Einführung in die Pragmatik und Diskurs:

Discourse Coherence

A. Palmer/A. Horbach

Universität des Saarlandes

Summer Semester 2014

adapted from slides by A. Horbach, I. Kruiff-Korbayová and C. Sporleder

Schedule

- **This week:** Exercise sheets due Friday, 12:00
- **2 June:** Guest lecture on Information Structure, no 0830 session!
- **9 June:** No class (Pfingstmontag)
- **16 June:** Wir sehen uns wieder, nach normale Zeitplan.

Discourse

A discourse is a coherent sequence of sentences/utterances.

Question: How is coherence defined?

Example: Coherence

Die Große Koalition berät zur Stunde in Berlin über Regelungen zu einem gesetzlichen Mindestlohn. Danach soll der Kündigungsschutz für die vom Umbau betroffenen rund 50.000 Mitarbeiter bis Ende 2012 gelten. Auch die USA kündigten ein Ende ihres Finanzboykotts an.

Coherent?

No. A collection of topics without "Coherence" ("Zusammenhang").

Example: Coherence

Beide Seiten bestehen weiterhin auf ihren gegensätzlichen Standpunkten - gleichzeitig betonen sie aber auch ihre Kompromissbereitschaft. Zur Stunde beraten die Spitzen der Großen Koalition über eines ihrer größten Streitthemen: den gesetzliche Mindestlohn. Allerdings machte Bundeskanzlerin Angela Merkel klar: Einen einheitlichen Mindestlohn werde es mit der Union nicht geben.

Coherent?

No.

Just one topic (Mindestlohn), but something isn't quite right ...

- Referring expressions
- what else ...?

Overview

Today's plan

- What is discourse?
- Theories of discourse
  - Discourse Structure Theory (Grosz & Sidner 1986)
  - Rhetorical Structure Theory (Mann & Thompson 1987)

Kernlektüre

- Jurafsky & Martin (2000), Kapitel 18
- Grosz & Sidner (1986)
- Grosz et al. (1989)
- Mann & Thompson (1987)

Part 1: What is discourse?

What is a "discourse"?

- Sequence of utterances
- but: an arbitrary collection of well-formed utterances is not always a discourse

  $\Rightarrow$ Utterances must somehow hold together/cohere, e.g.
  - Some system of related topics
  - Events that are connected to each other
  - The possibility of relating what is said to some communicative goal

Example

- *John hat Peters Autoschlüssel versteckt. Er war betrunken.*
  $\Rightarrow$ The fact that John was drunk explains why he hid Peter's car keys.

- (?) *John hat Peters Autoschlüssel versteckt. Er mag Spinat.*
  $\Rightarrow$ Is there coherence between the two sentences?

Example

Temporal sequence (zeitliche Abfolge) of events is often not sufficient for coherence:

Um 5 Uhr ist ein Zug in München angekommen.
Um 6 Uhr hat Angela Merkel eine Pressekonferenz gegeben.

Thematic coherence alone is often not sufficient:

Wie die meisten Bären besitzen Eisbären 42 Zähne.
Die Größe der Eisbären ist für den Lebensraum Nordpolarmeer ideal.
Anfang Juni wurde Knut ein halbes Jahr alt und entdeckt langsam das Raubtier in sich.

Discourse

There are many different theories of discourse. Typically it is assumed that a discourse consists of:

- Segments (sometimes called EDUs – elementary discourse units)
- Connections/Relations between segments (Coherence relations) (Kohärenzrelationen)

Discourse is hierarchically structured. The minimal discourse segment is often assumed to be one sentence/one utterance:

$$\forall w, e \; \mathit{minimal\_Segment}(w, e) \Rightarrow \mathit{Segment}(w, e)$$

$$\forall w_1, w_2, e_1, e_2, e \; \mathit{Segment}(w_1, e_1) \wedge \mathit{Segment}(w_2, e_2) \wedge \mathit{CoherenceRel}(e_1, e_2, e) \Rightarrow \mathit{Segment}(w_1, w_2, e)$$

(w is a sequence of words; e an event or state being described)

To interpret a coherent discourse W, we must prove it is a segment:
$\exists e$ Segment(W,e)

Segments: Linguistic realization

John ging zur Bank um eine Überweisung abzugeben.
Dann nahm er den Bus zu Bill's Autohaus.

