

Recognition of Textual Entailment Based on Image Schemata

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ABSTRACT. *Recognition of Textual Entailment (RTE) is the core of most natural language processing. Image schemata include qualia structure, idealized cognitive model, and frame, script, etc., all of which are structures that can be used for representing word meaning. In a wide sense, all these schemata belong to the category of semantic feature and thus have the potential to become linguistic motivation behind Textual Entailment. It is hopeful that the construction of the corpus of all kinds of schemata is conducive to surmounting bottlenecks of RTE.*

Keywords: RTE, image schema (IS); qualia structure (QS); idealized cognitive model (ICM), frame; script

1. Introduction. Existing studies of textual entailment (TE in short) come mainly from the field of NLP with English as the main study subject. When processing the TE test sets offered by PASCAL RTE challenge workshops, existing RTE systems obtain accuracies, recalls and F-scores ranging from 0.6 to 0.7. Faced with larger real texts, we will conceivably get RTE effects inferior to the effect shown by these figures. The effects of existing RTE are not satisfactory and there appears a bottleneck in improving RTE effects, one of the key reasons of which is that there is a severe lack of studies about (cognitive) linguistic motivations behind TE. Existing RTE studies usually deal with only simple word relations, shallow grammatical relations (with the method of syntactic transformation) or shallow semantic features, leaving most of the linguistic motivations, especially cognitive

motivations, of TE unclear.

This paper understands semantic features in a broad sense, observing that such ISs as qualia structure (QS), ICM, and frames, scripts are also semantic features. QS theory is important content of the Generative Lexicon of Pustejovsky and QS, which is a kind of mental structure for decomposing, representing and storing word meanings, owns the characteristics of common ISs from the perspective of cognition. In cognitive semantics, ISs are used for representing word meanings and thus the contents of them can be treated as semantic features. No wonder Feng points out that the representation of word meaning(s) should include not only the description of valence but also the description of ISs [1]. In a word, semantic features in this paper include both the semantic information obtained through traditional componential analysis and information expressed by ISs.

This paper tries to explore how ISs become the (cognitive) linguistic motivations of TE . The main contents of this paper are arranged as this: first, concepts of ISs are introduced briefly in section 2; then it is demonstrated how ISs become TE motivations; and finally comes the conclusion, summarizing the main idea of this paper and making clear the significance of this study.

Motivation in this paper is understood as knowledge involved in obtaining TE relations between two textual snippets; and ISs contributing to obtaining certain TE relations are motivations of these TEs.

2. **ISs.** All ISs have special contents and structures and are idealized, integrated, and stable¹. In short term, ISs are stable, while in the long term they are open and changeable to adapt to the change of society and culture. ISs owns similar stability and openness like culture.

2.1. **Qualia structure.** In Neo-structuralist semantic theories, the Generative Lexicon is the most productive and sophisticated type of post-generativist formal decompositional semantics which offers the most elaborate formalized componential model in contemporary semantics[3]. The Generative Lexicon focuses on sense determination and sense regulatory mechanisms, emphasizing the description of polysemy and trying to surpass Katzian semantics by transcending Sense Enumeration Lexicon. The Generative Lexicon describes dynamic, creative usage of language using lexicon as the basis and it surpasses Katzian semantics mainly in the following aspects: It is obviously related to semantic logic representation; it uses hierarchical representation of word meanings; its representation of word meanings contains more content and related descriptions are more meticulous compared with former theories; its representation caters to computational linguistics and offers operable semantic generation mechanisms [4].

QS is the most successful content of the Generative Lexicon and has been assimilated by many linguistic theoretical frame [5]. QS is used to express the semantic features of entities, especially artificial entities and it is one of the source of semantic productivity. According to Pustejovsky, QS has four parts of contents:

¹ Ungerer & Schmid points out further that, ISs have the characteristics of being open, selectivity, relevance and universality [2].

- ✧ Constitutive Quale: The relation between an object (entity) and its constituents, or proper parts, including material, weight, parts and component elements, etc.
- ✧ Formal Quale: That which distinguishes the object within a larger domain, including orientation, magnitude, shape, and dimensionality, color, position, etc.
- ✧ Telic Quale: Purpose and function of the object, including purpose that an agent has in performing an act and built-in function or aim which specifies certain activities, etc.
- ✧ Agentive Quale: Factors involved in the origin or ‘bring about’ of an object, including creator, artifact, and natural kind, causal chain, etc. [4].

