


DISCOURSE COHERENCE AND STRUCTURE

K.SRIRAGHAV

OUTLINE

- 
- Need for discourse coherence
 - Coherence relations
 - Discourse Interpretation
 - Discourse Structure



INTRODUCTION

COHESION VS. COHERENCE

- **Coherence** is "the **internal [resource]** for **structuring the clause** as a message", including the notions of 'theme' and 'information'
- **Cohesion** refers to the **external relationship between clauses** and clause complexes, which are independent of grammatical structure.
- **As a rule of thumb, a text can be coherent without being cohesive, and vice versa.**
- In the **following example**, the text shows a **strong degree of cohesion**, with its constituents being interlinked by many cohesive ties. But it is **not coherent**.
- **"Yesterday I met an old friend in London. In London, there are numerous public libraries. These libraries were visited by boys and girls. The boys are handsome, and they often go to public swimming pools. These swimming pools were closed for several weeks last year. A week has seven days. "**

NEED FOR DISCOURSE COHERENCE

- Consider the following example
 - Biomass is emerging as a viable source of power for rural electrification in India. At first glance, Kirgavalu may look like a typical village in Southern Karnataka.
- Both sentences are well formed and independently interpretable. But the passage seems a bit odd.
- Reason = we **try to establish a connection between first and second sentence.**
- The fact is the **discourse is not coherent.**
- In order to make the text coherent, we might **build an understanding** that perhaps **“Kirgavalu has a biomass plant”.**



COHERENCE RELATIONS

WHAT ARE COHERENCE RELATIONS?

- Many researchers have defined **coherence relations** as **relationships existing between sentences in a discourse** and have proposed various instances.

- **Joseph Grimes** mentioned the **relational rhetorical predicates** in his work, “**Thread of Discourse**” includes:


- ❖ Alternation
- ❖ Specification
- ❖ Equivalence
- ❖ Explanations

Discourse = “process of using knowledge acquired in the past to know what is happening in the present”

- The list of **coherence relations** proposed by **Hobbs** includes

- 1) Occasion
- 2) Explanation
- 3) Elaboration
- 4) Parallel
- 5) Contrast
- 6) Result
- 7) Exemplification

We'll
see this
only



1. OCCASION

- Consider the following passage:
 - At 9 AM, the train arrived at Delhi. The conference was inaugurated at 10 AM.
- One way to bring in **coherence** is to assume that **someone who wants to attend the conference was on the train.**
- So, **the first event sets up the occasion for the second.**
- This is **not causality** relation – there is nothing special about the train that causes the conference to commence.
- So there are two cases:
 - A change of state can be inferred from the assertion of S0, whose final state can be inferred from S1
 - A change of state can be inferred from the assertion of S1, whose initial state can be inferred from S0



1. OCCASION

- **Example 1:**

Go out of this door. → A

Turn right. → B

Go to the second room. → C

△ A → describes a change of location and assumes an orientation.

△ Final state of A holds during the event described in B.

△ Initial state of C is inferred from B.

Type	A	B	C
1	Loc1 → Loc2	Loc2	
2		Loc2	Loc2 → Loc3

Example 2:

Increment the counter by one.

If it is 100, reset it to zero.

The value of the counter is changed, which is presupposed in the second sentence.

2. EXPLANATION

- The segment S1 is an explanation of S0 if S1 describes an event or state that could cause a state or event in S0.
 - Sasana ate all the rice in the bowl. She was very hungry.
- In this passage, S1 explains the event asserted by S0.
- So, **explanation relates a segment of discourse to listener's prior knowledge.**
- **Causality can be explicitly expressed like below:**
 - Sasana ate all the rice in the bowl because she was very hungry.

3. ELABORATION

- **Elaboration** relation involves identical entities.
- **Formal definition**: Infer the same proposition from the assertions of S0 and S1.
 - Vijay scored an unbeaten century today. He was in full swing and made 108 not out on 97 balls.
- From the first sentence and from what we know about unbeaten century, we infer that Vijay made more than 100 runs and he remained not out.
- i.e. we infer the same proposition from S1 and from the fact that 'he' refers to Vijay.