Er mußte ein Auto kaufen.

Die Firma, für die er seit kurzem arbeitet, ist nicht mit öffentlichen Verkehrsmitteln zu erreichen.

Er wollte außerdem mit Bill über das Fußballtraining reden.

Segments: Linguistic realization

Discourse segments can also be referred to in text (Webber, 1988):

It's always been presumed that when the glaciers receded, the area got very hot. The Folsum men couldn't adapt, and they died out. That is what is supposed to have happened.

Segments: Linguistic realization

Segment boundaries are sometimes indicated by cue words (z.B., *übrigens*, *apropos*, *zurück zu*, *um zusammenzufassen*, etc.):

> . . . Die Jahresbilanz sieht gut aus. Wir sollten das aber noch mal gegenrechnen und mit Peter besprechen. Übrigens, weißt du, daß Peter sich eine neues Auto gekauft hat. Einen Porsche kannst du dir das vorstellen! . . . Um zur Jahresbilanz zurückzukommen . . .

Coherence Relations: Linguistic realization

- *John hat Peters Autoschlüssel versteckt. Er war betrunken.*
  $\Rightarrow$ The fact that John was drunk explains why ...
- *Peter ist gefallen, Max hat ihm wieder auf geholfen.*
  $\Rightarrow$ Max helped Peter after he fell.
- *Tom ißt gerne Schokolade, Peter lieber Chips.*
  $\Rightarrow$ There is a contrast between Tom and Peter's food preferences.

Coherence Relations: Linguistic realization

Underlying coherence relations can influence linguistic interpretation (e.g. anaphora resolution, temporal sequence):

- *John can open Bill's safe. He knows the combination.*
  ⇒ The fact that John knows the combination to Bill's safe Explains why . . .
- *John can open Bill's safe. He will have to change the combination.*
  ⇒ The fact that John knows how to open Bill's safe has the Consequence that . . .
- *John fell. Max pushed him.* push $<_t$ fall
  ⇒ The fact that Max pushed (John) Explains why . . .
- *John fell. He broke a leg.* fall $<_t$ breaking a leg
  ⇒ The broken leg was a Result of the fall.

Coherence Relations: Linguistic realization

Coherence relations are sometimes signaled via *cue words*.