As a member of ISSs, QS is also a kind of gestalt, which means that the contents of it cannot be expressed by language completely and linguistic description of it can only be carried out considering such factors as the need for understanding and the actual conditions of the object described.

Constitutive Quale and Formal Quale of a qualia structure, once realized as linguistic expressions, embody non-argumental semantic relations between these linguistic expressions (signifying Constitutive Quale or Formal Quale) and the expressions signifying the object described by the qualia structure; while Telic Quale and Agentive Quale of a qualia structure, once realized as linguistic expressions, embody argumental semantic relation between these linguistic expressions (signifying Telic Quale or Agentive Quale) and the expressions signifying the object described by the qualia structure.

QS is one of the effective means bridging lexicon, syntax, and common sense, which makes QS to have the potential to contribute to RTE.

2.2. ICMs. Comparatively, ICMs and frame theory are the most systematic and authoritative theories of cognitive semantics. ICM is first described with completeness and systematicness in Layoff (1987), the main thesis of which is: ICMs are the means for organizing knowledge, and category structure and prototype effects are the byproducts of that organization [6]. Lakoff’s description of ICM is quite complicated. Here the author cites only Wang’s statements about Cognitive Models and ICM for an easy understanding.

Wang observes that Cognitive Models are a kind of comparatively stereotyped mental structures which are formed during our process of getting familiar with and understanding worlds (including the outside world and the inner world); and that Cognitive Models, consisting of concepts and comparatively changeless relations, are models for organizing and representing knowledge [7]. Wang summarizes the concept of ICM as follows:

ICM is an abstract, relatively complete, idealized understanding of experience and knowledge of certain field carried out by a speaker from a specific cultural background. ICM is a kind of complex, integrated gestalt made up of many Cognitive Models and it has the characteristics of embodiment (viz., it is formed based on interaction between human beings and outside world), gestalt (it is not just an assemble of parts, but an integrated entity), and internality (it is a mode for cognizing matters in the mind) [8].

ICMs are used to express mainly the conceptual structures of abstract words and because

they are idealized, stable, and so on, they can become motivations of TE.

2.3. **Frame.** The concepts of *frame* and *script* originate from the field of artificial intelligence [9]. The concept *frame* is then introduced to the field of linguistics by Fillmore and get developed greatly [10], the result of which is the establishment of *Frame Semantics*.

Frame Semantics, a theory of cognitive semantics, is very special as it studies language using real corpus; and the FrameNet project with Frame Semantics as its theoretical background has been applied extensively in NLP.

Fillmore defines *frame* as covering many other ISs [10]. Nevertheless, this paper inherits the viewpoint of traditional artificial intelligence, treating *frame* as expressing the valence possibilities of a word.

The biggest difference between Frame Semantics and ICM theory is: the starting point of Frame Semantics is the description and understanding of event structures in social contexts and the emphasis is world knowledge, while the starting point of ICM theory is the description of conceptual structures with emphasis on mentality and mental operations.

Frame Semantics maps case frames from Case Grammar to the real world to deal with world knowledge. Frames are descriptions of situations and each frame depicts a little abstract, schematic ‘scene’ or ‘context’. After mapping to the real world, a case frame becomes an event frame and entities in the event frame are the index that can trigger the frame as contexts for understanding. Comprehensive understanding of frames need a lot of default knowledge shared by a speech community.

Seen from different perspectives, a same frame (which may include different events) can be expressed by different syntactic structures [11]. In cognitive linguistics, perspective is an important aspect of construal. If we refer to the FrameNet project, it can be seen that in Commercial_transaction frame, if we focus on the buyer, the buyer is foregrounded and made prominent and thus becomes the subject of a sentence; and in this situation, verbs like *buy*, *spend*, and *pay* act as the core of a sentence and such subframes² as Commerce_buy of Commercial_transaction frame will be first activated. If we focus on the seller, the seller is foregrounded and made prominent and thus becomes the subject of a sentence; and in this condition, verbs like *sell* or *charge* will be the core of a sentence and such subframes as Commerce_sell will be first triggered. If we focus on the goods transacted, the verb *cost* will act as the core of a sentence and such subframes as Commerce_goods-transfer of Commercial_transaction frame will be first triggered. Frame semantics lays stress on explaining polysemy and word sense disambiguity and it can be helpful in RTE.

2.4. **Script.** There is no well-recognized definition of script and only two definitions are quoted here to help get an idea of what is script.

