

CS 4650/7650

Discourse and dialogue

Jacob Eisenstein

November 12, 2013

Coherence

1. Sue hid Lakshmi's keys. She was drunk.

Coherence

1. Sue hid Lakshmi's keys. She was drunk.
2. ?? Sue hid Lakshmi's keys. She likes spinach.

Coherence

1. Sue hid Lakshmi's keys. She was drunk.
2. ?? Sue hid Lakshmi's keys. She likes spinach.
3. Yangfeng offered spinach to anyone who could keep Lakshmi from driving. Sue hid Lakshmi's keys. She likes spinach.

Coherence

1. You should wear sunscreen. It keeps your skin healthy.

Coherence

1. You should wear sunscreen. It keeps your skin healthy.
2. ?? You should wear sunscreen. Exercise is a key part of a healthy lifestyle.

Coherence

1. Serena went to her favorite music store to buy a piano.
2. It was a store Serena had frequented for many years.
3. She was excited that she could finally buy a piano.
4. It was closing just as Serena arrived.

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1. **Serena** went to **her** favorite **music store** to buy a piano.
2. **It** was **a store** **Serena** had frequented for many years.
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Summarization

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- ▶ First Union President John R. Georgius is planning to announce his retirement tomorrow.

Sentiment

It could have been a **great** movie. It could have been **excellent**, and to all the people who have forgotten about the older, **greater** movies before it, will think that as well. It does have **beautiful** scenery, some of the **best** since Lord of the Rings. The acting is **well** done, and I really **liked** the son of the leader of the Samurai. He was a **likeable** chap, and I **hated** to see him die... But, other than all that, this movie is nothing more than hidden **rip-offs**.

Thread disentanglement

Does anyone here shave their head?

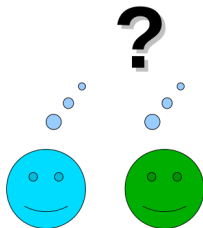
How do I limit the speed of my internet connection?

I shave part of my head.

A tonsure?

Use dialup!

Nope, I only shave the chin.



- A common situation:
 - Text chat
 - Push-to-talk
 - Cocktail party

Segmentation



Lecture Browser

SPOKEN LANGUAGE SYSTEMS
MIT COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE LABORATORY

Search for words

and/or pick a category

angular momentum

...no category

Search

Examples: video, "solar system", wine AND glass

50 results for angular momentum

1. Angular Momentum, Torques, Conservation of Angular Momentum, Spinning Neutron Stars, Stellar Collapse

Lecture 20, Physics I: Classical Mechanics, Physics, MIT, 51:05 1999 (Walter Lewin)



we're now answering the part of eight oh one which is the most difficult for students and faculty alike ... we are going to enter the domain of angular momentum and forks it's extremely non intuitive ... the good news however is that it will stay with this concept for at least four five lectures today ...

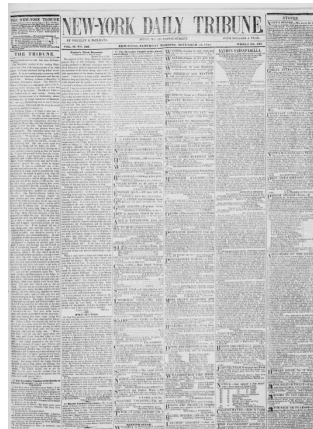
the good news however is that it will stay with this concept for at least four five lectures today ... we'll introduce both fork an angular momentum ... what is angular momentum if an object has a mass m ... and it has a velocity v ... then clearly it has a momentum ... v that's very well defined your reference frame the product of m and v ... think the momentum ... I can take relative to any point I choose I choose this point q arbitrary ... this now ... is the position

this now ... is the position vector which I call q of q ... but this angle buffer to ... an angular momentum relative to that point q it's a vector q ... is the position vector relative to that point q cross p



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Cohesion and coherence

Cohesion without coherence

- ▶ Wash and core six apples.
- ▶ Use the apples to cut out material for your new suit.