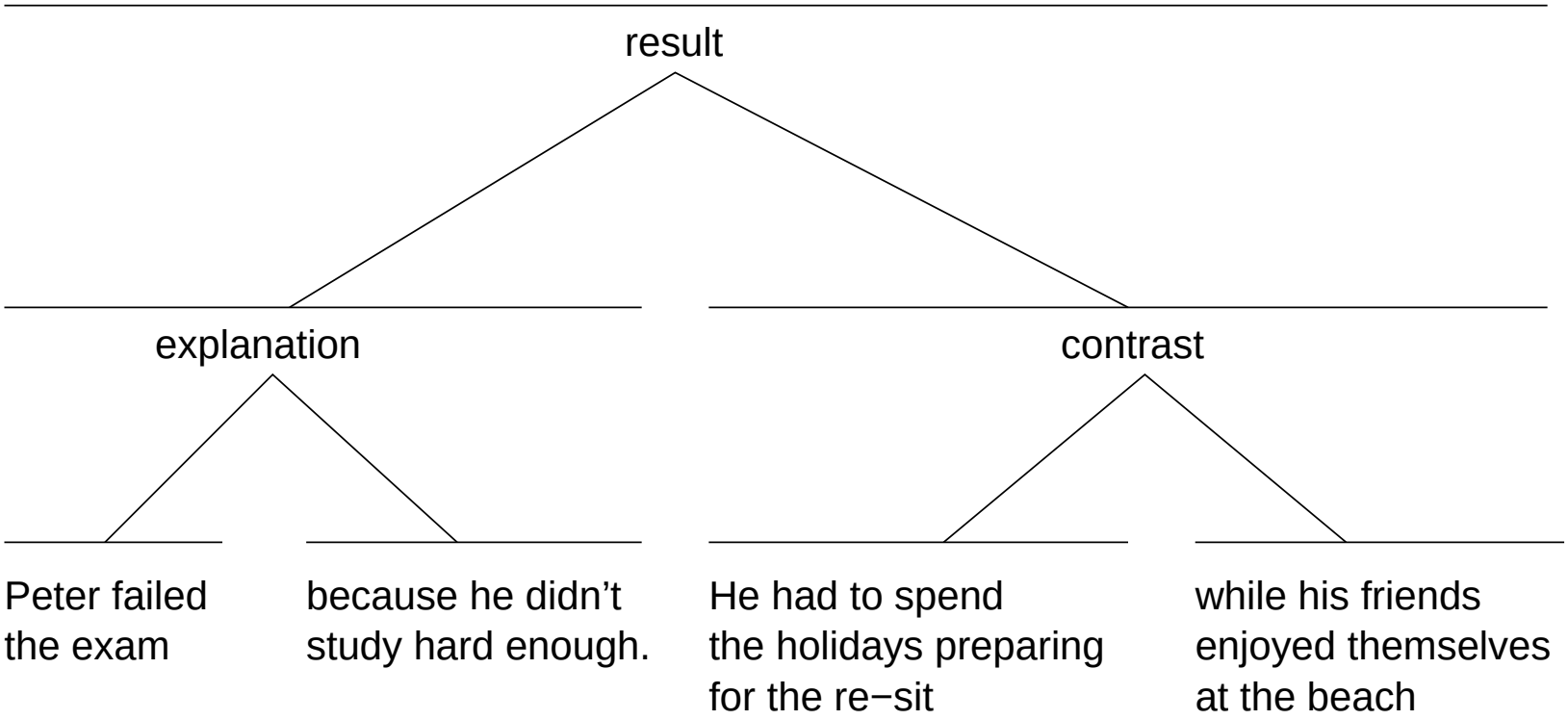
- *John hat Peters Autoschlüssel versteckt weil er betrunken war.*
- *Peter ist gefallen, und dann hat Max ihm wieder auf geholfen.*
- *John can open Bill's safe. Therefore he will have to change the combination.*

Coherence vs. Cohesion (cf. Halliday & Hasan 1976)

Coherence (Kohärenz): structural relations between discourse segments

Cohesion (Kohäsion): non-structural text-forming relations, e.g. reference (esp. anaphora), ellipsis, conjunction, lexical cohesion

Example: Coherence



Example: Cohesion

Peter failed the exam because he didn't study hard enough.
He had to spend the holidays preparing for the re-sit while his friends enjoyed themselves at the beach.

Example: Coherence with little Cohesion

Peter hat gestern seine Führerscheinprüfung bestanden.
Danach ist Peter zu Klaus gegangen.
Klaus hat sich über den Besuch gefreut,
weil Klaus Peter schon lange nicht mehr gesehen hatte.
Dann sind Peter und Klaus in eine Kneipe gegangen.

Example: Cohesion with little Coherence

Peter ist gestern nach Australien geflogen.
In diesem Land gibt es viele Känguruhs.
Die Känguruhs im Kölner Zoo hat sich Karla gestern angeschaut.
Sie verreist gerne.
Gnus sind schöne Tiere.

Part 2: Theories of Discourse

1. Discourse Structure Theory (Grosz & Sidner, 1986)
2. Rhetorical Structure Theory (Mann & Thompson, 1987)

Discourse Structure Theory (Grosz & Sidner, 1986)

Three aspects of discourse structure which influence one another:

- Linguistic Structure: the linguistic manifestation of discourse structure, i.e. *cue words*, intonation, gesture, referring expressions, etc.
- Intentional Structure: every discourse segment has a particular purpose (*discourse segment purpose*, *DSP*); DSPs stand in different relationships to each other (*satisfaction-precedence* vs. *dominance*)
- Attentional State: the focus structure of discourse, i.e. which entities are *salient* (aktiviert) at a particular point in the discourse

Discourse Structure Theory (Grosz & Sidner, 1986)

The three aspects of discourse structure supply the information needed by discourse participants to determine *how an individual utterance fits with the rest*, i.e. why it was said and what it means.

Discourse understanding relies on recognizing DSPs and the relations among them.