Schank and Abelson offers this definition of script:

A script, as we use it, is a structure that describes an appropriate sequence of events in a particular context. A script is made up of slots and requirements about what can fill those

² The FrameNet project offers eight kinds of frame-to-frame relations, including the subframe relation that exists between Commercial_transaction frame (acting as the parent frame) and Commerce_buy (as child frame) [12].

slots. The structure is an interconnected whole, and what is in one slot affects what can be in another. Scripts handle stylized everyday situations. They are not subject to much change, nor do they provide the apparatus for handling novel situations, as plans do [9].

For Schank and Abelson's purposes, a script is a predetermined, stereotyped sequence of actions that define a well-known situation, which is also meaningful for this study.

Both in short term and at abstract level, scripts are stable, however, in the long term scripts are changeable to certain degree (like culture) and at concrete level, instantiations of scripts usually brings out deviations, with which new information is offered. Deviations embody dynamic uses of language, but they are not the emphasis of this study and will not be discussed further here.

Later, Abelson (1981) offers further explanation of script as follows:

In sum, a script is a hypothesized cognitive structure that when activated organizes comprehension of event-based situations. In its weak sense, it is a bundle of inferences about the potential occurrence of a set of events and may be structurally similar to other schemata that do not deal with events. In its strong sense, it involves expectations about the order as well as the occurrence of events. In the strongest sense of a totally ritualized event sequence (e.g., a Japanese tea ceremony), script predictions become infallible—but this case is relatively rare [12].

According to the discussion above and studies of other scholars, the author observes that scripts owns the following characteristics which can provide clues and convenience for RTE:

- ✧ Contents and structures of scripts as abstract concepts are stable at the synchronic level;
- ✧ In strong scripts, there is usually cause-and-effect relationship between different events;
- ✧ By default, contents (elements and events) of a script are integrated and inseparable.

3. ISs as motivations of RTE. Entailment studies the relationship between two sentences or propositions, while TE studies relationship between two textual snippets. Textual snippets can be language units of any length, such as a phrase, clause, sentence, or complex sentence, sentence group, paragraph and so on. So the study of entailment is part of the study of TE.

If the truth of one textual snippet (the hypothesis, H) comes from another textual snippet (the text, T), then there is an *textual entailment* relation between the two textual snippets, e.g.,

(1) Baby, don't lie on the ground, it has just rained. (T)

(1a)The ground is wet. (H)

By default, if it rains, the ground will get wet. So if there is no special explanation that the ground is not wet, it can be decided that we can get (1a) from (1) or (1) subsumes (1a). In other words, (1) entails (1a) or (1a) is entailed by (1).

The core task of the study of TE is RTE which is the key of textual inference and the

kernel of most *natural language processing* (NLP for short) applications [14].

Inference involved in language understanding needs to obtain entailments, including presupposition, semantic entailment, and cause-effect relations, conversational implicature, etc. Correspondingly and in broad sense, TE has four kinds: *textual presupposition*, *textual semantic entailment*, and *textual resultative entailment*, *textual conversational implicature*. Textual presupposition is further divided into textual semantic presupposition and textual pragmatic presupposition; and textual conversational implicature is further divided into textual conventional conversational implicature and non-conventional conversational implicature. As textual pragmatic presupposition are subjective, covert and defeasible [15] and non-conventional textual conversational involves very extensive contexts, including social cultural and historical values, and mental state, etc., which makes this kind of entailment highly dynamic and full of uncertainty. So this paper does not study textual pragmatic presupposition or textual non-conventional conversational implicature.

In this paper, semantic entailment is defined as entailment which results from direct methods such as word relations and syntactic transformation. There has been large quantity of study about this kind of entailment and it will not be discussed any more here. And thus study objects of this paper include only *textual semantic presupposition*, *textual resultative entailment* and *textual conventional conversational implicature*. The event(s) or speech act(s) described by a textual semantic presupposition (as the hypothesis, H) happen(s) prior to what is described by the text (T); the event(s) or speech act(s) described by a textual conventional conversational implicature (H) happen(s) simultaneously with what is described by the text (T); and the event(s) or speech act(s) described by a textual resultative entailment (H) happen(s) later than what is described by the text (T).

