A Review on Semantic Waves and Its Application in Discourse Analysis

Wentao Wang*

Lanzhou University of Technology, Lanzhou 730000, China

*Corresponding author: Wentao Wang, wangwtedu@sohu.com

Abstract: Since the past 10 years, the theory of semantic waves has further progressed. This theory is deeply rooted in the theory of knowledge structures, legitimation code theory, and systemic functional linguistics. In addition, the theory can also be applied in discourse analysis, language learning, language teaching, and many other fields.

Keywords: Theory of semantic waves; Semantic gravity; Semantic density; Discourse analysis

---

1. Source of semantic wave theory

Bernstein proposed the theory of knowledge structures in 1999 with the consideration that different types of knowledge are presented by different types of discourses. He classified discourses into two types: vertical discourse and horizontal discourse. Generally speaking, horizontal discourse is the discourse used in people's daily life; meanwhile, vertical discourse refers to natural science discourse, social science discourse, and humanities discourse [1]. Aiming at distinguishing completely different knowledge structures of various aforementioned discourses, he introduced the idea of hierarchical knowledge structure.

Based on the theory of knowledge structures, Karl Maton introduced the knower structure. He claimed that every knowledge structure corresponds to a knower structure. Thereafter, Maton proposed the legitimation code theory, LCT for short, which comprises of five elements: density, autonomy, specialization, temporality, and semantics. Subsequently, Maton proposed the concept of semantic waves on the basis of semantic elements. The formation of semantic waves mainly relies on two factors: semantic density and semantic gravity [2]. As semantic waves avail in the investigation about the crucial features of knowledge accumulation, this view has attracted great attention from systemic functional linguists. However, the idea of semantic waves was brought up from social pedagogy, which needs to be transformed for adapting theories of systemic functional linguistics. Then, Maton put forward ideas of mass and presence in accordance with semantic density and semantic gravity. He combined them with metafunctions of systemic functional linguistics and studied the generation as well as interpretation of discourse meaning from three perspectives: ideational function, interpersonal function, and textual function.

2. Basic content of semantic wave theory

As mentioned before, the formation of semantic waves depends on semantic density and semantic gravity. Semantic gravity is the degree of semantic dependence on its discourse, while semantic density refers to the degree of semantic concentration of a certain discourse. In a discourse, semantic gravity is usually inversely proportional to semantic density. Sentences with high semantic gravity tend to have low semantic density, while those with low semantic gravity always have high semantic density. More specifically, spoken languages in daily life are of high semantic gravity and low semantic density, but academic

languages used in colleges and universities are of low semantic gravity and high density. Especially when a new term is introduced, the new term tends to have high semantic density but low semantic gravity. At this point, teachers often design a lead-in part to introduce background information about this term to reduce its semantic density. After introducing this new term to students, teachers should explain this term to the students, making the term easily understood by the students via reducing its semantic density. Teachers often generalize information about the term to reintroduce this term to students by increasing its semantic density. In summary, the process of knowledge practice is a process alternating between unpacking difficulties and repacking knowledge.
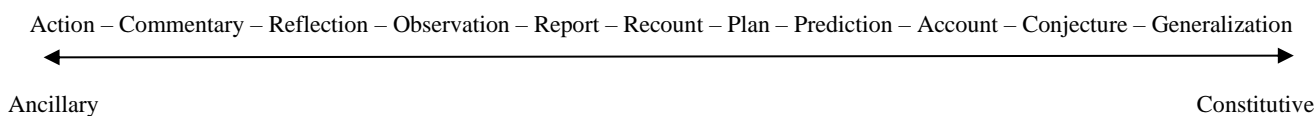
3. Application of semantic wave theory

3.1. In teaching and learning

Since the theory of semantic waves originated from knowledge accumulation practice, its application is deeply rooted in teaching and learning. The current applications of the theory center on designing the teaching process, teaching evaluations, and the compilation of textbooks.