4. PARALLEL

- The **parallel relation** is based on **similarity of entities**.
- Infer $p(x_1, x_2, \dots)$ from the assertion of S_0 and $p(y_1, y_2, \dots)$ from the assertion of S_1 , where x_i and y_i are similar, for all i .
 - **Velu likes reading novels. Surya enjoys reading science fictions.**
- For each of the segments, we infer that a person likes reading books. Velu and Surya are similar in that they are both people, reading books.
- The **predicate** in this case may be **hobby**.

5. CONTRAST

- There are two cases which define the contrast relations:
 - Infer $p(x)$ from the assertion of $S0$ and $\neg p(y)$ from the assertion of $S1$, where x and y are similar.
 - Infer $p(x)$ from the assertion of $S0$ and $\neg p(y)$ from the assertion of $S1$, where there is a property q such that $q(x)$ and $\neg q(y)$.
- Renuka does not like football. But she likes football more than any other game.

6. EXEMPLIFICATION

- Infer $p(X)$ from the assertion of $S0$ and infer $p(x)$ from the assertion of $S1$, where x is a member or subset of X .
- *Swarna bought a printer today. It is a laser printer.*

SOME INDICATORS OF COHERENCE RELATIONS

Coherence relation	Indicators
Explanation	Because, and so, hence, That's why
Occasion	then
Elaboration	Also, in addition to, note that
Parallel	Similarly, likewise
Exemplification	For example
Contrast	But, however



DISCOURSE INTERPRETATION

VARIOUS SUB PROBLEMS

Hobbs suggested that problem of discourse interpretation can be solved by decomposing it into six sub problems.

- 1) Logical Notation or Knowledge Representation
- 2) Syntax and Semantics
- 3) Knowledge Encoding
- 4) Deductive Mechanism
- 5) Specifications of possible interpretation
- 6) Specifications of the best interpretation

1. KNOWLEDGE REPRESENTATION

- To **interpret discourse**, a **logical representation** of natural language sentences is required.
- **First order predicate logic** is one such representation. It supports reasoning also.

I have five dollars. But I can not buy a samosa.

$\text{Have}(\text{Speaker}, 5 \text{ dollars}) \wedge \neg \text{Buy}(\text{Samosa})$

2. SYNTAX AND SEMANTICS

- ❑ This is concerned with translation of text, sentence by sentence, into logical notation or representation.
- ❑ It is considered to be solved to a large extent for common syntactic constructions.

3. KNOWLEDGE ENCODING

- This deals with representation of world and language in the knowledge base.
- We must decide what knowledge to represent, how to represent it and whether the new knowledge being added is consistent with what is already present in the KB.
- Consider the following fact in knowledge base:

$$(\forall x) (\exists y) \text{ printer } (x) \rightarrow \text{catridge } (y,x)$$

4. DEDUCTIVE MECHANISM

In order to use stored facts, we must have some deductive mechanism.

Modus ponens rule : $P, P \rightarrow Q \Rightarrow Q$

If today is Tuesday, then John will go to work.

Today is Tuesday.

Therefore, John will go to work.

5. SPECIFICATION OF POSSIBLE INTERPRETATION

- Many **problems** like, Co-reference resolution **needed to be identified** and **to solve** them, we must **specify** as to **what it means**.
- Ex: **A specification state might state that the existence of an entity (described the NP), can be inferred from previous text and KB.**

6. SPECIFICATION OF THE BEST INTERPRETATION

We need to **identify** the **most economic interpretation** of a sentence. The **factors** which govern cost of the solution are:

1. **Complexity of the proof**
2. **Salience of axiom used**
3. **Redundancy in interpretation**



DISCOURSE STRUCTURE

WHAT IS DISCOURSE STRUCTURE

- ∂ A discourse has a structure.
- ∂ The coherence relationships between the sentences assign a coherence structure to the discourse.
- ∂ It is a **tree-like structure** in which **each node** represents a **group of locally coherent sentences** called as **discourse segments**.

Raghav joined SSN last year → 1

It was all okay for eight months. → 2

Initially he thought to stay in hostel → 3

But then he was assigned UG classes at a remote place . → 4

The classroom was 300m from his hostel. → 5

So he opted to be a day scholar. → 6