3.1. QS as motivation of RTE. QS contributes mainly to the recognition of textual semantic presupposition and textual conventional conversational implicature. Here is an example of textual semantic presupposition:

(2) Bangbang, don't take down the foot stool of the bike. (T)

(2a) This bike has a foot stool. (H)

Constitutive Quale of bike's QS includes material, weight, parts and component elements, etc., and according to life experience, *foot stool* is an important element of a bike and should be part of the contents of the Constitutive Quale of bike's QS, which means that once such words as 'bike' trigger bike's QS, *foot stool* as part of the QS is also activated and becomes part of the contexts for understanding. Referring to the Constitutive Quale of bike's QS, it can be seen that there is a part-whole relation between *foot stool* and the bike, which is in fact expressed by (2a). And the fact described by (2a) exists before the speech act expressed by (2). Thus, it can be decided that (2a) is a textual semantic presupposition of (2).

As ISs are integrated, once an IS is triggered, all the descriptions of existence and factuality about the contents of it can be the textual semantic presuppositions of the text (T)

that triggers the IS as long as there is no blockings³ in the text (T). Textual semantic presupposition is one important kind of contexts for understanding words and language and which part of the textual semantic presupposition is chosen for understanding depends on the concrete environments in which the text (T) happens.

If the QS of *bike* constructed includes such functions as “ride”, the RTE of the following example will be helped:

(3) The supermarket is quite far from here, why not use my bike. (T)

(3a) The speaker suggests that the listener go to the supermarket by bike. (H)

This is an example of getting a textual conventional conversational implicature (H) from the text (T). There are two reasons for (3) to entail (3a). On one hand, ‘why not’ expresses the function of ‘suggestion’⁴ (of course this is not the contribution of QS); and on the other hand, the word *bike* as a lexical unit⁵ can trigger bike’s QS and thus the *function* of a bike--*ride*. In this example of TE, *ride* as *function* is in fact a presupposition, which is the basis for obtaining the relation of textual conventional conversational implicature between (3) and (3a).

3.2. ICMs as motivations of RTE. ICMs are useful mainly for recognizing textual semantic presupposition and textual conventional conversational implicature. Here the ICM of mother is used for demonstration. According to Lakoff, *Mother* is a concept that is based on a complex model in which a number of individual cognitive models combine, forming a cluster model. The models in the cluster are:

- ✧ The birth model: The person who gives birth is the mother.
- ✧ The genetic model: The female who contributes the genetic material is the mother.
- ✧ The nurturance model: The female adult who nurtures and raises a child is the mother of that child.
- ✧ The marital model: The wife of the father is the mother.
- ✧ The genealogical model: The closest female ancestor is the *mother*[6].

As a kind of ISs, ICM’s contents are also integrated and thus, by default, the short clause “A is B’s mother” contains at least the following presuppositions:

- ✧ A gave birth to B. (H1)
- ✧ B inherits the genetic material of A. (H2)
- ✧ A nurtures and raises B. (H3)

Similarly, ICMs can be motivations of textual conventional conversational implicature, e.g.,

(4) The earth is the mother of mankind and mankind lives in the embrace of the earth.
(T)

³ Blockings are means that prevent entailment from taking place, for details, please refer to Karttunen[16].

⁴ This is an example of the correspondences between concrete linguistic expression and abstract linguistic function which is worth detailed study but will not be given more space in this paper.

⁵ In brief, lexical unit ‘is a pairing of a word with a meaning’ and can be a word or a linguistic unit bigger than a word that can trigger an IS or ISs, for details, please refer to Ruppenhofer etc. [12]

- (4a) The earth nurtures mankind. (H1)
- (4b) The earth offers mankind good living conditions. (H2)

Mother in (4) is used metaphorically. Metaphor is based on ISs and the operations of metaphor can be seen as mapping from a source domain (e.g., *Mother*) to a target domain (e.g., *the earth*) based on similarities. Theories of metaphor observes that:

Metaphorical mapping is systematic, and metaphorical ISs are productive and creative. Once metaphorical mapping happens, usage of the source domain can be accepted systematically by the target domain and some new metaphorical uses of may be created and the target domain may be endowed with new understanding [17].

Mapping all the individual cognitive models of *Mother* one by one to the associations (i.e., different dimensions of meanings of *the earth*) activated by *the earth*, it can be found that the nurturance model of *Mother* has many similarities with the functions of the earth: mother (and father) offer(s) basic necessities of life and meticulous care for their children, while the earth selflessly offers all kinds of living resources and good living environments for mankind, etc. Based on these similarities, a mapping is established between the nurturance model of *Mother* and *the earth*, which creates a possibility that all the contents of the nurturance model of *Mother* become the contents of the ICM of *the earth*, and thus *the earth* is endowed with new meanings. As a result, both (4a) and (4b) are textual conventional conversational implicatures of (4).

