VisArgue
Visual Analysis of deliberative argumentation
Project Background

Interdisciplinary Approach towards modelling deliberation in political communication (eHumanities)

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Motivation

- The realization of large-scale public projects is prone to creating conflicts between governments and the public sphere, particularly local residents.

- Recent example in Germany – *Stuttgart 21*
  - Proposal to revamp the Stuttgart train station
  - Public opposition made international headlines and ushered in a new Green state government.
Motivation

• Stuttgart 21 is an example showing that the capacity of representative democracy is limited with respect to handling public policy conflicts

• Germany: participatory procedures have been adopted since the early 1990s:
  – formal procedures for citizens’ participation
  – implementation of deliberative procedures to achieve consensus within a public discourse
Theory of Deliberative Democracy

• A form of non-majoritarian democracy: collective decisions should be taken based on reason, rational argumentation and consensus via public discourse.

• Main protagonists: Jürgen Habermas, John Dryzek, Robert Goodin.
Theory of Deliberative Democracy

• Theoretical claims as to effects of deliberation:
  – can overcome interest positions,
  – enhances policy satisfaction and acceptance,
  – decisions taken represent the common good,
  – increases political knowledge of citizens, …

• Empirical tests of these claims usually refer to the institutional setting of a process but rarely include the actual communication.
Deliberative Dialog/Discourse

• The most prominent exception is the Discourse Quality Index (DQI) proposed by Steenbergen et al. (2003) to measure the degree of deliberativity of a discourse.

• Problems:
  – Requires manual coding
  – Inter Annotator agreement not very high
  – No clear guidelines on what linguistic cues exactly indicate deliberativity
Deliberative Dialog/Discourse

• To resolve the Stuttgart 21 conflict an arbitration process was conducted which ended in dissent.

• Questions:
  – Is the Stuttgart 21 arbitration an example of a deliberative discourse?
  – How can one tell?
Our Approach:

- innovative interdisciplinary combination of methods
Political Science – Methodology

• Quantitative and experimental approach
• Design experiments (simulation-gaming) to test claims of the theory of deliberative democracy
• Employ automated methods to analyze the dialogs
  • Include
    – shallow text mining techniques (computer science and computational linguistics)
    – deep linguistic knowledge (linguistics)
    – interactive visual analysis (computer science)
Political Science – Goals

• Development of an index for the quality of deliberative communication based on automated annotation

• Ability to automatically analyze participatory communicative processes like Stuttgart 21 with respect to their degree of deliberation
Political Science – Goals

Test claims of deliberative theory:

(RQ1) Is the degree of interest conflict in a particular decision-making process correlated with the level of deliberation?

(RQ2) Can arguments indeed overcome interests?  
→ new follow-up project (Sept. 2013)
Political Science – Experiments RQ1

A group of subjects negotiates a public policy conflict (e.g., fracking).

Experimental design:

3 factors: conflict over facts, over values, over interests

=> hypothesis: decreasing level of deliberation

4 subjects (2 pro, 2 con)

120 repetitions

1 hour discussion time

pre- and post discussion surveys
Analysis

• The experiments result in large amounts of spoken (transcribed) material.
• How can this material be analyzed effectively?
Our Approach:

- interdisciplinary combination of methods
Tasks for (Computational) Linguistic Research

• Identify linguistic cues that indicate deliberative discourse.
• Identify candidates for automatic detection.
• Develop an annotation scheme to feed into the visual analysis.
• Take multiple annotation dimensions into account.
• Write inference rules for deliberative index.
Challenges

• We cannot evaluate the content (at-issue) of the utterances.

• But we can analyze
  – the rhetorical structure of a discourse
  – key terms indicating reference to democratic or “greater good” principles (needs to be developed in close cooperation with political science)
Linguistic Cues and Deliberativity: key terms

Research Question: Which terms are relevant?

Simulation gaming example:
Also ich bin prinzipiell eher für ein Mehrheitswahlsystem, weil Wettbewerb sehr wichtig ist für Demokratie und dadurch auch das Allgemeinwohl am besten vertreten werden kann.

