

Relation between Chaos Theory and Lewis's Development theory: Common Understanding is never achieved by covariation alone

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Abstract: In this paper, four levels of Lewis's development theory are compared with a representative chaos equation

$$Z(n+1) = p[1 - Z(n)]Z(n)$$

and the counseling process. This equation is equal to the following two equations:

$$X(n+1) = p[1 - Y(n)]Y(n)$$

and

$$Y(n) = X(n).$$

The first level is equivalent to the variable X with no "n," where n is equivalent to time.

Thus, X means no change with time. The second level is equivalent to X (n) with "n," which means X (n) changes with time. The third level is equivalent to one of the two equations. X (n) and Y (n), being I and you, change with time. The fourth level is equivalent to the two equations. Therefore, Lewis's theory can be explained with chaos theory. A mistake on the fourth level and that on the further level are called "transference" and

"counter-transference" in the counseling process, respectively. There are fixed and chaotic states in chaos theory. When any condition does not change, a chaotic state never converges to a fixed state. Each variable is equivalent to a person or a circumstance factor. The fixed state with convergence is a common understanding. The chaotic state is each person's personal understanding. Covariation is required for obtaining common or personal understanding. However, common understanding is not obtained with covariation alone. Because common understanding is produced with convergence of each other's thoughts, it is never produced with only one's self alone. Therefore, we do not have to feel frustrated for reality without common understanding.

Keywords: Communication, covariation, chaos, convergence, counseling

Introduction

Lewis (2003) has reported a relation between covariation and communication in child development. Lewis's development theory has four levels. According to Grueneisen et al. (2015), the first level is "I know"; the second level is "I know I know"; the third level is "I know you know"; and the fourth level is "I know you know I know". Their definition of each level is different from that in Rochat's (2003) paper.

Covariation is required in chaos theory, too. A relation between chaos theory and counseling has been reported (Yanagisawa, 2004; Yanagisawa, 2015a). In the present paper, Lewis's four development levels are compared with a chaos equation and a counseling process. "Transference" is understood to be a mistake on the fourth level, and "counter-transference" as a mistake on the further level. The latter is derived from chaos theory and was not reported by Lewis.

Methods

Definition of chaos theory

The definition of chaos theory can be found in Yanagisawa's (2014) paper.

Relation between continuous covariation and chaos theory

In Yanagisawa's (2015b) paper, continuous covariation is related to chaos theory. The basic concepts are outlined below. A representative chaos equation is expressed as

$$Z(n+1) = p[1 - Z(n)]Z(n) \quad (1)$$

As the parameter p changes from 3.0 to 3.56995 (called the Feigenbaum point (Feigenbaum, 1978)), the number of fixed points in Equation 1 varies from 1 to 2 and eventually to 4. Below the Feigenbaum point, the solution $Z(n)$ converges, while above the point, it splits into a localized state and a proliferating chaotic state. The solution does not converge in the chaotic state.

Figure is a schema near the Feigenbaum point, showing the converging fixed (part R), localized (part S), and expanded chaotic (part T) states. The arrow F is the Feigenbaum point. The far-off right side of part T in the figure is a random state, and is outside of chaos theory. The vertical and horizontal axes are equivalent to " $Z(n)$ " and " p " in Equation 1, respectively. Equation 1 is equal to the following two equations:

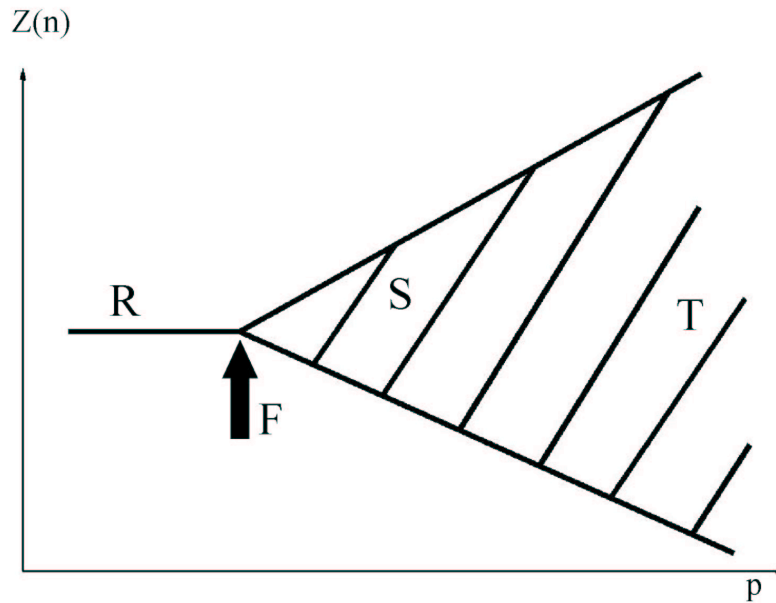


Figure: Schema near the Feigenbaum point.

Arrow F indicates the Feigenbaum point. The converging fixed, localized, and expanded chaotic states are shown as parts R, S, and T, respectively.

$$X(n+1) = p[1 - Y(n)]Y(n) \quad (2)$$

$$Y(n) = X(n) \quad (3)$$

Here, the differences among the variables, X, Y, and Z, and those among variables X (n), Y (n), and Z (n) are explained. X, Y, and Z do not change with variable "n," while X (n), Y (n), and Z (n) change. Since the calculations in Equations 2 and 3 are alternately repeated, the solutions to X (n) and Y (n) are in an ordered spiral state. Therefore, X (n), Y (n), and Z (n) change to one direction according to the increasing value of "n." In Equations 1, 2, and 3, "n" is equivalent to time. Thus, X, Y, and Z do not change with time, while X (n), Y (n), and Z (n) change.