Linguistic Structure

- Discourse Structure Theory does not explicitly define what a minimal discourse segment is
- it assumes a hierarchical structure of discourse
- there is two-way interaction (Wechselbeziehung) between the linguistic form of utterances and their segmentation
  - utterances can convey information about structure/segmentation: *cue words*, intonation, prosody, etc.
  - segment structure can constrain interpretation of utterances: referring expressions

Example: Segmentation and Linguistic Form

E: Good morning. I'd like for you to re-assemble the compressor.

E: I suggest you begin by attaching the pump to the platform.

...

E: Good. All that remains is to attach the belt housing cover to the belt housing frame.

A: All right.

I assume the belt housing cover opens to the pump pulley rather than to the motor pulley.

E: Yes that is correct ...

A: All right, the belt housing cover is on and tightened down.

E: Fine, Now, let's see if it works.

Intentional Structure

- every discourse has exactly one discourse purpose (DP) (Diskurszweck), i.e. a reason why the discourse was initiated
- every discourse segment has exactly one discourse segment purpose (DSP)
- DP and DSPs are intentions that are meant to be recognized (erkannt werden sollen) by the hearer; recognition of the DP and DSPs are essential to understanding a discourse
- possible DPs/DSPs are (among others):
  - the intention that the hearer takes a particular action
  - the intention that the hearer recognizes a particular proposition as true
  - the intention that the hearer can identify a particular object
  - etc.

