

# Breaking Down Rhetorical Relations for the purpose of Analysing Discourse Structures

Jun'ichi FUKUMOTO\*    Jun'ichi TSUJII †  
Centre for Computational Linguistics, UMIST  
P.O.Box 88, Manchester M60 1QD, United Kingdom  
E-mail jun@ccl.umist.ac.uk    tsujii@ccl.umist.ac.uk †

## Abstract

In Rhetorical Structure Theory (RST) the definitions of some relations are rather vague because they are given on a pragmatic basis. This paper presents another way of seeing the relations which leads to a more precise specification of the relations. The relations are associated with constraints on the semantic relationships between the propositional contents of two clauses, their Modality and Tense/Aspect.

## 1 Introduction

The Rhetorical Structure Theory (RST) by Mann and Thompson [Mann and Thompson, 1987] is a theory of inter-sentential (or inter-clausal) relationships in a text. Although RST is intended to serve both as a framework for text analysis and text generation, it has so far been used exclusively in text generation [Hovy et al., 1992] [Linden et al., 1992] [Rösner and Stede, 1992]. Several researchers recognise that RST has defects as an analytical framework. Moore and Pollack [Moore and Pollack, 1992], for example, claim that the assumption of a *single* relation between discourse elements is one of the reasons why RST analyses are inherently ambiguous. They also claim that the under-specificity of the rhetorical relation definitions causes problems.

Our claim is that the main cause of the difficulties of applying RST to text processing systems is that some of the relations are defined on the basis of the effects which they have on a reader. This is particularly the case for the relations classified as *presentational relations*, the relations whose intended effects are to increase *some* inclination in a reader.

Background relation, for example, is defined as a relation whose Satellite increases the ability of a reader to comprehend an element in Nucleus and the reader will not fully comprehend Nucleus before reading the text of Satellite. This definition is problematic because there are many ways of increasing the ability of a reader to comprehend Nucleus. More seriously, the definition

itself does not predict anything about textual forms of Nucleus and Satellite.

In order to use RST in actual text processing systems, we have to break down such definitions to relate them with textual forms. In this paper, we show how the definitions can be broken down and be associated with semantic constraints between constituents (clauses), in order to relate them with constraints on surface linguistic forms. Among the 24 rhetorical relations defined in [Mann and Thompson, 1987], we focus on *presentational relations* (7 relations are classified as such) which are the most problematic. The results of applying our method to leading articles in a Japanese newspaper are also discussed.

## 2 Basic Framework

In RST, 24 relations are divided into two groups: *presentational relations* and *subject matter relations*. According to Mann and Thompson [Mann and Thompson, 1987], subject matter relations are those whose intended effect is that the reader recognises the relation in question and presentational relations are those whose intended effect is to increase *some* inclination in the reader. Moore and Pollack [Moore and Pollack, 1992] comment that subject matter relations are informational and presentational relations are intentional.

Table 1 shows what kind of inclination each presentational relation is intended to increase. One can see that the definitions are highly abstract and have nothing to do with the surface realisations of the relations.

On the other hand, it has been observed that there are various surface cues in texts which are useful for identifying inter-sentential (or inter-clausal) units. Halliday and Hasan [Halliday and Hasan, 1985] identified a set of linguistic devices for linking one part of a text to another, such as *reference*, *substitution* and *ellipsis*, *conjunction*, and *lexical cohesion*.

From the view point of text processing, these linguistic devices can be used as cues for segmenting a text into structural units (Satellite and Nucleus). However, these cues hardly give any clue about which clause of a unit is Satellite, which clause is Nucleus, and which

---

\*Supported by Oki Electric Industry Co., Ltd.

Table 1: RS relations and their inclination type

relation	kind of inclination
Background Enablement	<i>ability</i> of R to comprehend an element potential <i>ability</i> to perform action in N
Motivation Evidence	<i>desire</i> to perform action in N <i>belief</i> of N
Justify Antithesis	<i>readiness</i> to accept writer's right in N <i>positive regard</i> for situation presented in N
Concession	<i>positive regard</i> for situation presented in N

RS relation combines the two clauses into a single unit. For determining these, we have to look for other kinds of surface cues.