In the field of designing the teaching process and teaching evaluations, semantic waves are a reasonable way to realized accumulative knowledge construction from the perspective of student knowledge acquisition. In classroom conversations, students can integrate new knowledge with prior knowledge by following the semantic waves formed by the strong and weak changes of semantic gravity and semantic density in the teacher's discourse, thereby realizing cumulative knowledge construction [3]. Besides, it is believed that the teaching approach of alternating between unpacking difficulties and repacking knowledge is a desirable teaching method. Moreover, semantic waves can be utilized in evaluations of teaching effects – whether a teacher's teaching process followed by the scientific rules of semantic waves can be another standard to gauge a teacher's teaching skills.

3.2. In discourse analysis

Except for those that have been mentioned before, the theory of semantic waves can also be applied to discourse analysis. To assign a sentence with concrete semantic gravity and semantic density, the semantic wave of a paragraph, and even a whole passage can be illustrated. The semantic of context dependence is conceptualized based on the central entity value in the message and event orientation, which is called the rhetorical unit (RU). The rhetorical unit is a semantic unit between the context and the message at the structure level. In Cloran's and Hasan's views, the rhetorical unit is an expression of the language function of social processes, located between two poles (constitutive and ancillary social activities), as shown below:

Action – Commentary – Reflection – Observation – Report – Recount – Plan – Prediction – Account – Conjecture – Generalization

Ancillary ⟷ Constitutive

It is suggested that these classes of RU are expressions of the role of language in the social process. This contextual variable is conceptualized as a continuum at the left extreme of which language is ancillary to the task at hand, while at the right extreme, language constitutes the social activity. In the above-mentioned gradual change, the central entity of the rhetorical unit near the ancillary end is the interactant or the other person who is co-present in the material situation and the referred event concurrent with the time of speaking, thus constituting the action rhetorical unit. The central entity of the rhetorical unit near the constitutive end is the entity that does not exist at the moment of speaking. The event orientation is also generalized; it does not refer to any specific time but rather, it is timeless or habitual, and thus this kind of

rhetorical unit constitutes the generalization rhetorical unit. Based on this proposal, it can be seen that the central entity value of the discourse unit itself and the event orientation it refers to reflect its typical context-dependent characteristics; that is, the ancillary rhetorical unit is contextualized language use, while the constitutive rhetorical unit is decontextualized language use. This characteristic is consistent with the semantic gravity under the semantic principle of LCT, reflecting the degree of dependence and independence of meaning on the context [4]. From the perspective of the semantic gravity of LCT, the action rhetorical unit at the left end is the closest to the current discourse context because of its entity and reference, so it has the highest degree of context dependence. Luo Zaibing assigns its semantic gravity and semantic density to SG10, SD1 [4]. The generalization rhetorical unit at the right end is non-immediate reference because its central entity is a fictitious event, which is the most out of context and has the lowest degree of context dependence [5]. Therefore, it can be seen that its semantic attraction is the lowest while the semantic density is the highest. Luo Zaibing assigns its semantic gravity and semantic density to SG0, SD11 [4]. The specific semantic gravity and semantic density values of each discourse unit are shown in **Table 1**.

Table 1. Assignment scale

Generalization	SG0	SD11
Conjecture	SG1	SD10
Prediction	SG2	SD9
Plan	SG3	SD8
Account	SG4	SD7
Recount	SG5	SD6
Report	SG6	SD5
Reflection	SG7	SD4
Observation	SG8	SD3
Commentary	SG9	SD2
Action	SG10	SD1

In any context, as a constitutive and ancillary rhetorical unit, it can objectively and explicitly describe the specific scale of semantic gravity and semantic density as well as objectively and concretely define the fluctuation and continuity of semantic waves. The aforementioned semantic wave assignment framework is based on the reciprocity of semantic gravity and semantic density. It highlights the specific movement process and the degree of semantic fluctuations of the semantic wave and provides an objective as well as explicit measurement scale for the description of the specific fluctuations of the semantic wave.