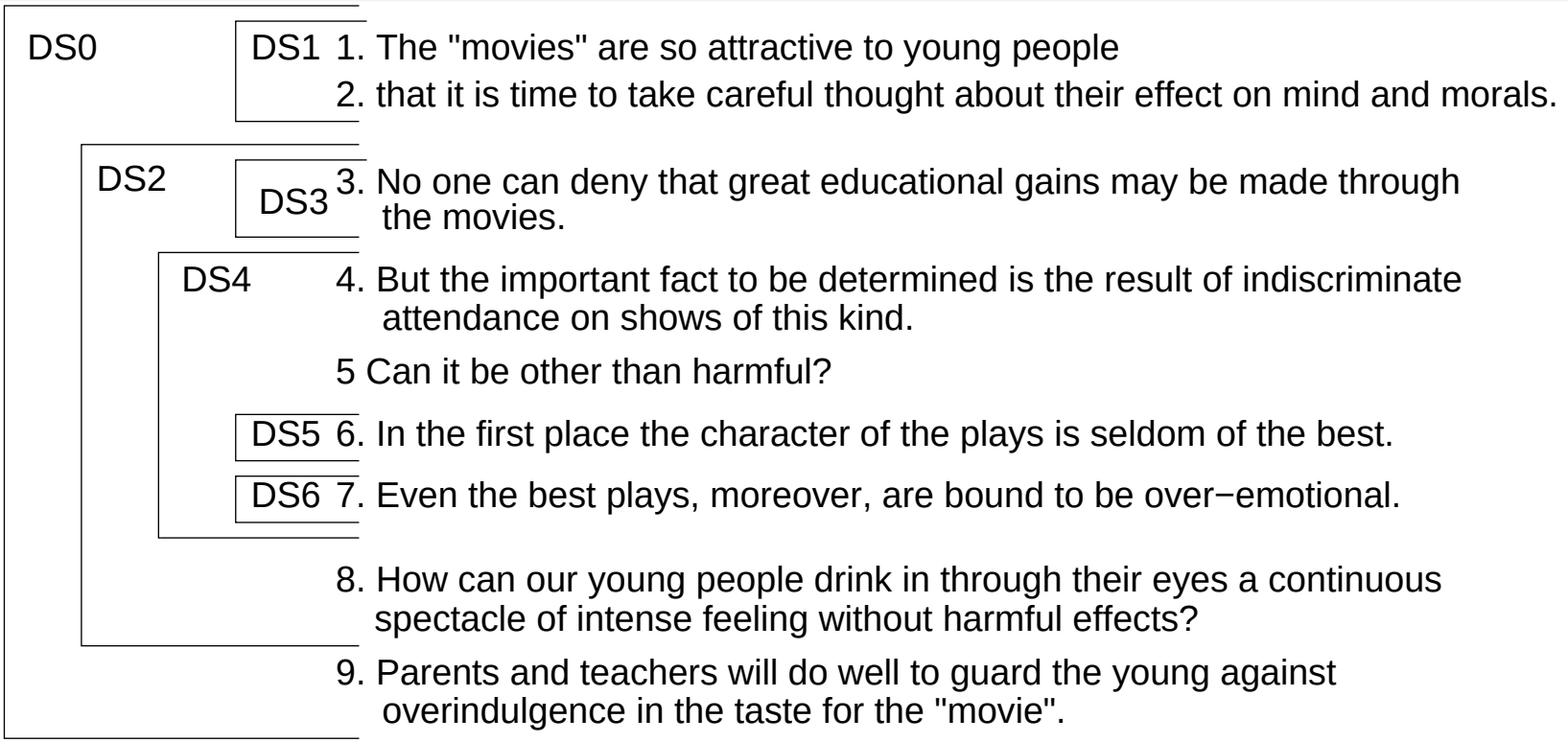
Intentional Structure

Two structural relations between DSPs:

- dominance: A DSP2 dominates a DSP1 when an action that satisfies DSP1 also contributes to the satisfaction of DSP2
- satisfaction-precedence: A DSP1 satisfaction-precedes a DSP2 when DSP1 must be satisfied before DSP2 is (often the case in task-oriented discourse)

Hierarchical structure of discourse segments (DSs) and dominance structure of DSPs are isomorphic.

Example: Intentional Structure



- DSP 0: make reader believe that young people should be guarded from overindulgence in the movies
- DSP 1: make reader believe that it's time to consider the harmful effects of movies
- DSP 2: make reader believe that young people can't be exposed to the movies without harmful effects
- etc. . . .

DSP 0 dominates DSP 1, DSP 2 dominates DSP 3, . . .

Attentional State

- dynamic model of the discourse participants' focus of attention as the discourse unfolds
- modeled as a set of focus spaces (Menge von Fokusräumen), that are organized in a *stack* (Stapelstruktur)
- each discourse segment (DS) is associated with a focus space, which contains:
  - the entities that are *salient* in the current DS
  - the discourse segment purpose (DSP) of the segment
- the relationship between DSPs (i.e. the intentional structure) determines when which focus space is taken from the stack (*popped*) or added to the stack (*pushed*)

Example: Attentional State

DS0

DS1 1. The "movies" are so attractive to young people
2. that it is time to take careful thought about their effect on mind and morals.

DS2

DS3 3. No one can deny that great educational gains may be made through the movies.

DS4

4. But the important fact to be determined is the result of indiscriminate attendance on shows of this kind.

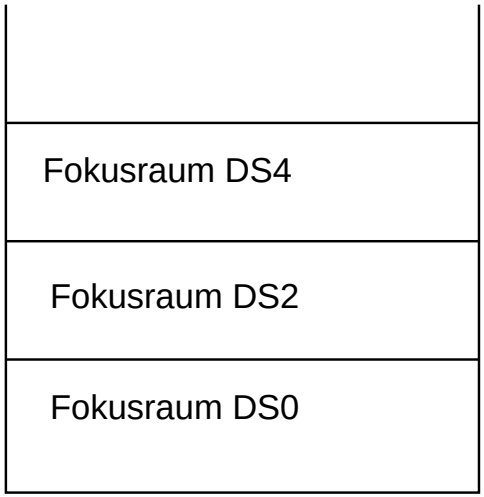
5 Can it be other than harmful?

DS5 6. In the first place the character of the plays is seldom of the best.

DS6 7. Even the best plays, moreover, are bound to be over−emotional.

8. How can our young people drink in through their eyes a continuous spectacle of intense feeling without harmful effects?