Because RS relations are defined pragmatically, their ultimate recognition requires understanding of texts which in turn requires detailed knowledge about the world. Furthermore, the condition that the presentational relations are inherently *intentional*, implies that their recognition requires knowledge about the writer's intention, plans, etc. Because this kind of information is implicit in texts, its recognition often causes problems.

However, though the writer's intention is implicit, certain linguistic devices give us clues to infer it. Modality information in a clause, for example, expresses the writer's attitude toward an event/state described, and therefore, often gives us clues to recognise a RS relation.

Let us consider the following two examples:

**[Example 1]**

- (1) I prepared documents for a meeting.
- (2) I sent them to the head office.

**[Example 2]**

- (1)' I am preparing documents for a meeting.
- (2)' I have to send them to the head office.

Though these two examples describe pairs of similar events, the relation between (1) and (2) in Example 1 is (*temporal*) Sequence (a subject matter relation) because they simply describe two events which happened in sequence. On the other hand, in Example 2, (1)' describes an event occurring simultaneously with the utterance, and (2)' concerns what the writer plans to do. While the two events, *preparing documents* and *sending them*, may happen in this sequence, the relation is not regarded as Sequence but as Background. (2)' gives the reason why the writer is performing the action described by (1)'.<sup>1</sup>

This change of RS relation occurs due to the difference of modality of (2) and (2)'. Our basic claim is that, though they cannot determine RS relations uniquely, information of modality and tense of clauses imposes significant constraints on possible RS relations, and, being used together with other surface cues

like clausal conjunctions, it can reasonably restrict a set of possible discourse structures of texts without resorting to detailed knowledge about the world and the writer's plan.

However, the contribution of modality and tense to the constraints of RS relations is not straightforward. Both these grammatical features are intertwined with the propositional content of clauses. Therefore, in order to formulate the constraints on them properly, we have first to reveal how the intended effects of RS relations can be attained. This leads to our breaking down single RS relations into sets of subschemas, each of which is formulated in terms of the semantic relationships between propositional contents of clauses, their modality and temporal relationships.

### 3 Properties of Clauses

Like Mann and Thompson, we use clauses as the basic constituents which are related by RS relations, except that clausal subjects and complements and restrictive relative clauses are considered parts of their host clause. The constraints which we formulate for each RS relation are expressed in terms of *properties* of clauses. In order to express these constraints formally, we first introduce the basic terms.

#### 3.1 Contents and Modality

A clause comprises its *Contents* and *Modality*. Modality is the part which expresses the writer's attitude toward the Contents.

While individual languages have their own linguistic devices or grammatical forms of modality, what sorts of modality are expressed by such linguistic devices does not vary from one language to another. For example, although the major linguistic device for modality are modal auxiliary verbs both in English and in Japanese, some kinds of modality expressed in Japanese by modal auxiliary verbs are expressed by lexical verbs in English, and vice versa.<sup>1</sup>

Furthermore, we find many phrasal or quasi-phrasal expressions which consist of several words, and which collectively express the writer's attitude toward the event/state described. In order to treat them, we adopt a semantics-based view for the definition of Modality. That is, we treat expressions which concern the writer's attitude as modal expressions, whichever linguistic forms they may take. We first establish a classification schema of Modality based on semantic considerations (See Section 3.3) and then treat all expressions whose functions can be classified under this schema as modal expressions.

<sup>1</sup>The concepts expressed by English lexical verbs like *wish*, *hope*, *beg*, *urge*, etc., for example, are often expressed by modal auxiliaries in Japanese, when the subject is the writer or speaker.

Contents of a clause is defined as the part which remains after removal of the modal expression. Contents contain expressions concerning tense and aspect, which also contribute to the specification of constraints on RS relations. The same discussion as the above can be applied to Tense and Aspect, so that all expressions whose function is to express temporal aspects of clauses are, regardlessly of their actual forms, treated in the same classification schemas. Tense/Aspect are represented as properties of Contents (See Section 3.2).

### 3.2 Properties of Contents

Contents is the main part of Clause of which a truth value can be established. Contents is characterised by three attributes: *Type*, *Time* and *Quality*.

#### (a) Type

The truth value of Contents changes according to the time axis. We can think of two time points,  $t_a$  and  $t_b$ , where the Contents  $C$  is true during the time interval between  $t_a$  and  $t_b$ . Depending on the temporal nature, we classify Contents into the following four classes.