Selected by Cloran, the outcome of a transcribed discourse was presented in a paper – *Rhetorical Unit Analysis and Bakhtin's Chronotype* (as shown in **Figure 1**). The discourse was first converted from PDF to TXT. As is shown in the figure, there are 30 rhetorical units in the selected discourse. Then, the discourse was imported into UAM Corpus Tool version 3.3 to build a self-made corpus.

Figure 1. Selected discourse

Based on the theoretical framework proposed by Cloran and Luo Zaibing, the function of manual annotation in UAM Corpus Tool version 3.3 can be used to address the selected discourse (as shown in **Figure 2**, **Figure 3**, and **Figure 4**).
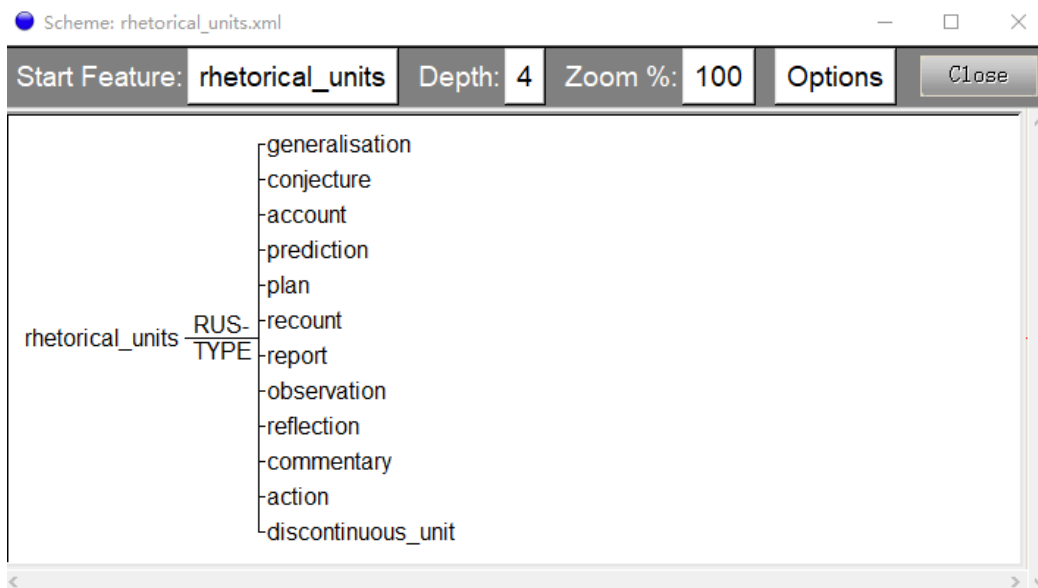