So in principle I am more in favor of a system of majority vote because competition is very important for democracy and that way the greater good can also be represented in the best manner.
Rhetorical Structure

• we cannot evaluate which argument is “better”
  (at-issue content)
• but we can evaluate
  – the overall argumentative structure of a discourse
  – the rhetorical means employed
  – the conventional implicatures (CI)

➢ Basically how the information is packaged.
Relevant Dimensions

• rhetorical/discourse relations (e.g., reason, concession, opposition, condition)

• information structure (topic, focus, etc.)

• turn taking (length, structure, type)

• manifold further rhetorical devices
Rhetorical/discourse relations

• Can build on a long tradition
• Much work done for English and German
  (cf. a.o. the Penn Discourse Bank: Joshi/Webber)
• Important for us:
  – not primarily interested in discourse coherence
    (some of the turns are quite incoherent...)
  – but in the **speech act** (illocution) of the utterance
    (cf. Stede&Pelzdus 2012)
Information Structure

• Distribution of Topic and Focus is relatively complex in German (e.g. work by Büring)
• But: can look at German Vorfeld, which is topic-like

Simulation gaming example:

Die Geschwindigkeit der Entscheidungsfindung ist, scheint mir so ein bisschen, Ihr Totschlagsargument.

The speed of decision making is, it seems to me just a little, your killer argument.
Related Effort: “Lexical Episodes”

• Visualization of what is under discussion in a stretch of dialog
  – Words that occur more often than expected in a given stretch of text.
  – The distance between instances of a word within an episode is smaller than the expected distance with respect to the entire corpus.

• Example: 3rd presidential debate between Barack Obama and Mitt Romney (Oct. 2012)
Lexical Episodes

- Each grey box is a turn
- Each word has a color
- Interaction possible (mouse over, zooming)
Lexical Episodes

Could also use to determine "key words"
**Rhetorical Devices**

- The German example we just saw has a different interpretation if the parenthetical is removed.

  Die Geschwindigkeit der Entscheidungsfindung ist Ihr Totschlagsargument.

  The speed of decision making is your killer argument.

- How you **package** an utterance rhetorically is of extreme importance in argumentation.
Rhetorical devices

- expression of speaker/hearer belief
- evidentiality
- establishment of common ground
- triggering of presuppositions
- expression of subjectivity vs. objectivity
- hedging, etc.

How do these play out in German? – Just some examples...
Modal Particles

- Spoken German makes extensive use of modal particles

From Stuttgart 21

und in München und Nürnberg wohnen ja wohl doch
doppelt so viele Leute wie in Stuttgart und Ulm zusammen

and isn’t it the case that in Munich and Nürnberg twice as many people live as in Stuttgart and Ulm taken together
Modal/Discourse Particles

- Quite a bit of research on particles in German (Zimmerman 2011 provides an overview)
- Precise meaning contribution difficult to pin-point
- Particles are ambiguous – occur in different contexts with different meanings.
- But can build on some existing analyses, e.g. *ja, doch, wohl, halt, eben*
Modal/Discourse Particles

Zimmermann: discourse particles contribute to the CI (conventional implicature) meaning:

$$[[\text{ja}]](p) = p \text{ is true and speaker believes } p \text{ is uncontroversial}$$

From Stuttgart 21:

weil \textbf{ja} Lokomotiven auch für eine längere Zeit eingekauft werden als für 10 Jahre.

because \textbf{(it’s clear)} that train engines are bought for a longer time span than for 10 years
Modal/Discourse Particles

\[[\text{halt}]\](p) = resigned acceptance of p by speaker due to perceived unalterable state of affairs (based on Karagjsova)

From Stuttgart 21:
Dann rüste ich **halt** den Kopfbahnhof auf.
Then *(in that case)* I’ll upgrade the railway terminal.
Modal/Discourse Particles

With a causal connector, *halt* takes on a meaning of justification via the invocation of an immutable constraint due to “this-is-the-way-the-world-is”.