This example demonstrates the productivity and creativity of metaphor and shows us what partial mapping is, which will not be explored into in detail in this paper.

3.3. Frames as motivations of RTE. There has been RTE studies using frames [18] and frame-to-frame relations [19], which improves existing RTE effects a lot.

Both contents of frames and frame-to-frame relations can be motivations in RTE and they mainly contribute to the recognition of textual semantic presupposition and textual conventional conversational implicature. Contents of frames as motivations have similar mechanisms as ICMs do and are not to be exemplified here; and only frame-to-frame relations as motivations in RTE be will demonstrated.

FrameNet 1.5 offers eight kinds of frame-to-frame relations, of which *inheritance*, *using*, and *subframe*, *perspective_on* are the most important [13].

The relation *inheritance* between frames is similar to the inheritance relation between words. Inheritance relations between words trigger semantic entailments and similarly, *inheritance* relations between frames contribute to recognition of textual conventional conversational implicature, which will not be exemplified here.

In FrameNet 1.5, *using* is defined as follows :

Using: The child frame presupposes the parent frame⁶ as background, e.g., the Speed frame “uses”(or presupposes) the Motion frame; however, not all parent FEs need to be bound to child FEs [13].

According the this definition of *using*, *using* can help in recognizing textual semantic

⁶ The parent frame can be seen as a kind of small, compact script with fixed contents and structure.

presupposition, e.g.,

(5) Because of high speed, the car bumped into a wall and started a fire, causing two scoundrels in the car died on the spot. (T)

(5a) The car went very fast. (H)

Referring to the Speed frame from the folder of *frame* of FrameNet 1.5, it can be seen that the word *speed* as one of the lexical units that can trigger the Speed frame presupposes the Motion frame that can be triggered by its lexical unit *go*. At the same time, we know that ‘high speed’ from (5) and ‘very fast’ from (5a) in fact express the same meaning. In addition, as far as a car is concerned, the word *go* is felicitous to express its way of motion. Thus, it can be decided that (5a) is one textual semantic presupposition of (5).

FrameNet 1.5 defines the subframe relation as:

Subframe: The child frame is a subevent of a complex event represented by the parent, e.g., the Criminal_process frame has subframes of Arrest, Arraignment, Trial, and Sentencing [13].

In subframe relations, if subevents (e.g., these events expressed by Arrest, Arraignment, Trial, and Sentencing) of the parent frame (e.g., the Criminal_process frame) has strict time sequence or cause-and-effect relationship between (some of) them, there is possibility for subframe relations to become motivations of RTE, e.g., all the events that fall within the child frame of Sentencing presupposes all the events that fall within other subframes of the parent frame--Arrest, Arraignment, Trial because of the strict time sequence between the frame Sentencing and other frames.

FrameNet 1.5 defines Perspective on relation as this:

Perspective on: The child frame provides a particular perspective on an un-perspectivized parent frame. A pair of examples consists of the Hiring and Get_a_job frames, which perspectivize the Employment_start frame from the Employer’s and the Employee’s point of view, respectively [13].

The same parent frame (e.g., the Employment_start frame) can be looked at from different angles to create corresponding perspectivized child frames (e.g., the Hiring and Get_a_job frames). It is found that in both subframe and perspective on relations, if the concrete and abstract frame elements⁷[13] triggered by the hypothesis (H) are subsumed within those concrete and abstract frame elements triggered by the text (T) respectively and there is no blockings in either T or H, the instantiations of the parent frame entail the instantiations of the child frame, e.g.,

(6) Thereupon he dropped out to show his protest and up to now hasn’t found a job. (T)

(6a) Up to now, no body employed him. (H)

(6) describes the Employment_start frame from the perspective of an employee, triggering the Get_a_job frame, while (6a) describes the Employment_start frame from the perspective of an employer, triggering the Hiring frame. Mapping (6) and (6a) to the Employment_start frame, it is found that all these concrete and abstract frame elements of the parent frame instantiated in (6a) are subsumed in (6), so it is judged that (6) entails (6a) or specifically

⁷ Concrete frame elements are instantiations of abstract frame elements which are presented in frames and can be inferred from a frame at the abstract level.

speaking (6a) is the textual conventional conversational implicature of (6).