Cohesion and coherence

Cohesion without coherence

- ▶ Wash and core six apples.
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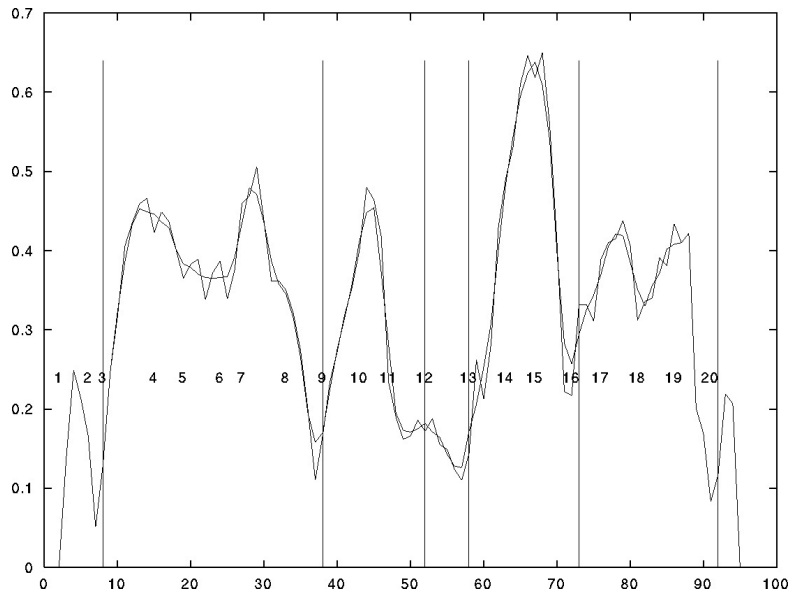
Coherence without (lexical) cohesion

- ▶ I came home from work at 6:00pm.
- ▶ Dinner consisted of two chicken breasts and a bowl of rice.

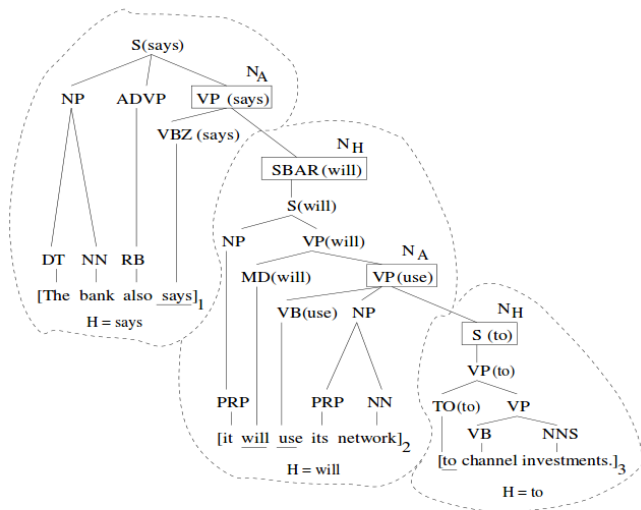
Textiling

Sentence:	05	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
14 form	1		111 1	1						1 1		1 1		1	1		1	1	
8 scientist					11		1 1			1			1		1 1				
5 space	11	1	1												1				
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5 binary												11 1		1					1
4 trinary												1 1		1					1
8 astronomer	1			1								1 1		1 1	1 1	1 1			
7 orbit	1				1								12	1 1					
6 pull					2		1 1							1 1					
16 planet	1	1		11			1		1				21	11111				1	1
7 galaxy	1											1			1 11	1			1
4 lunar			1 1	1		1													
19 life	1 1 1							1	11 1	11 1		1				1 1	1 111	1 1	
27 moon		13	1111	1 1	22 21	21	21			11 1									
3 move								1 1 1											
7 continent								2 1 1 2 1											
3 shoreline								12											
6 time				1				1 1 1	1										1
3 water							11			1									
6 say							1 1		1		11			1					
3 species								1 1 1											
Sentence:	05	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95

Textiling

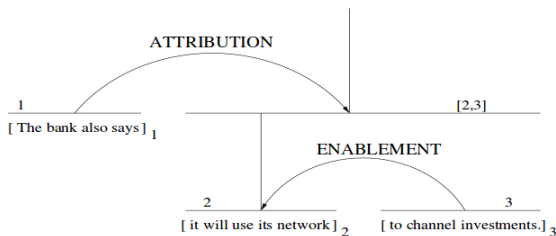
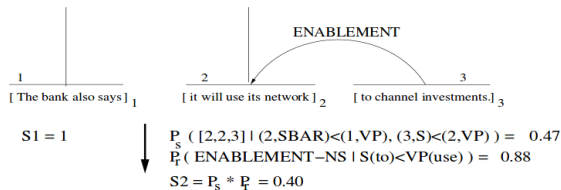


