

cohesion, coherence, RST

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What is a unit of communication?

Theories of discourse meaning depend in part on a specification of the basic units of a discourse and the relations that can hold among them. Discourse processing requires an ability to determine to which portions of a discourse an individual utterance relates. Thus the role of discourse structure in discourse processing derives both from its role in delimiting units of discourse meaning and...

What is a unit of communication?

M: hi. d4 to d6.
J: uh–huh.
(*week passes*)

J: a3 to a7.
M: hmmm.
(*2 weeks pass*)

M: Queen beats the laufer at e1. Check.
...

Sentences cannot be processed in isolation

Coreference

Segmentation and Ordering

Please use the toilet, not the pool.

Please use the pool for members only.

“Consider, for example, the difference between passages (18.71) and (18.72). Almost certainly not. The reason is that these utterances, when juxtaposed, will not exhibit coherence. Do you have a discourse? Assume that you have collected an arbitrary set of well-formed and independently interpretable utterances, for instance, by randomly selecting one sentence from each of the previous chapters of this book.”

vs....

“Assume that you have collected an arbitrary set of well-formed and independently interpretable utterances, for instance, by randomly selecting one sentence from each of the previous chapters of this book. Do you have a discourse? Almost certainly not. The reason is that these utterances, when juxtaposed, will not exhibit coherence. Consider, for example, the difference between passages (18.71) and (18.72).”
(JM:695)

Discourse has *structure*

Discourse segments can be connected in a limited number of ways
→ **coherence**

There exist linguistic devices that make the structure explicit

Discourse comprehension consists of recognizing the structure

- Linguistic structure
- Rhetorical relations
- Intentional structure

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- Rhetorical relations
- Intentional structure

- Set of clues
 - linguistic (discourse markers)
 - prosodic
 - non-verbal (e.g. gesture)
- Grammar (analogous to sentence grammar)

- Linguistic structure
- Rhetorical relations
- Intentional structure

- Model: domain-independent rhetorical structure (RST)
- Defines binary relations between discourse units
- Examples of relations: Justification, Evidence, Concession, Elaboration, Contrast
- Relations may be made explicit by linguistic cues
- Discourse tree built compositionally

- Linguistic structure
- Rhetorical relations
- Intentional structure

[No matter how much one wants to stay a non-smoker,]_A [the truth is that the pressure to smoke in junior high is greater than it will be any other time of one's life.]_B [We know that 3,000 teens start smoking each day,]_C [although it is a fact that 90% of them once thought that smoking was something they'll never do]_D.

(EVIDENCE, C, B)
 (CONCESSION, C, D)
 (RESTATEMENT, D, A)

- Linguistic structure
- Rhetorical relations
- Intentional structure

- Utterances == *actions*
- Intentions of speaker → a *plan* to communicate them
- Hearer: understand intentions
- Model: hierarchical structure of (communicative) goals of speaker

- Linguistic structure
- Rhetorical relations
- Intentional structure

– Abstract model of discourse is a *tripartite structure* comprising:

linguistic structure (utterances)

intentional structure (intentions)

dynamically-changing attentional structure (model of objects, properties, and relations between them that are *salient* at every point)

Cohesion

→ discourse and dialog exhibit patterns of lexical connectivity

cohesive devices:

- Reference
 - Lexical repetition
 - Use of synonymy
 - Ellipsis
 - Conjunctions
- Time flies.
 - You can't; they fly too quickly. (Halliday and Hasan 1982)

Coherence vs. Cohesion

- Coherence: structural, functional relations between sentences
- Cohesion: non-structural, text-forming relations that “tie” parts of discourse together

John went to his favourite music store to buy a piano.

He had frequented the store for many years.

He was excited that he could finally buy a piano.

He arrived just as the store was closing for the day.

John went to his favourite music store to buy a piano.

It was a store John had frequented for many years.

He was excited that he could finally buy a piano.

It was closing just as John arrived.

Coherence vs. Cohesion

- Coherence: structural, functional relations between sentences
- Cohesion: non-structural, text-forming relations that “tie” parts of discourse together

When Teddy Kennedy paid a courtesy call on Ronald Reagan recently, he made only one Cabinet suggestion. Western surveillance satellites confirmed huge Soviet troop concentrations virtually encircling Poland. (Hobbs 1982)

E: Forks have windows.

P: Yes they do. Augmented pretension. Four plus four equals sixteen. It is a larger element, it's photographic and phototrophic, but it is a higher number, higher course-work. It grows through evaporation or nocturnalism, it is sleepy, you rediscover it and I suppose forks could have windows through evaporation.

Coherent, cohesive discourse:

anaphoric reference

- individual, temporal, spatial, „abstract entity”

discourse markers/cue phrases

conventional conversational sequences

Anaphora: pronominal

- My neighbor has a monster Harley 1200. *They* are huge but gas-efficient bikes.
- One should mind *their* own business.
- We had two hurricanes hit us in the teeth, one of which you can read about in the current New Yorker if you find the place. It's called "Our Windswept Correspondents" and I am *they*.