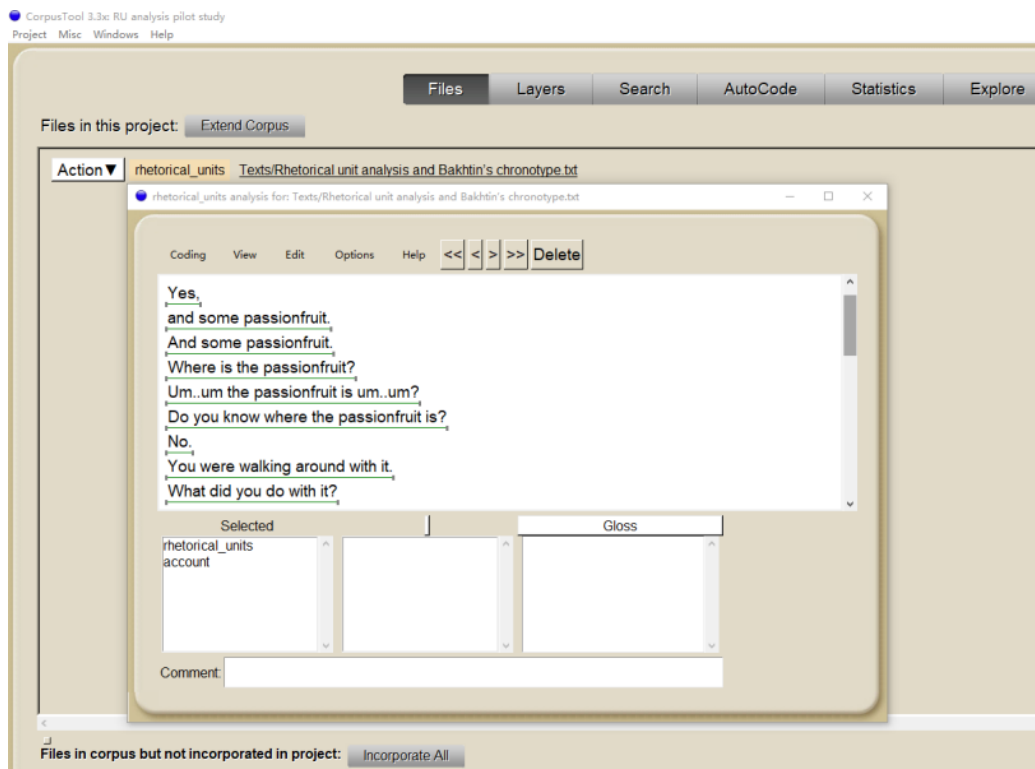**Figure 2.** Scheme of the manual annotation
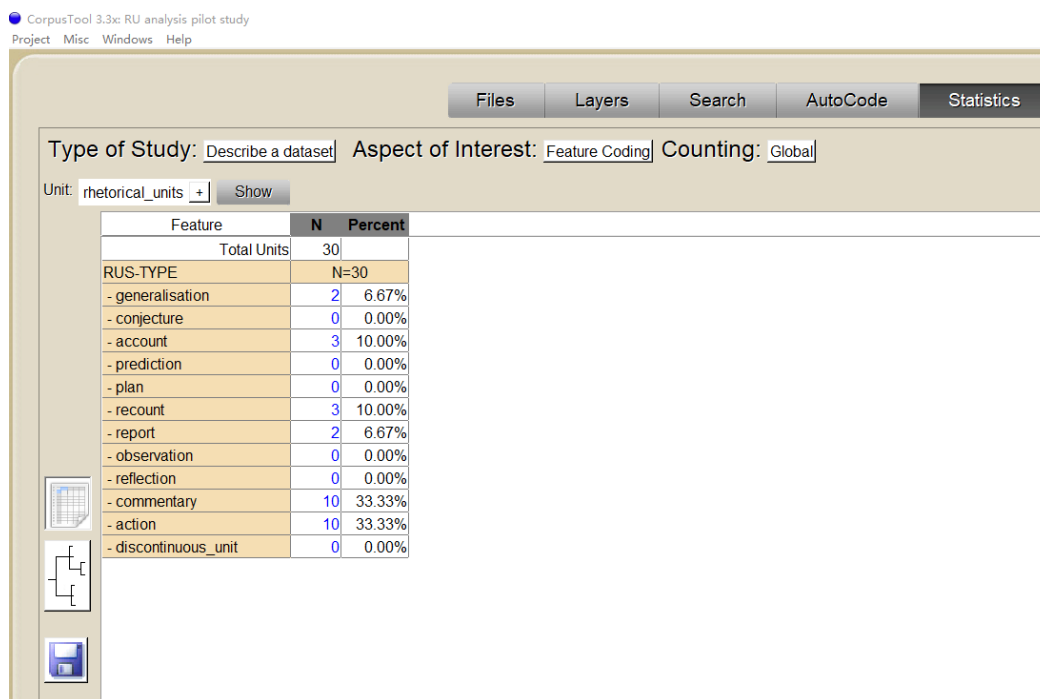
Figure 3. Process of manual annotation