RST Parsing: EDU segmentation



$D = \{ (2, \text{SBAR(will)}) < (1, \text{VP(says)}) , (3, \text{S(to)}) < (2, \text{VP(use)}) \}$

RST Parsing



Example text

With its distant orbit — 50% farther from the sun than Earth — and slim atmospheric blanket, C1 Mars experiences frigid weather conditions. C2 Surface temperatures typically average about -60 degrees C at the equator and can dip to -123 degrees C near the poles. C3 Only the midday sun at tropical latitudes is warm enough to thaw ice on occasion, C4 but any liquid water formed in this way would evaporate almost instantly C5 because of the low atmospheric pressure. C6 Although the atmosphere holds a small amount of water, and water-ice clouds sometimes develop, C7 most Martian weather involves blowing dust or carbon dioxide. C8 Each winter, for example, a blizzard of frozen carbon dioxide rages over one pole, and a few meters of this dry-ice snow accumulate as previously frozen carbon dioxide evaporates from the opposite polar cap. C9 Yet even on the summer pole, where the sun remains in the sky all day long, temperatures never warm enough to melt frozen water. C10 ¹

¹From (Marcu 2000)

Shift-reduce discourse parsing in RST

C1 With its distant orbit — 50% farther from the sun than Earth
— and slim atmospheric blanket

Shift-reduce discourse parsing in RST

C2 Mars experiences frigid weather conditions.

C1 With its distant orbit — 50% farther from the sun than Earth
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SHIFT

Shift-reduce discourse parsing in RST

C3 Surface temperatures typically average about -60 degrees Celsius at the equator and can dip to -123 degrees C near the poles.

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SHIFT

Shift-reduce discourse parsing in RST

- C3 Surface temperatures typically average about -60 degrees Celsius at the equator and can dip to -123 degrees C near the poles.
 - C2 (Justification) Mars experiences frigid weather conditions.
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REDUCE

Shift-reduce discourse parsing in RST

- C3 Surface temperatures typically average about -60 degrees C at the equator and can dip to -123 degrees C near the poles.
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SHIFT

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- C4 Only the midday sun at tropical latitudes is warm enough to thaw ice on occasion

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SHIFT

Shift-reduce discourse parsing in RST

- C5 but any liquid water formed in this way would evaporate almost instantly

- C4 Only the midday sun at tropical latitudes is warm enough to thaw ice on occasion
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Shift-reduce discourse parsing in RST

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- C7 Although the atmosphere holds a small amount of water, and water-ice clouds sometimes develop

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- C9 Each winter, for example, a blizzard of frozen carbon dioxide rages over one pole, and a few meters of this dry-ice snow accumulate as previously frozen carbon dioxide evaporates from the opposite polar cap.

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- C9 Each winter, for example, a blizzard of frozen carbon dioxide rages over one pole, and a few meters of this dry-ice snow accumulate as previously frozen carbon dioxide evaporates from the opposite polar cap.
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Shift-reduce discourse parsing in RST

- C10 (Antithesis) Yet even on the summer pole, where the sun remains in the sky all day long, temperatures never warm enough to melt frozen water.
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- C8 (Concession) Most Martian weather involves blowing dust or carbon dioxide.
- C2 (Elaboration) Mars experiences frigid weather conditions.

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- C10 (Antithesis) Yet even on the summer pole, where the sun remains in the sky all day long, temperatures never warm enough to melt frozen water.
 - C8 (Concession) Most Martian weather involves blowing dust or carbon dioxide.
 - C2 (Elaboration) Mars experiences frigid weather conditions.

SHIFT

Shift-reduce discourse parsing in RST

C8 (Exemplification) Most Martian weather involves blowing dust or carbon dioxide.

C2 (Elaboration) Mars experiences frigid weather conditions.