Anaphora: nominal (definite NP)

- Al bought a car the other day. [...] He took it out of the garage last night with the help of George Cottrell, and *the thing* gave forth such immense clouds of smoke that one man came running up and asked me where the fire was.
- [...] I wanted a Trumpeter Swan who could play like Louis Armstrong, and I simply created him and named him Louis. The cutting of the webs between his toes is also fantastical, just as *the bird* itself is; [...].

Anaphora: surface-count and demonstrative

- Sarah could leave but she was also given an option to stay; she chose *the latter*.
- Have just driven to town, carrying our cook₁ and our cook's dog₂. Gave *the one*₁ \$300 in currency and placed *the other*₂ in the infirmary, with eczema.

Strained anaphora

- John became a guitarist because he thought that *it* was a beautiful instrument.

Temporal anaphora

- If I must declare *today* that I am not a Communist, *tomorrow* I shall have to testify that I am not a Unitarian. And *the day after*, that I never belonged to a dahlia club.

Spatial anaphora

- The awful hot spell broke last night and today is clear and beautiful, [...] *Across the street*, the entire janitorial family has blossomed out in pink carnations, [...]

Abstract entity anaphora

Each Fall, penguins migrate to Fiji.
That's where they wait out the winter.
That's when it's cold even for them.
That's why I'm going there next month.
It happens just before the eggs hatch.

(Webber 1988)

Send engine to Elmira.
That's six hours.

(Byron 2002)

Ellipsis

- The well water had chemicals in it and nothing in the house worked as it should [*work*].
- [*I*] Have been uncommunicative lately, and [*I have been*] lagging in life's race.
- I'm afraid my poem isn't as nicely written as "Paradise Lost," but anyway, it's shorter [*than "Paradise Lost"*].
- Ultimately, even after Garcia was gone, Ruelas was able to cope and move on with his career. And indeed, he has [*coped and moved on with his career*].

Rhetorical structure

Rhetorical Structure Theory (RST)

- Mann, Matthiessen, and Thompson 89
- theory of discourse structure
- based on identifying relations between parts of the text

Rhetorical structure

nucleus(N)/satellite(S) notions encode asymmetry

some relations:

Elaboration (set/member, class/instance/whole/part...)

Contrast: multinuclear

Condition: S presents precondition for N

Purpose: S presents goal of action in N

Sequence: multinuclear

Result: N results from something presented in S

Evidence: S provides evidence for what N claims

Rhetorical structure

example definition: **Evidence**

constraints on N: Hearer might not believe N as much as Speaker think s/he should

constraints on S: Hearer *already believes or will believe* S

example:

George Bush supports Big Business.

He is sure to veto House Bill 1711.

Problems with RST (cf. Moore and Pollack 92)

- how many Rhetorical Relations are there?
- how can we use RST in dialogue as well as monologue?
- how to incorporate speaker's intentions into RST?
- RST does not allow for multiple relations holding between parts of a discourse
- RST does not model overall structure of the discourse

Automatic identification of rhetorical structure

(Marcu 99 and later work)

- parser trained on a discourse treebank
 - 90 hand-annotated rhetorical structure trees
 - Elementary Discourse Units (EDU) linked by Rhetorical Relations (RR)
 - parser learns to identify N and S and their RR
 - mainly shallow features: lexical, structural, Wordnet-based similarity
- discourse segmenter (to identify EDUs)
 - trained to segment on hand-labeled corpus (C4.5)
 - mainly shallow features: 5-word POS window, presence of discourse markers, punctuation, presence/absence of particular syntactic items
 - 96-8% accuracy

Automatic identification of rhetorical structure

- evaluation of Marcu's parser:
 - EDU identification: recall 75%, precision 97%
 - hierarchical structure (related EDUs): recall 71%, precision 84%
 - nucleus/satellite labels: recall 58%, precision 69%
 - rhetorical relation: recall 38%, precision 45%

⇒ hierarchical structure easier to identify than rhetorical structure

Applications

- Anaphora resolution
- Text segmentation
- Text summarization
- Essay scoring
- Dialog processing
- ...

As a concluding remark:
could this art be applied (we put this question
in the strictest confidence) – **could** it, we ask,
be applied to the speeches in Parliament?

Lewis Carroll „Photography Extraordinary”

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slides in German with German examples: <http://rst.80686-net.de/downloads/rstfolien.pdf>

Daniel Marcu's website: <http://www.isi.edu/~marcu/>

RSTTool (graphical interface for marking up of the RST structure of text; perhaps something to consider for homework...):
<http://www.wagsoft.com/RSTTool/index.html>