- *Static*  
 $t_a = \text{undef}, t_b = \text{undef}, C(t) = \text{true}$   
( $t_a < t < t_b$ )
- *Durative*  
 $t_a = \text{def}, t_b = \text{def}, C(t) = \text{true}$   
( $t_a < t < t_b$ )
- *Repetitive*  
 $t_a = \text{def}, t_b = \text{def}, C(t_i) = \text{true}$   
( $t_a < t_1 < t_2 < \dots < t_i < \dots < t_n < t_b$ )
- *Non-repetitive*  
 $t_a = \text{def}, t_b = \text{def}, C(t_i) = \text{true}$   
( $i = 1; t_a \leq t_i \leq t_b; t_a \hat{=} t_b$ )

In the above,  $t_a/b = \text{undef}$  in Static means that the truth value of Contents does not change.

#### (b) Time

The temporal nature of Contents is also classified in terms of the speech time,  $T_S$ , as follows.

- *Before* :  $T_S < t_a$
- *Simultaneous* :  $t_a < T_S < t_b$
- *After* :  $t_b < T_S$

We use the following notation to specify a temporal relationship between two Contents ( $C_1$  and  $C_2$ ).

- $C_1 \ll C_2$  ...  $C_1$  occurs before  $C_2$
- $C_1 \gg C_2$  ...  $C_1$  occurs after  $C_2$

#### (c) Quality

Contents is also classified according to whether the writer believes it is good or bad. This classifica-

tion is represented by the attribute *Quality (qty)* whose value is either *good* or *bad*.<sup>2</sup>

### 3.3 Properties of Modality

Concerning modality, a number of criteria have been proposed. Palmer [Palmer, 1986] took the same semantics-based view of Modality as we discussed in Section 3.1, though he hardly extended his analysis to cover phrasal or quasi-phrasal expressions. We adopt his classification schema and modify it. He classified modality into *Epistemic modality* and *Deontic modality*. Epistemic Modality is concerned with language as information, with the expression of the degree or nature of the writer's commitment to the truth of what s/he says. Deontic modality is concerned with language as action, mostly with the expression by the writer of his/her attitude towards possible actions by him/herself and others.

#### 3.3.1 Epistemic modality

Epistemic modality is classified according to the degree of the writer's commitment to the truth of Contents, as follows.

- *Evidential (M-ep<sub>evid</sub>)*  
The truth condition of Contents is based on evidence like sensory evidence or linguistic evidence.
- *Confidential (M-ep<sub>com</sub>)*  
The truth condition of Contents is based on the degree of confidence expressed by the writer.
- *Inferential (M-ep<sub>inf</sub>)*  
The truth condition of Contents is based on a reasoning rule of the writer and inferred from the other facts.
- *Assumptive (M-ep<sub>asm</sub>)*  
The truth condition of Contents is based on some assumption.

The degree of the writer's commitment to the truth becomes weaker in the order of Evidential, Confidential, Inferential, Assumptive. In the following sections, we use " $\succeq$ " and " $\preceq$ " to indicate this ordering.

$$C_x \succeq C_y \quad \text{or} \quad C_y \preceq C_x$$

means that the degree of the writer's commitment to the truth of Contents  $C_x$  is higher than or equal to the degree of the writer's commitment to the truth of Contents  $C_y$ .

<sup>2</sup>When the writer does not think that his/her judgement is obvious for readers, s/he usually expresses the judgement by Modality. Therefore, this attribute has a value only when the judgement can be made based on common sense knowledge.

### 3.3.2 Deontic modality

Deontic modality is classified according to the kind of a writer's attitude which s/he expresses.

- *Evaluative* ( $M-de_{eva+}$ ,  $M-de_{eva-}$ )  
Evaluative expresses the writer's attitude towards what s/he already accepts as true in his/her mind. There are two kinds of attitude; positive ('+') and negative ('-').
- *Volitive* ( $M-de_{vol+}$ ,  $M-de_{vol-}$ )  
Volitive is concerned with a possible action or situation which a writer is hoping or wishing to occur. There are two kinds of attitude; possible ('+') and impossible ('-').
- *Directive* ( $M-de_{dir}$ )  
Directive is concerned with an action which a writer tries to get others to perform. Though Directive is further classified into Permission and Obligation, their distinction is not relevant for our purpose.
- *Commissive* ( $M-de_{com}$ )  
Commissive is concerned with an action which a writer commits him/herself to perform or to ensure that an event takes place.
- *Request* ( $M-de_{req}$ )  
Request is concerned with an action which a writer can ask others to do.