9. Parents and teachers will do well to guard the young against overindulgence in the taste for the "movie".



Fokus Stack

Attentional State

- while the intentional structure always includes the complete discourse, the attentional structure always contains only the part that is relevant for the current position in the discourse
- at the end of the discourse, attentional state is typically empty
- attentional state influences the interpretation of referring expressions

  $\Rightarrow$ right-frontier constraint

Rhetorical Structure Theory (RST) (Mann & Thompson 1987)

- originally developed for automatic text generation.
- facilitates (ermöglichen) structural description of text meaning
- RST Analysis: in the view of the analyst, what are the intentions of the writer?
- exact intentions of the writer are not always clear/explicit

  $\Rightarrow$ in principle, more than one analysis per text could be possible

Elements of RST

- Rhetorical Relations: the possible Coherence Relations between discourse segments
- Schemas: abstract structures for describing application patterns for relations (similar to grammatical rules)
- Schema Application Conventions: describe how schemas can be varied

Rhetorical Relations

- fixed set of possible relations (currently 32) that can connect discourse segments
- discourse segments function as Nucleus (N, more central) or Satellite (S, less central)
- most relations are binary and mono-nuclear: N+S or S+N
- there are some multi-nuclear (e.g. CONTRAST) and some non-binary relations (e.g. JOINT)
- Relations are defined according to five fields:
  - Constraints on the Nucleus (N)
  - Constraints on the Satellite (S)
  - Constraints on the combination of N+S
  - Effect of the relation (i.e. the reason the discourse segment appears in the text)
  - Locus of the effect (i.e.. N, S, N+S)

Example: Nucleus vs. Satellite

[Nora schläft viel,]$_N$ [weil sie krank ist.]$_S$

[Ich gehe ins Theater,]$_N$ [nicht ins Kino.]$_S$

[Heute war schönes Wetter,]$_N$ [es hat nicht geregnet.]$_S$

Example: Relation definition

[**This tax calculation software really works.**]$_N$
[I entered all the figures from my tax return and got a result which agreed with my hand calculations to the penny.]$_S$

relation name:	EVIDENCE
constraints on N:	Reader (R) might not believe N to a degree satisfactory to Writer (W)
constraints on S:	R believes S or finds it credible
constraints on N+S:	R's comprehending S increases R's belief of N
effect:	R's belief of N is increased
locus of effect:	N

Example: Relations

ANTITHESIS

[**Ich gehe heute ins Theater,**]$_N$ [nicht ins Kino]$_S$.

constraints on N: W has positive regard for N

constraints on N+S: The two situations stand in contrast to one another

effect: R's positive regard for N is increased

Example: Relations

CONTRAST (multi-nuclear)

[**Peter mag Schokolade,**]$_N$ [**Mary mag Chips.**]$_N$

constraints: Situations in the nuclei contrast with one another yet have some similarity; the two nuclei are equally important

effect: R recognizes the comparability and the differences between the situations

Example: Relations

BACKGROUND

[**Der Skispringer liegt im Krankenhaus,** $]_N$ [er hatte sich bei einem Sturz das Bein gebrochen. $]_S$

constraints on N+S: S contributes to the understandability of the situation in N.

effect: R's ability to understand N increases.

Example: Relations

CONCESSION

[Tempting as it may be,]$_S$ [**we shouldn't embrace every popular issue that come along.**]$_N$

constraints on N: W has positive regard for N.

constraints on S: W is not claiming that S doesn't hold.

constraints on N+S: W acknowledges the seeming incompatability between N and S; recognizing the compatability between N and S increases R's positive regard for N.

effect: R's positive regard for N increases.

Example: Relations

PURPOSE

[To see which Syncom diskette will replace the one you're using now]$_S$ [**send for our free 'Flexi-Finder' selection guide.**]$_N$

constraints on N: presents an activity

constraints on S: presents an unrealized situation

constraints on N+S: S is to be realized through the activity in N.

effect: R understands, that the activity in N is initiated in order to realize S.

Example: Relations

RESTATEMENT

[**A well-groomed car reflects its owner.** $]_N$ [In other words, the car you drive says a lot about you. $]_S$

constraints on N+S: S restates N; S and N are of similar length (convey the same amount of information); N is more central to W's intentions than S is.

effect: R recognizes S as a restatement of N.

Example: Relations

SUMMARY

[**Unsere Firma hat letztes Jahr eine großen Gewinn erziehlt. Wir haben viele zufriedene Kunden. Unsere Mitarbeiter sind glücklich.** $]_N$ [Mit anderen Worten, der Firma geht es gut. $]_S$

constraints on N: N must contain more than one unit.

constraints on N+S: S is a (shortened) summary of N.

effect: R recognizes that S is a shorter restatement of N.

