assimilation process of brain is the basis of the occurrence and the development of "mathematics- logic" ability. And the combination of these "inherent linkages and conversion mode of characteristic information" and the imagination (the subject activities or the psychological demands in social interaction can be met) may be the basis to produce the artistic ability.

From the assimilation ideology, the three behavior basis of animals (instinct, learning ability and intelligence) can be classified as follows:

Instinct--- it refers to the functional display of biological genetic structure. The assimilation process can be directly finished through the intervention of specific environmental information and the single tendentious assimilation structure can be formed.

Learning ability--- it refers to the functional integrated display of instinct structure. The assimilation process can be completed through the intervention of the information in different behavior processes (including the simulation process) and the assimilation structure with certain determinate selectivity can be formed.

Intelligence--- it refers to the functional reorganization display of learning structure in new environment. The assimilation process can be completed through the comprehensive intervention of new information and the assimilation structure with partial new selectivity can be formed.

If the basis of intelligence activities can be divided into the discovery assimilation method (the role of the changes of external parameters has been cognized) and the invention assimilation method (the structure of assimilation factors has been reconstructed), the long-standing controversy about the brain and the computer difference[8] can be simply divided into: the former assimilation is independently and comprehensively completed (function and structure); the later one is passively and partially finished (function).

5.3. The social histology

For various social organization systems, the adjustment objects of assimilation rule are wide. They are intersected with each other, which are the components of environment. The following general description of the logical relationship of assimilation process is expected to complement the existing theoretical basis.

The formation and the development of systematic organizational system have complied with the principle of the maximum output effectiveness and the minimum input cost. The suffered constraints of this requirement are not only from the general environment, but also from the “background field” decided by the demand pattern: the various members within the system or beyond the system have shared the system efficacy with different ways and in different degrees and they have to pay the cost, which determines this background field deposit.

The average sharing payment ratio and the weights of different subsystems (up to the specific individual) in this average value have been considered as the parameters to determine the background field. The changes of these parameters will be inevitably reduced to the changes of external parameters.

If the changes of external parameters are beyond the adjustment scope of original system functions, the assimilation of the alteration of system structure will start. At this time, no matter the changes of the sharing demands of some members or the changes of general environment, both of them can make the system structure face the shock pressure: the changed income pressure (= efficiency- cost) comes from the environment and the changed sharing payment ratio pressure is from the system. If these pressures are not released, they will be accumulated to a force which can destroy the system structure. Then, the communication rule between the members or the different systems will be spontaneously changed and the vicious competition development will be appeared.

The repairing or the reconstruction of system structure can be inevitably developed under the conditions of new environment and new background field demands if the subject of the system functional requirements exists. The change ability of the system for its parameters in this process has determined the strength of the assimilation functions of system. The strength of the assimilation functions of system under ideal conditions is affected by the product of parameter A of implementation function and parameter F of the feedback function. At the same time, when A+ F= constant, the assimilation function can reach a relative maximum value.

Therefore, if the resources of a relatively independent system have been allocated to the "executive" and "feedback" aspects (assuming that the inputs of resources can directly determine the functions), the biggest function which can resist the external changes will be obtained. If people can find and determine the specific positions of A and F in the specific system object model, there will be a new method for the specific application of assimilation rule.

However, the strong assimilation function also has the tendency to induce the system shocks in theory. Taking a social system with complete differentiation as the example, the rough analogy elaboration can be provided: the various feedback adjustment functions of political subsystems have determined the correspondence with F in the social system. The political subsystems are powerful, which is undoubtedly required when the social system deals with the natural disasters and the foreign major crisis. Once this manipulation deviates from the reasonable assimilation (the system environmental parameters or the parameters of background field can be changed or determined according to the preferences of masters), the pressures of social system structures will be increased. If these pressures are reinforced (the actual probability is great), they will undoubtedly exceed the adjustment range of system functions, which will induce the entire social system to be unstable and the political subsystems to be crashed and rebuilt.

If these features of assimilation rule are noticed, the existence of the ideal model in the social organizations as well as the significance of the phenomenon that the existing systems are changed according to a certain pattern should be denied. In view of the uncertainty and the uncontrollability of the constraints of general environment and background field, the only thing that human can do in rationality is to provide the ground preparation for the continuous assimilation changes of system.

This ground preparation includes the transparency of information and the organization preparation. The former one includes the various operations of system, the scientific assessment of system environment and the tendency assurance of the changes of background field. The later one contains the functional orientation of social members to participate in the politics and the equal intervention of various spontaneous (non-governmental) organizations to the changes of political system.

5.4. The health and medicine

From the perspective of systematology, the health is just the strength and the stability of human regulatory functions. According to the assimilation rule, this kind of strength and stability can be partially caused by the external environmental factors. Therefore, the moderate exercise and the invasion of a small amount of harmful factors (including the immune therapy) can become the means to maintain or enhance the human health.

In view of the assimilation ideas, the influence of the changes of living methods (including the labor movement, the diet, the learning and training and some other specific implementation ways) on the human health can be reasonably explained. What's more, the special effects of some traditional medical treatment methods and the special abilities obtained by the long-term special training can be also theoretically explained according to the assimilation rule.

Generally speaking, the influence of the environmental substances on the human functional structures and the influence of environmental information on the human mental functional structures are all expected to obtain the more reasonable explanation from the perspective of assimilation rule. At the same time, the study on the problems faced by the modern health--- the physical and psychological structures of humans evolved in the long-term environmental conditions are facing the new challenges in which the new environment (including the production and the lifestyle) is rapidly changed--- will also obtain the scientific theoretical guidelines due to the proposition of assimilation rule.

6. Conclusion

The changes of the functional structure of feedback system are adjusted by the assimilation rule: when the external parameter changes, the system can spontaneously complete the assimilation adjustment of the internal functions and the structural parameters. The property of this newly finding is the same as other well-known feedback properties, which is just the result of the mutual coordination of the original "execution- feedback" conditions of system.

The common rules can be found in the evolutions of the biological species, the cognitive understanding, the social organization forms and other self-organizing systems if the time scale is neglected. From the perspective of systematics, the assimilation rule determines the evolutionary mechanism---even if the causes of evolution are attributed to the genetic accident variation, this assimilation also dominates the "survival of the fittest" process.

Considering that the assimilation process of system also affects their environment (including the re-selection of environment), the abstract description of their relationship can be summarized in Figure 3. The "internalization" and the "abduction" refer to the presumable influence of assimilation process on the systems.

The "assimilation of parameters" can be promoted as the natural laws of the general feedback systems from the research results of specific disciplines, which can provide the reference for some disciplines. And the systematic thinking methods can be also integrally improved.

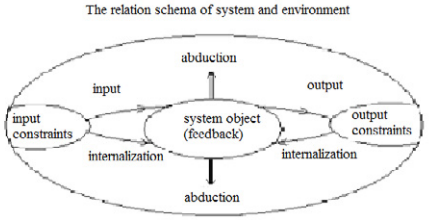

Figure 3 The routine changes of input and output will not affect the internal functions of feedback system and the parameters of morphological structure. If the external environment parameter factor which determines the constraint modes of input and output changes, the internal parameters within the system will be adjusted. At the same time, they will respond to the unconventional changes of environment in assimilation method so as to rebuild the balance of system.

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