### 3.3.3 Combination of Epistemic and Deontic modality

In Deontic modality Evaluative and Volitive are concerned with a writer's attitude toward Contents which has a truth value. Therefore, clauses with these modalities can also have Epistemic modality. If a clause has any of the other values of Deontic modality like Directive, etc., the Clause has no Epistemic modality as such. However, for the simplicity of formulation in Section 4, we assume their Epistemic modality value to be Confidential.<sup>3</sup>

## 4 Breaking Down of Rhetorical Relations

In this section, we will show how Background, Enablement, Motivation and Evidence of the presentational relations are broken down into subschemas, and give formal representations of their constraints. The constraints comprise

(a) Semantic Relationships between Contents of the two clauses

(b) Constraints on Time

<sup>3</sup>This is not inappropriate because it is considered that a writer commits the action in the Clause with full confidence in his/her action.

(c) Constraints on Modality.

(b) and (c) are expressed by using a characterisation of clauses of Section 3. We first show the framework for (a) and then give the actual breakdown of presentational relations.

### 4.1 Semantic Relations

By semantic relationships between Contents we mean the relationships between states/actions/events described by Contents in the extra-linguistic world.<sup>4</sup> As we see in Example 1 and 2, even when two actions seem to stand in the same semantic relationship, they can be used to attain different effects on a reader by adding different expression of a writer's attitude as Modality or putting them in different temporal relationships.

We classify semantic relationships into five categories, four of which also are subject matter relations in RSL. That is, if two Contents are presented without any Modality, they stand in the corresponding subject matter relations. We use the following symbols in their definitions.

- $Cl_i$  : Clause  $i$  composed of Contents and Modality
- $C_i$  : Contents of Clause  $i$
- $S_i$  : Contents of Clause  $i$  whose Type is Static
- $A_i$  : Contents of Clause  $i$  whose Type is not Static
- $M_i$  : Modality in Clause  $i$

[Semantic Relations]

- $S_i - (A_k) \rightarrow S_j$   
 $A_k$  causes a situation change from  $S_i$  to  $S_j$ . If a Contents states that  $A_k$  causes a situation  $S_j$ ,  $S_i$  will be omitted.
- $S_i \models Cl_j$   
 $Cl_j$  is held true or acceptable in the environment stated in  $S_i$ . If  $Cl_j$  expresses a situation, this relation is the same as *Circumstance*.
- $S_i \vdash Cl_j$   
 $Cl_j$  is held true or acceptable, if  $S_i$  is true. If  $Cl_j$  expresses an action caused by  $S_i$ , this relation is the same as *Cause and Result*.
- $S_i \rightsquigarrow A_j$   
 $S_i$  has the possibility to resolve the problem stated in  $A_j$ . This relation is the same as *Solutionhood*.
- $C_i \Rightarrow C_j$   
 $C_i$  presents additional details about  $C_j$  or is inferentially accessible in  $C_j$  in one or more ways. This relation is the same as *Elaboration*.

<sup>4</sup>One may argue that such relationships have to be called pragmatic. However, we adopt a rather narrow definition of the term *pragmatic* and a broad definition of the term *semantic*. We use *pragmatic* only when it concerns effects on readers or the intention of the writer. The rest, like relationships held in the extra-linguistic world, are called *semantic issues*.

## 4.2 Subschemas of Presentational Relations in RST

We show breakdowns of four typical presentational relations into their subschemas and state their constraints more formally. The subscripts of “*nu*” and “*sa*” means Nucleus and Satellite, respectively.