REDUCE

Shift-reduce discourse parsing in RST

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- C8 (Exemplification) Most Martian weather involves blowing dust or carbon dioxide.
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SHIFT

Shift-reduce discourse parsing in RST

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REDUCE

Summarization from discourse parsing

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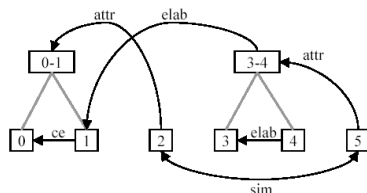
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Discourse graphs

Wolf and Gibson (2003) argue that many discourses cannot be fully described by a tree, and that graphs are more appropriate.

0. Farm prices in October edged up 0.7% from September
1. as raw milk prices continued to rise,
2. the Agriculture Department said.
3. Milk sold to the nations dairy plants and dealers averaged \$14.50 for each hundred pounds,
4. up 50 percent from September and up \$1.50 from October 1988,
5. the department said.



(see <http://www.isi.edu/~marcu/discourse/Discourse%20structures.htm>)

Serving as an arg to multiple relations

- (9) In times past, life-insurance salesmen targeted heads of household, meaning men, but ours is a two-income family and accustomed to it. So if anything happened to me, I'd want to leave behind enough so that my 33-year-old husband would be able to pay off the mortgage . . . [Lee et al., 2006]

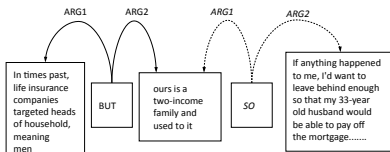
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[Lee et al., 2006]

Serving as an arg to multiple relations

Fully Shared Arg: Example



1

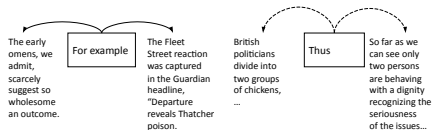
Partial connectivity – Disconnected structures

- (10) The early omens, we admit, scarcely suggest so wholesome an outcome.
The Fleet Street reaction was captured in the Guardian headline, “Departure Reveals Thatcher Poison.” British politicians divide into two groups of chickens, those with their necks cut and those screaming the sky is falling. So far as we can see only two persons are behaving with a dignity recognizing the seriousness of the issues: Mr. Lawson and Sir Alan Walters [wsj_0553]

Partial connectivity

- (11) The early omens, we admit, scarcely suggest so wholesome an outcome. Implicit=FOR EXAMPLE The Fleet Street reaction was captured in the Guardian headline, “Departure Reveals Thatcher Poison.” **NoRel** British politicians divide into two groups of chickens, those with their necks cut and those screaming the sky is falling. Implicit=THUS So far as we can see only two persons are behaving with a dignity recognizing the seriousness of the issues: Mr. Lawson and Sir Alan Walters [wsj_0553]

Partial connectivity



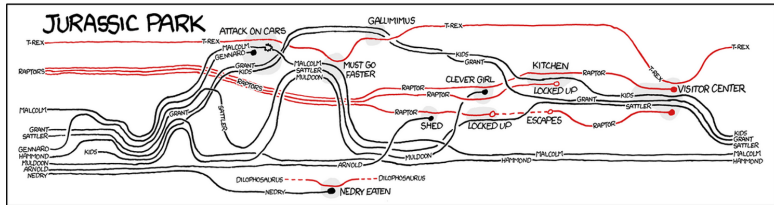
Automatically recognizing coherence relations

Task involves:

- Identifying the evidence for the discourse relation – ie, evidence for the “discourse predicate”;
- Identifying the arguments related by that predicate;
- Identifying the sense of the relation.

[Elwell & Baldridge, 2008; Lin et al, 2010; Pitler & Nenkova, 2009; Prasad et al. 2008; Prasad, Joshi & Webber, 2010; Wellner & Pustejovsky, 2007]

Narrative structure



Essay scoring

1. In today's society, college is ambiguous.
2. We need it to live, but we also need it to love.
3. Moreover, without college most of the world's learning would be egregious.
4. College, however, has myriad costs.
5. One of the most important issues facing the world is how to reduce college costs.
6. Some have argued that college costs are due to the luxuries students now expect.
7. Others have argued that the costs are a result of athletics.
8. In reality, high college costs are the result of excessive pay for teaching assistants.¹

¹From Lee Perelman, <http://www.cbc.ca/spark/wp-content/uploads/2012/05/Essays-for-Robo-Reader.pdf>