3.4. Scripts as motivations of RTE. Some scholars have utilized scripts to help RTE [20]. However, there is a need to offer more detailed discussion about how scripts become motivations of RTE.

Script is the sequence of events (or frames); and the boundary between script and frame is not clearcut. These characteristics of script mentioned in 2.4 make it possible for scripts to be motivations of textual semantic presupposition, textual resultative entailment and textual conventional conversational implicature, which is different from frames as motivations of RTE.

Schank & Abelson offers the following sketch of a script of restaurant from the perspective of the customer:

Script: restaurant

Roles: customer, waitress, chef, cashier

Reason: to get food so as to go up in pleasure and down in hunger

Scene 1: entering

PTRANS self into restaurant

ATTEND eyes to where empty tables are

MBUILD where to sit

PTRANS self to table

MOVE sit down

Scene 2: ordering

ATRANS receive menu

MTRANS read menu

MBUILD decide what self wants

MTRANS order to waitress

Scene 3: eating

ATRANS receive food

INGEST food

Scene 4: exiting

MTRANS ask for check

ATRANS receive check

ATRANS tip to waitress

PTRANS self-cashier

ATRANS money to cashier

PTRANS self out of restaurant [9]

This is a strong script and the events in different scenes are restricted by time sequence and there is cause-and-effect relationship between some events of different scenes. Events in the front scenes are prerequisites for the events in the later scenes to take place.

The sketch of restaurant script above can help recognize the relationship between (7) and (7a):

(7) A: Let's eat together, OK? B: Oh, I have just return from Xiao Guanyuan. (T)

(7a) Speaker B has eaten. (H)

Similar dialogues often happens in Wuhan university. Xiao Guanyuan is a restaurant in Wuhan university and from the dialogue it can be inferred that there is high possibility that the two speakers have common knowledge about Xiao Guanyuan. The word *eat* and the place Xiao Guanyuan as a restaurant can definitely trigger the *restaurant script*, which makes all of the contents in the script to be the potential contexts for understanding the dialogues that trigger the script.

Referring to the characteristics of script as a kind of schemata and the time sequence between the events and scenes of the *restaurant script*, 'return from Xiao Guanyuan' (entailing 'go out of restaurant') triggers scene 4 of the *restaurant script*, which in turn presupposes the preceding three scenes. Besides, the frame elements of (7a) are all included in (7) and there is no blocking means in both (7) and (7a). Thus, it can be judged that (7a) is a textual semantic presupposition of (7).

The *restaurant script* can also be motivation of textual conventional conversational implicature, e.g.,

(8) Take more money with you, I want to have a meal. (T)

(8a) The speaker wants to eat in a restaurant. (H)

'Have a meal' is a synonym of 'eat'. 'Money' is one of the essential elements of the *restaurant script*. 'Have a meal' and 'Money' can easily trigger the *restaurant script*. 'I want to have a meal' and 'The speaker (i.e. 'I') wants to eat in a restaurant' hints the same time for the planned event to happen. With these conditions and referring to the analysis of the above example, it can be decided that (8a) is a textual conventional conversational implicature of (8).

In fact, under the broad context of 'eating', any essential elements (e.g, waitress, check) or events (e.g., receive menu) of the *restaurant script* can trigger the script, making all the other contents of the scripts contexts for understanding.

Because of the cause-and-effect relationship between some events of the *restaurant script*, it can be motivation of textual resultative entailment. From the perspective of cause-and-effect, the content of the above sentence (8a) is the result of (8), and (8) is the cause of (8a). From the perspective of logic there is no inevitable cause-and-effect relationship between (8) and (8a), however, it is reasonable from the perspective of linguistics, e.g.,

(9) Why you go out of the restaurant?

(9a) Because I have finish eating.

(9b) Because I have paid the money.

It is natural for (9a) and (9b) to be the answers of (9). So scripts can be helpful in recognizing textual resultative entailment.

4. Conclusion. Cognitive semantics observes that cognitive styles are mainly in the form of ISs (but not proposition); and the operations of metonymies and metaphors we live by are based on ISs [17][21]. Study of this paper shows that many literal usages of language also

involve ISs. To improve the effects of applications (e.g., NLP), there is a need to carry out a comprehensive study to make clear the functions of ISs as motivations behind RTE and to establish or improve (e.g, we already have the FrameNet project) corresponding resources of all the ISs, which should offer more effective means for understanding language, especially metonymic and metaphorical usage of language and for improving the effects of linguistic application studies.

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