From Stuttgart 21:
weil *halt* in dem Bereich auch die meisten Autos unterwegs sind.
because that area is also frequented by the most cars.
Causal Connectors

• But not all causal connectors are created equal.
• Differ on scale of “speaker involvement” (subjectivity) (e.g., Pander Maat and Degand 2001)

also > folglich > denn > infolgedessen > nämlich > so > somit > schließlich > deshalb > daher > darum

• our initial results do not quite confirm this scale
Causal Connectors: *weil* vs. *denn*

- *denn*: indirect assertion of causal relation, related to speaker knowledge (epistemic) (e.g., Scheffler 2005)
- *weil*: assertion of objective direct causal relation

Wir haben den Zug aber wieder eingestellt, *weil* die Nachfrage zu gering war. We terminated that train *because* the demand was too low.

*denn* der normale Gedanke beim Güterverkehr ist ...  
*because* the normal reasoning with respect to freight traffic is ...
Other Relevant Linguistic Cues to Explore

Position of verb in embedded clauses of attitude verbs (Scheffler 2009)

– V2 (second position in clause): expression of doubtfulness or uncertainty of outcome

Ich hoffe, dass Peter heute noch kommt. (neutral expectation)
I hope that Peter is still coming today.

Ich hoffe, Peter kommt heute noch. (doubtful of event happening)
I hope, Peter is (really) still coming today.
Other Relevant Linguistic Cues to Explore

• Level of politeness in discussion (cf. Stanford politeness corpus)
• Level of tolerance in discussions (Mukherjee et al. 2013)
• and more...
Annotation Scheme

no existing annotation scheme that fits our purpose
– linguists tend to work on one of the relevant dimensions (particles or connectors or information structure), but very seldom on all dimensions that are relevant to us
– annotation scheme has to be able to take at least the different factors just sketched into account
Annotation Scheme – Methodology

• build on state-of-the-art where possible
• work bottom-up using linguistic cues that can be identified reliably and automatically
• inference rules collect up relevant information and provide an analysis that goes beyond the individual cues
Inference Rule: Example

• if causal connector *weil* plus the modal particle *ja* $\rightarrow$ invocation of common ground as reason
• if causal connector *weil* plus the modal particle *halt/eben* $\rightarrow$ invocation of immutable constraint due to “this-is-the-way-the-world-is” as reason
• etc.
Our Approach:

• interdisciplinary combination of methods
Tasks for Visual Analytics Research

• Support the development of an automated measure of deliberation
• Support the visual analysis of deliberative mediation processes
• Support the visual analysis of linguistic phenomena
Machine: Quantitative Measures (scalable, „objective“)

Text Features
• Average word length
• Frequency distribution of pronouns
• Branching factor of sentence syntax parse tree
• Relative frequency of foreign words
• ...

Meta Features
• Utterance frequency of persons
• Order of persons
• ...

Human: Qualitative Judgements (not scalable, „subjective“)

Semantic Judgements
• Negotiation vs. Argumentation
• Degree of Deliberation
• Eloquence
• Persuasiveness
• Fairness
• Emotionality
Challenges for Computer Science Research

- System Architecture
- Design
- Algorithms
- Evaluation
System Architecture

• Infrastructure for Visual Discourse Analysis
  – Modular
  – Understandable
  – Flexible
  – Extendible

• Flexible Workflows

• Open-source Release envisioned
Design

• Visualization
  – What information to show?
  – How to show it?

• Interaction
  – Which interactions to offer?
  – How to make them intuitive?
Conceptual Recurrence Plots
(based on Angus et al. 2011)

Track topic (dis)continuation across speakers

Each speaker gets a color.

Gradience indicates thematic overlap (the more solid the color, the more overlap).
Algorithms

• Automated Processing/Analysis
  – What kind of information to extract from the data?
  – Where are novel methods required?
  – How to design efficient and effective solutions?

• Visualizations
  – How to achieve optimal layouts efficiently?
  – How to dynamically adapt layouts to interactions?
Evaluation

• Benchmark
  – How to create valid benchmarks for the evaluation of automated preprocessing/analysis methods?

• User Studies
  – How to design insightful studies on the usability of single visualizations and the overall system?
Summary

• Multi-faceted problem:
  – Understanding the connection between the degree of deliberativity of a dialog and actual argumentative strategies
  – Using linguistic cues to measure the degree of deliberativity of a dialog?
  – Using visual analytics to understand the structure of a deliberative dialog.
More details on the Powerwall tomorrow!
(C202)