### 4.2.1 Background

1. Time and space situations are stated by an action in Satellite, and under these situations an action in Nucleus becomes possible.
  - (a)  $S_0-(A_{sa}) \rightarrow S_1, S_1 \models A_{nu}$
  - (b)  $A_{sa} \ll A_{nu}$   
( $A_{nu}$  becomes true while  $S_1$  is true. Then, the time of  $A_{sa}$  is before  $A_{nu}$ .)
  - (c)  $A_{sa} \succeq A_{nu}, M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}$   
(If  $A_{nu}$  becomes possible in the environment given by  $A_{sa}$ , then the modality of  $A_{sa}$  should be more certain than that of  $A_{nu}$ .)
2. Time and space situation are stated in Satellite, and under the situation an action in Nucleus becomes possible.
  - (a)  $S_{sa} \models A_{nu}$
  - (b)  $S_{sa} \ll A_{nu}$
  - (c)  $S_{sa} \succeq A_{nu}, M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}$
3. Satellite presents additional information to understand Contents in Nucleus.
  - (a)  $C_{sa} \Rightarrow C_{nu}$
  - (b) no
  - (c)  $M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}, M_{nu} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}$   
(Both Clauses will be understood as true, so they have to have truth value.)
4. An action in Nucleus has the possibility to resolve an undesirable situation which is caused by an action in Satellite.
  - (a)  $S_0-(A_{sa}) \rightarrow S_1[qty : bad], A_{nu} \rightsquigarrow S_1$
  - (b)  $A_{sa} \ll A_{nu}$
  - (c)  $M_{sa} \in \{\mathbf{M-cp_{evi}|con}\}$   
( $A_{sa}$  is an event which has occurred or is occurring, or a writer is confident about the event. A writer intends to do  $A_{nu}$  to resolve a problem caused  $A_{sa}$ .)
5. Nucleus states an undesirable situation caused by another undesirable situation stated in Satellite.
  - (a)  $S_{sa}[qty : bad] \vdash S_{nu}[qty : bad]$
  - (b)  $S_{sa} \ll S_{nu}$
  - (c)  $S_{sa} \succeq S_{nu}, M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}, M_{nu} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}$
6. An action in Nucleus can resolve an undesirable situation stated in Satellite.
  - (a)  $S_{sa}[qty : bad] \neg(A_{nu}) \rightarrow S_1[qty : good]$
  - (b)  $S_{sa} \ll S_{nu}$
  - (c)  $M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}$
7. An action in Nucleus is caused by a situation in Satellite.
  - (a)  $S_{sa} \vdash A_{nu}$
  - (b)  $S_{sa} \ll A_{nu}$
  - (c)  $S_{sa} \succeq A_{nu}, M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}, M_{nu} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}$
8. Based on a situation which is caused by an action in Satellite, a writer’s attitude stated in Nucleus is acceptable.
  - (a)  $S_{sa} \models Cl_{nu}$  or  $S_{sa} \models Cl_{nu}$
  - (b) no
  - (c)  $S_{sa} \succeq S_{nu}, M_{sa} \in \{\mathbf{M-cp_{evi}|con|inf|asm}\}, M_{nu} \in \{\mathbf{M-dc_{eva|vol|dir|com|req}}\}$
9. Based on a judgement stated in Satellite, a writer’s attitude stated in Nucleus is acceptable.
  - (a)  $Cl_{sa} \models Cl_{nu}$  or  $Cl_{sa} \vdash Cl_{nu}$
  - (b) no
  - (c)  $M_{sa} \in \{\mathbf{M-dc_{eva}}\}, M_{nu} \in \{\mathbf{M-dc_{eva|vol|dir|com|req}}\}$

### 4.2.2 Enablement

1. Nucleus states an action which will be performed by a reader, and the action becomes possible by presenting the situation in Satellite.
  - (a)  $S_{sa} \vdash A_{nu}$
  - (b)  $S_{sa} \ll A_{nu}$   
(When  $S_{sa}$  is presented,  $A_{nu}$  becomes possible. So, the time of  $S_{sa}$  is before  $A_{nu}$ .)
  - (c)  $M_{sa} \in \{\mathbf{M-cp_{evi}|con}\}, M_{nu} \in \{\mathbf{M-dc_{dir|req}}\}$   
( $S_{sa}$  already exists or will exist, so  $S_{sa}$  has the possibility to have truth value. If  $S_{sa}$  is true,  $A_{nu}$  becomes possible. So,  $S_{sa}$  should be more certain than  $A_{nu}$ .)
2. Nucleus states an action which will be performed by a reader, and the action becomes possible by presenting the situation which is caused by an action in Satellite.
  - (a)  $S_0-(A_{sa}) \rightarrow S_1, S_1 \vdash A_{nu}$
  - (b)  $A_{sa} \ll A_{nu}$
  - (c)  $M_{sa} \in \{\mathbf{M-cp_{evi}|con}\}, M_{nu} \in \{\mathbf{M-dc_{dir|req}}\}$

### 4.2.3 Motivation

1. An action stated in Nucleus causes a good situation stated in Satellite. It is considered that the situation motivates the reader to perform the action.