Relation between Lewis's four levels and the variables

X and Y can be considered as me and you, respectively. The first level is equivalent to X. There is no specified time in X with no "n." "I know," being the first level, means that I know my state with no specified time. In other words, I do not know my clear state at the specified time. On the first level, I am confusing my consciousness with my sub-consciousness. The second level is equivalent to X (n). There is a specified time in X (n). "I know I know," being the second level, means that I know my clear state at the specified time. On the second level, I convert my sub-consciousness to my consciousness. The third level is equivalent to Equation 2. "I know you know," being the third level, means that I know your clear state at the specified time. You and I change with time. The third level means that I at time (n+1) know your clear state at the previous time (n). Therefore, the corrected third level is "Current me know old you knew." When "I" and "you" are counselor and client, respectively, I convert your sub-consciousness to your consciousness as your counselor. The fourth level is equivalent to Equations 2 and 3. "You know I know" is equivalent to Equation 3. "I know you know I know," being the fourth level, means that I know your clear state was changed by my state. It indicates a covariant relation between me and you. For example, the fourth level indicates the counselor's awareness that the client has a special emotion for him/her in the counseling process. When the counselor does not have a special emotion for his/her client, it is called "transference." This is because the client (you) does not know the emotion of the counselor (I). If the counselor does not know that his/her client's emotion was changed by the counseling process, the counselor cannot avoid "transference." Here, there is also no time factor in the expression of the fourth level. Therefore, the time factors must be added to it according to Equations 2 and 3.

Theoretically, the corrected fourth level is "Current me know old you knew old me knew."

A further fourth level not pointed out by Lewis is thus explained. It is "You know I know you know." In Equations 2 and 3, X (n) and Y (n) are exchanged:

$$Y(n+1) = p[1 - X(n)]X(n) \quad (4)$$

$$X(n) = Y(n) \quad (5)$$

In this paper, it is defined as the fifth level, which is equivalent to Equations 4 and 5. The corrected fifth level is "Current you know old me knew old you

knew." It means that you know my clear state was changed by your state. This is because counselor (I) does not know the emotion of his client (you). When the client cannot notice his/her counselor's change with counseling, the client mistakes a correspondence with his/her counselor; this is called "counter-transference."

Relation between chaos theory and Lewis's development theory

Therefore, Lewis's development theory can be explained with covariation being a necessary condition of chaos theory. There are fixed and chaotic states in chaos theory. A chaotic state does not always converge to a fixed state with only a covariant relation. The fixed state may be recognized as common understanding and the chaotic state as not common but personal understanding. Common understanding can never be obtained with this covariation. However, it is not always achieved with covariation alone. Rather, covariation being a necessary condition of common understanding is not a sufficient condition for it. Therefore, common understanding is not always guaranteed in Lewis's development theory. In human development, common understanding can never be obtained multiple times. Common understanding being convergence is decided with the covariant relation made by each person. Therefore, we do not have to feel frustrated for reality without common understanding. Thus, the reason why common understanding cannot be achieved is not oneself but both relations.

Results

In Lewis's development levels, each person is equivalent to the variables of the chaos equation. Each level in Lewis's theory is explained by covariation required chaos theory. Because common understanding is not equal to covariation, it is not always guaranteed in Lewis's development theory. Covariation being a necessary condition of common understanding is not a sufficient condition for it. People do not have to feel frustrated for reality without common understanding.

Discussion

Fixed and chaotic states can be explained by chaos theory. Convergence is equivalent to a fixed state. Chaotic and random states are understood as non-converged states. However, a chaotic state with a limited range is different

from a random state with no limited range. Random states are outside of chaos theory. It means that, theoretically, a random state can never be changed to a fixed state. All phenomena related to human recognition have some covariance with time. When each variable has a covariant relation, a chaotic state, and not a random state, is produced. Therefore, there is no random state with time. In human development, all phenomena relate to time. Because they have some covariant relation, human development is a chaotic phenomenon. Therefore, it can be explained by chaos theory. The author presents a relation between Piaget's development theory and chaos theory. Piaget reported a relation between human development and convergence of thought. Furthermore, Lewis reported a relation between human development and change to covariation from one-directional variation.

In chaos phenomenon, covariation is required and convergence is produced with some variable state. However, covariation being a necessary condition of common understanding is not a sufficient condition for it. Humans experience many chaotic phenomena in their growth. Their thoughts develop so as to understand their experiences as chaotic phenomena. Therefore, chaotic phenomena are naturally observed in child development. Thus, as the fifth level in this report, it is possible to predict a new phenomenon theoretically. According to chaos theory, if an observer knows chaos theory, he/she may discover a new theory of child observations.

Conclusion

Each level in Lewis's theory can be explained by covariation required chaos theory. Because common understanding is not equal to covariation, it is not always guaranteed in Lewis's development theory. Covariation being a necessary condition of common understanding is not a sufficient condition for it. Therefore, humans do not have to feel frustrated for reality without common understanding. According to chaos theory, if an observer knows chaos theory, he/she may discover a new theory of child observations.

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