Figure 4. Rhetorical units of selected discourse

According to Luo Zaibing's assignment of rhetorical units, a semantic wave diagram of the selected discourse can be formed with the help of MATLAB 2021.
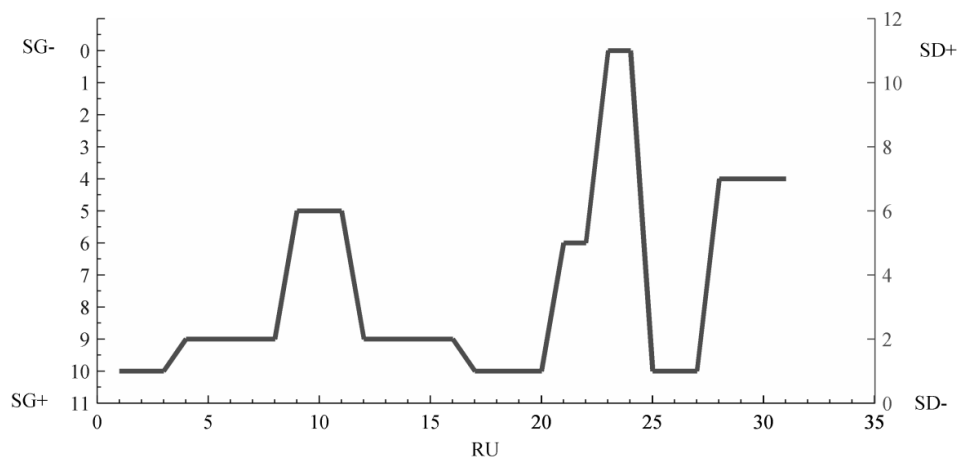
Figure 5. Semantic waves of 30 rhetorical units

The movement of the semantic wave can be divided into ascending, descending, and parallel (as shown in **Figure 5**). The rising of the semantic wave means that the semantic gravity is weakening while the semantic density is strengthening. The presented knowledge reflects the tendency of contextualization. The knowledge structure shifts to the higher-level knowledge structure, just as the action rhetorical unit of "SG10, SD1" moves to the generalization rhetorical unit of "SG0, SD11." The decline of the semantic wave reflects that the semantic gravity is strengthening, while the semantic density is weakening. The presented knowledge reflects the tendency of context dependence. The knowledge structure shifts to a common-sense knowledge structure, just as the recount rhetorical unit of "SG5, SD6" moves to the commentary rhetorical unit of "SG2, SD9".

Previous studies have shown that a semantic wave of high semantic level is not conducive to knowledge structure crossing the semantic gap in specific contexts, while a semantic wave of low semantic level is not conducive to the structuring of knowledge in specific contexts; however, a fluctuating semantic wave is the key to bridging the knowledge gap.

The assignment scale shown above is a tentative scale from a study conducted by a Chinese scholar. At present, there is still lacking an authoritative assignment scale for semantic waves; therefore, more time is needed to conduct further research on the theory of semantic waves.

Disclosure statement

The author declares that there is no conflict of interest.

References

[1] Zhu Y, 2015, Formation Mechanism of Semantic Wave in Analects. Journal of Shanghai International Studies University, 38(04): 48-57.

[2] Zhu Y, 2015, From Semantic Density and Semantic Gravity to Matter and Existence. Chinese Foreign Languages, 12(04): 16-25.

[3] Zhang D, Qin J, 2016, Semantic Wave Theory and Its Role in Classroom Discourse Analysis and Construction. Foreign Language Teaching, 37(02): 52-55.

[4] Luo Z, 2020, Explicit Construals of the Semantic Waves of The Analects: A Case Study of Scientific Discourse. Foreign Languages, 43(2): 61-71.

[5] Luo Z, 2019, Explicit Constraints of the Semantic Wave of The Analects: A Case study of Scientific Discourse. Foreign Languages (Journal of Shanghai International Studies University), 43(02): 61-71.