- (a)  $S_0-(A_{nu}) \rightarrow S_{sa}, S_{sa}[qty : good],$   
actor( $A_{nu}$ , Reader)
- (b)  $A_{nu} \ll S_{sa}$
- (c)  $M_{sa} \in \{M-ep_{con|inf|asm}\},$   
 $M_{nu} \in \{M-de_{eval|vol|dir|com|req}\}$

2. An action stated in Nucleus causes a bad situation stated in Satellite. It is considered that the situation motivates the reader not to perform the action.

- (a)  $S_0-(A_{nu}) \not\rightarrow S_{sa}, S_{sa}[qty : bad],$   
actor( $A_{nu}$ , Reader)
- (b)  $A_{nu} \ll S_{sa}$
- (c)  $M_{sa} \in \{M-ep_{con|inf|asm}\},$   
 $M_{nu} \in \{M-de_{eval|vol|dir|com|req}\}$

3. Satellite states some attributive information related to an action in Nucleus, and the information may be desirable for Reader.

- (a)  $S_{sa}[qty : good] \Rightarrow A_{nu}$
- (b) no
- (c)  $M_{sa} \in \{M-ep_{evi|con|inf|asm}\}$

### 4.2.4 Evidence

- (a)  $C_{sa} \vdash C_{nu}$
- (b)  $C_{sa} \ll C_{nu}$
- (c)  $M_{sa} \in \{M-ep_{evi}\}, M_{nu} \in \{M-ep_{con|inf}\}$

## 5 Examples

We will show an example of a text structure analysis. Figure 1 shows a sample text from a leading article in a Japanese newspaper<sup>56</sup> and Table 2 shows the attributes of each sentence. The discourse structure of the sample text is shown in Figure 2.

In this example, the following relations are analysed as presentational relations. The number attached to a relation name shows the subschema number of the relation.

- Background(8) between ‘1-2’ and ‘3’

Sentence 3 has Evaluative modality about the situation ‘3’ (economic crisis) and it is based on the situation of ‘1-2’ (drop of dollar). These satisfy the constraints of the 8th subschema of Background.

<sup>5</sup>This article appeared in the October 30th, 1987, morning edition of the Asahi Shimbun.

<sup>6</sup>Literal translations are made by the authors.

1	世界的な株式市場の混乱は外国為替市場にも波及し、 (A world-wide confusion in stock market affected the foreign exchange rate.)
2	ドル相場が急落した。(and exchange rates for the dollar dropped sharply.)
3	経済危機の様相が、一段と強まったわけだ。(It is regarded that the aspect of economic crisis has been worsened.)
4	国際的な政策協調の足並みの乱れが、市場を動揺させている。(Disagreement of international policy is making the market unsettle.)
5	ドルを防衛するために (to protect the dollar)
6	米国は、きぜんとした態度を示すべきときだ。(It is high time that US should show a resolute attitude.)
7	ドルは依然として基軸通貨の地位にあり、(The dollar is the key currency,)
8	もし米国が行き詰まれば、(if US comes to a deadlock,)
9	悪影響は世界に及ぶ。(a bad economical influence affects all the world.)
10	他の国々にも、この点を頭に入れて協調体制を固め直さなければならない。(Other countries should re-solidify their cooperation taking this point into consideration.)
(©1987 Asahi Shimbun)	

Figure 1: Sample text

- Background(6) between ‘4’ and ‘5-6’

The semantic relation is that a bad situation in sentence ‘4’ (unsettle market) will be resolved by performing an action in ‘5-6’ (show a resolute attitude). Sentence ‘5-6’ has Directive modality. These satisfy the constraints of the 6th subschema of Background.