Example: Relations

CIRCUMSTANCE

[**Probably the most extreme case of Visitors Fever I have ever witnessed was a few summers ago**]$_N$ [when I visited relatives in the Midwest]$_S$.

constraints on S: S is not unrealized.

constraints on N+S: S sets a framework (regarding content) in which R is intended to interpret N.

effect: R recognizes that S provides the framework for interpreting N.

Example: Relations

ELABORATION

[**Die nächste ACL wird in Baltimore stattfinden.**]$_N$ [Es wird erwartet, daß mehr als tausend Computerlinguisten aus aller Welt an dieser Konferenz teilnehmen.]$_S$

constraints on N+S: S presents additional detail about the context of N.

effect: R recognizes that S provides additional detail about N.

Example: Relations

VOLITIONAL RESULT

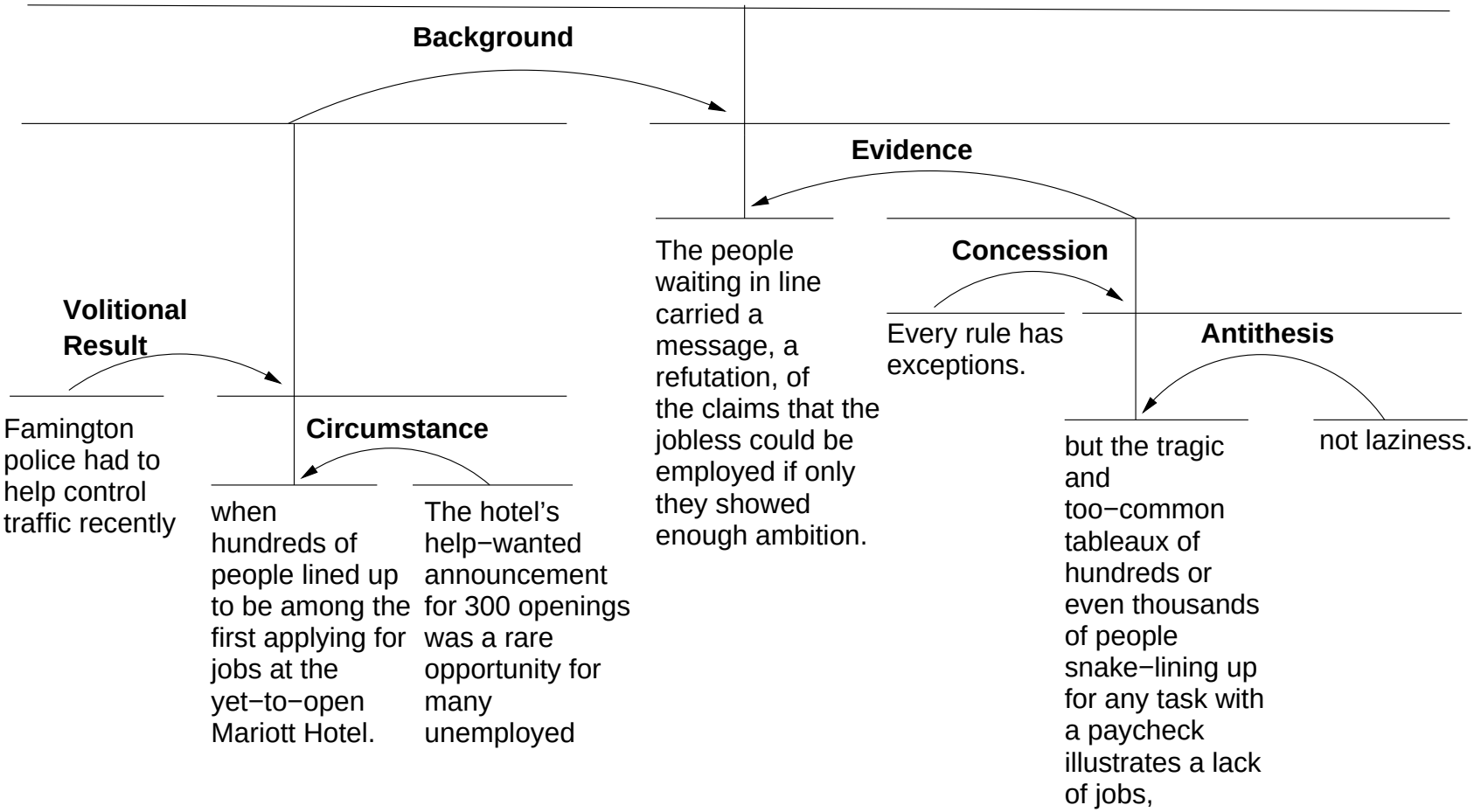
[Farmington police had to help control traffic recently]$_S$ [**when hundreds of people lined up to apply for jobs at the Mariott Hotel**]$_N$