- Background(7) between ‘7’ and ‘8-9’

The situation ‘7’ (dollar is a key) is held true, so Contents ‘8-9’ (effect of bad influence) is true. These satisfy the constraints of the 7th subschema of Background.

Table 2: Attributes of sample sentences

No.	Type	Time	Modality
1	Durative	Before	M-ep <sub>evi</sub>
2	Non-repetitive	Before	M-ep <sub>evi</sub>
3	Static	Simult.	M-de <sub>eva</sub> , M-ep <sub>con</sub>
4	Static	Simult.	M-ep <sub>con</sub>
5	Durative	After	M-ep <sub>con</sub>
6	Non-repetitive	After	M-de <sub>dir</sub>
7	Static	Simult.	M-ep <sub>con</sub>
8	Non-repetitive	After	M-ep <sub>asm</sub>
9	Durative	After	M-ep <sub>con</sub>
10	Durative	After	M-de <sub>req</sub>

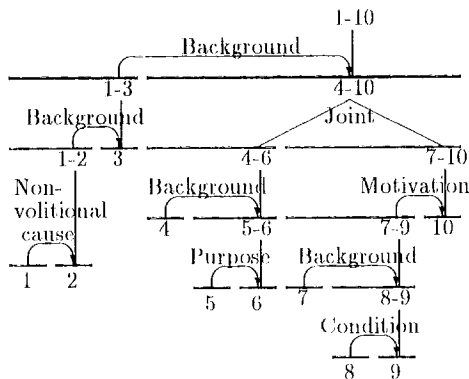


Figure 2: Discourse structure of the sample text

- Motivation(2) between ‘7-9’ and ‘10’  
Sentence ‘7-9’ states a bad situation (effect of bad influence), and the action in ‘10’ (re-solidify their cooperation) has the possibility to change the situation. The writer is requesting the other countries to take this action. These satisfy the constraints of the 2nd subschema of Motivation.
- Background(9) between ‘1-3’ and ‘4-10’  
The request in ‘4-10’ (re-solidify their cooperation) is based on the judgement of ‘1-3’ (a writer’s evaluation of the economic crisis). These satisfy the constraints of the 9th subschema of Background.

## 6 Conclusion

In this paper, we propose further a breakdown of the presentational relations in RST into their subschemas. The subschemas represent strategies by which two states/actions/events which stand in certain semantic relationships can be used to attain intended effects on readers. By associating the definitions of the relations with formally stated constraints, these subschemas help human analysts to recognise them in texts, and thus improve RST as an analytical tool. Moreover, because characterisation of clauses in Section 3, especially Modality and Tense/Aspect, are accompanied by their actual linguistic realisations, some parts of the constraints stated in Section 4 can readily be associated with textual forms and be used for text processing systems. Although constraints on semantic relations between Contents can only be evaluated by reference to a knowledge base, we expect that, even without constraints on semantic relations, the other constraints can be used to restrict a set of possible inter-clausal structures of texts.

We have defined four presentational relations in RST more formally and analysed a sample text using these definitions. But the definitions do not cover all the relations in RST and have not been widely tested. After

defining all the relations, we will apply them to analyse a full range of text.

## References

- Halliday, M. A. K. and Hasan, R. (1985). *Language, context, and text: aspects of language in a social-semiotic perspective*. Oxford University Press.
- Hovy, E., Lavid, J., Maier, E., Mittal, V., and Paris, C. (1992). Employing knowledge resources in a new text planner architecture. In *Proc. of 6th International Workshop on NLC*, pp. 57-72.
- Linden, K. V., Cumming, S., and Martin, J. (1992). Using system networks to build rhetorical structures. In *Proc. of 6th International Workshop on NLC*, pp. 183-198.
- Mann, W. C. and Thompson, S. A. (1987). Rhetorical structure theory: A theory of text organization. USC/ISI Reprint Series RS-87-190.
- Moore, J. D. and Pollack, M. E. (1992). A problem for RST: The need for multi-level discourse analysis. *Computational Linguistics*, 18(4), pp. 537-544.
- Palmer, F. R. (1986). *Mood and modality*. Cambridge University Press.
- Rösner, D. and Stede, M. (1992). Customizing RST for the automatic production of technical manuals. In *Proc. of 6th International Workshop on NLC*, pp. 199-214.