constraints on S: S is a volitional action (gewollte Handlung) or a situation that could have arisen from a volitional action.

constraints on N+S: N could have caused S; presentation of N is more important for W's intentions/purposes than is S.

effect: R recognizes that N could be a cause for the action or situation in S.

Example: RST Analysis



Links to RST Relations

- Definitions of the relations are available on the RST website (`http://www.sfu.ca/rst/`), here: `http://www.sfu.ca/rst/01intro/definitions.html`.
- Some example analyses are also available via the website, e.g. here: `http://www.sfu.ca/rst/02analyses/published.html`

Properties of an RST Analysis

- unit of minimal discourse segment is defined (typically one sentence)
- tree-structured (with the exception of maximal segments, every segment has exactly one parent segment)
- relations can only connect neighboring segments (no crossing branches)
- only one relation can hold between any two segments

Discourse Structure Theory vs. Rhetorical Structure Theory

- DST assumes three distinct structures, RST only one
- The set of RST relations is finite, and relations are precisely defined
- The set of possible intentions in DST is non-finite, and there are only two types of relations between intentions (dominance, satisfaction-precedence)
- RST is strictly rooted in linguistic structure (cue words are seen as direct correlates of relations)
- For DST, intentional structure is in the foreground
- DST does not define what a minimal segment is; RST defines minimal segments syntactically

Criticisms and controversies (in brief)

- Can discourse be adequately represented with tree structures? (e.g. Wolf & Gibson, 2005)
- Moore & Pollack (1992): It is important to distinguish between informational and intentional relations; the two do not necessarily correlate with one another.
- Knott et al. (2001): local coherence and global coherence should be treated separately.

Summary

- Coherent discourse is structured, and the individual elements (discourse segments) are connected with one another
- Connections hold between entities (coreference, anaphora)
- Also there are communicative, intention-based connections (coherence relations)
- Discourse is hierarchically organized
- Discourse meaning is more than the sum of sentence meanings
- Linguistic structure often reflects discourse structure (cue words, intonation, etc.)

Bibliography

Grosz, B. and C. Sidner

Attentions, Intentions, and the Structure of Discourse.

Computational Linguistics, 12:3, 1986.

Grosz, B. and M. Pollack and C. Sidner

Discourse.

Foundations of Cognitive Science, M. Posner (ed.), Cambridge, MA: MIT Press, 1989.

Halliday, M.A.K. and R. Hasan

Cohesion in English

New York: Longman House, 1976.

Jurafsky, D. and J. Martin

Speech and Language Processing.

Prentice Hall: Upper Saddle River, NJ, 2000.

Knott, A., J. Oberlander, M. O'Donnell and Chris Mellish

Beyond elaboration: the interaction of relations and focus in coherent text.

Text Representation: Linguistic and Psycholinguistic Aspects, T. Sanders, J. Schilperoord, and W. Spooren (eds), Amsterdam: Benjamins, 2000.

Mann, W. and S. Thompson

Rhetorical Structure Theory: A Theory of Text Organization.

Technical Report, ISI/RS-87-190, 1987.

`http://www.sfu.ca/rst/05bibliographies/report.html`

Moore, J. and M. Pollack

A Problem for RST: The Need for Multi-Level Discourse Analysis

Computational Linguistics, 18(4), 1992.

Webber, B.

Discourse Deixis: Reference to Discourse Segments.

ACL-88, 1988.

Wolf, F. and E. Gibson

Representing Disourse Coherence: A Corpus-based Analysis.

Computational Linguistics, 31, 2005.